Department for Business, Energy & Industrial Strategy

ENERGY TRENDS
MARCH 2019

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Designation can be broadly interpreted to mean that the statistics:

- meet identified user needs
- are well explained and readily accessible
- are produced according to sound methods, and
- are managed impartially and objectively in the public interest

Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed.

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Introduction

Energy Trends and Energy Prices are produced by the Department for Business, Energy and Industrial Strategy (BEIS) on a quarterly basis. Both periodicals are published concurrently in June, September, December and March. The March editions cover the fourth quarter of the previous year and also the previous year as a whole.

Energy Trends includes information on energy as a whole and by individual fuels. The text and charts provide an analysis of the data in the tables. The tables are mainly in commodity balance format, as used in the annual Digest of UK Energy Statistics. The 2018 edition of the Digest was published on 26 July 2018 and is available on the BEIS section of the GOV.UK website at: www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

The balance format shows the flow of a commodity from its sources of supply, through to its final use. The articles provide in-depth information on current issues within the energy sector.

The text and tables included in this publication represent a snapshot of the information available at the time of publication. However, the data collection systems operated by BEIS, which produce this information, are in constant operation. New data are continually received and revisions to historic data made. To ensure that those who use the statistics have access to the most up-to-date information, revised data will be made available as soon as possible. The tables are available free of charge from the BEIS section of the GOV.UK website. In addition to quarterly tables, the main monthly tables continue to be updated and are also available on the BEIS section of the GOV.UK website. Both sets of tables can be accessed at:
www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics

Annual data for 2018 included within this edition is on a provisional basis. New data are continually received and revisions to previous data made. Finalised figures for 2018 will be published on the 25 July 2019 in the annual Digest of UK Energy Statistics.

Energy Trends does not contain information on Foreign Trade, Weather (temperature, wind speed, sun hours and rainfall) and Prices. Foreign Trade and Weather tables are however available on the BEIS section of the GOV.UK website at: www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics. Information on Prices can be found in the Energy Prices publication and on the BEIS section of the GOV.UK website at:
www.gov.uk/government/collections/quarterly-energy-prices

Please note that the hyperlinks to tables within this document will open the most recently published version of a table. If you require a previously published version of a table, please contact Kevin Harris (see details below).

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The main points for 2018:

- Total energy production was 3.7 per cent higher than in 2017. This increase, the fourth in successive years, was due to rises in output from oil, bioenergy and waste, wind and solar. Coal output fell to a record low level, whilst output from gas and nuclear also fell.
- Imports in 2018 were 0.1 per cent lower than in 2017, whilst exports rose by 3.3 per cent. As a result, net import dependency fell back from 36.3 per cent to 35.3 per cent.
- Crude oil & NGL production was 8.9 per cent higher than in 2017, due to new fields on the UKCS coming online.
- Natural gas production was 3.1 per cent lower than in 2017. Gas exports were 33 per cent lower, whilst imports were 2.0 per cent lower; net imports rose 7.9 per cent on 2017.
- Coal production was 15 per cent lower than in 2017, and at a record low level, mainly due to one of the large surface mines not producing since April 2017 (it is under 'care and maintenance'), along with lower demand for electricity generation. Imports of coal in 2018 were nearly 17 per cent higher compared to 2017. Coal stocks were broadly similar to 2017.
- Total primary energy consumption for energy uses was 0.6 per cent lower than in 2017. However, when adjusted to take account of weather differences between 2017 and 2018, primary energy consumption fell by 1.3 per cent.
- Temperatures in 2018 were broadly similar to a year earlier, with average temperatures in Q2, Q3 and Q4 being noticeably warmer than a year earlier, but Q1 being noticeably colder due to the 'Beast from the East'.
- Final energy consumption (excluding non-energy use) was 0.7 per cent higher than in 2017. On a seasonally and temperature adjusted basis it is estimated to have fallen by 0.3 per cent with rises in industrial and transport consumption offset by falls in the domestic and services sectors.
- Gas demand was 0.1 per cent higher than in 2017, but with less use of gas in electricity generation, whilst electricity consumption was broadly unchanged.
- Electricity generation in 2018 fell by 1.4 per cent, from 339 TWh a year earlier to 334 TWh, with falls in generation from coal, gas and nuclear offset by an increase from renewables, primarily bioenergy, wind and solar generation.
- Of electricity generated in 2018, gas accounted for 39.4 per cent (down 1.0 percentage points compared to 2017) and coal 5.0 per cent (a fall of 1.6 percentage points on 2017). Nuclear's share decreased by 1.3 percentage points on 2017 to 19.5 per cent.
- Renewable electricity generation was 111.1 TWh in 2018, a record high, an increase of 11.8 per cent on the 99.3 TWh in 2017, largely due to increased capacity. Renewables' share of electricity generation increased by 3.9 percentage points on 2017 to 33.3 per cent, also a record high. Renewable electricity capacity was 44.4 GW at the end of 2018, a 9.7 per cent increase (3.9 GW) on a year earlier.
- Low carbon electricity's share of generation increased from 50.1 per cent in 2017 to a record high of 52.8 per cent in 2018, driven by growth in renewable generation due to increased capacity.
- Provisional estimates show that carbon dioxide emissions fell between 2017 and 2018 by 2 per cent; the key factor leading to this decrease was the switch in generation from coal and gas to renewable sources. A separate BEIS statistical release published at: www.gov.uk/government/statistics/provisional-uk-greenhouse-gas-emissions-national-statistics-2018 provides more detail.

The main points for the fourth quarter of 2018:

- Total energy production was 7.9 per cent higher when compared with the fourth quarter of 2017, boosted by strong growth in oil and bioenergy and waste output.
- Crude oil production rose by 18 per cent when compared with the fourth quarter of 2017, due to the closure of the Forties pipeline in December 2017, whilst NGL production fell by 3.2 per cent.
- Natural gas production was 5.1 per cent lower than the fourth quarter of 2017. Gas imports fell by 5.9 per cent, whilst exports fell by 47 per cent; net imports fell by 0.7 per cent compared to the fourth quarter of 2017.
- Coal production in the fourth quarter of 2018 was 20 per cent lower than the fourth quarter of 2017. Coal imports were 19 per cent higher, whilst generators' demand for coal was down by 40 per cent.
- Total primary energy consumption for energy uses fell by 3.0 per cent. However, when adjusted to take account of weather differences between the fourth quarter of 2017 and the fourth quarter of 2018, primary energy consumption also fell by 2.7 per cent.
- Temperatures in the quarter were on average 0.4 degrees warmer than a year earlier, with average temperatures in November and December 2018 being noticeably warmer than a year earlier, but October 2018 being noticeably colder.
- Final energy consumption (excluding non-energy use) was 2.1 per cent lower than in the fourth quarter of 2017. Domestic consumption fell by 4.4 per cent driven by the warmer weather in November and December 2018. On a seasonally and temperature adjusted basis final energy consumption fell by 0.2 per cent.
- Gas demand was 4.5 per cent lower and electricity consumption was 1.3 per cent lower than the fourth quarter of 2017, driven by warmer temperatures in November and December 2018.
- Electricity generated in the fourth quarter of 2018 decreased by 4.4 per cent, from 92.2 TWh a year earlier to 88.1 TWh.
- Of electricity generated in the fourth quarter of 2018, gas accounted for 37.9 per cent, whilst coal accounted for 5.7 per cent. Nuclear generation accounted for 16.5 per cent of total electricity generated in the fourth quarter of 2018.
- Renewables' share of electricity generation increased from 30.1 per cent in the fourth quarter of 2017 to 37.1 per cent in the fourth quarter of 2018, reflecting higher renewable generation and lower overall electricity generation.
- Low carbon electricity's share of generation increased from 48.2 per cent in the fourth quarter of 2017 to 53.6 per cent in the fourth quarter of 2018, due to a large rise in renewables generation compared with 2017 Q4.

Section 1 - Total Energy

Key results show:

Provisional 2018

Total energy production was 3.7 per cent higher than in 2017. This increase, the fourth in successive years, was due to rises in output from oil, bioenergy and waste, wind and solar. Oil output rose, up 9.0 per cent, and together with gas, which fell 3.1 per cent, accounts for 72 per cent of UK production. Coal output fell to a record low level, whilst output from nuclear also fell, due to outages. The output from bioenergy and waste and wind, solar and hydro is now nearly 13 times higher than coal, notable as coal output was higher as recently as 2012. **(Chart 1.1**)

Total primary energy consumption for energy uses was 0.6 per cent lower than in 2017. However, when adjusted to take account of weather differences between 2017 and 2018, primary energy consumption fell by 1.3 per cent. **(Chart 1.3**)

Final energy consumption (excluding non-energy use) was 0.7 per cent higher than in 2017. On a seasonally and temperature adjusted basis it is estimated to have fallen by 0.3 per cent with rises in industrial and transport consumption offset by falls in the domestic and services sector. (**Chart 1.5**)

Net import dependency was 35.3 per cent in 2018. Imports fell whilst exports rose in 2018. Fossil fuel dependency was at a record low in 2018 at 79.3 per cent. (**Charts 1.6 & 1.7**)

Quarter 4 2018

Total energy production was 7.9 per cent higher than in the fourth quarter of 2017, boosted by strong growth in oil and bioenergy and waste output. (**Chart 1.2**)

Total primary energy consumption for energy uses fell by 3.0 per cent. However, when adjusted to take account of weather differences between the fourth quarter of 2017 and the fourth quarter of 2018, primary energy consumption also fell by 2.7 per cent. **(Chart 1.3**)

Final consumption fell by 2.2 per cent compared to the fourth quarter of 2017, with the warmer weather in November and December 2018 compared to a year earlier a significant factor, resulting in domestic consumption falling by 4.4 per cent. (**Chart 1.4**)

Relevant tables

1.1: Indigenous production of primary fuels
1.2: Inland energy consumption: primary fuel input basis
1.3: Supply and use of fuels, and Seasonally adjusted and temperature corrected final energy consumption

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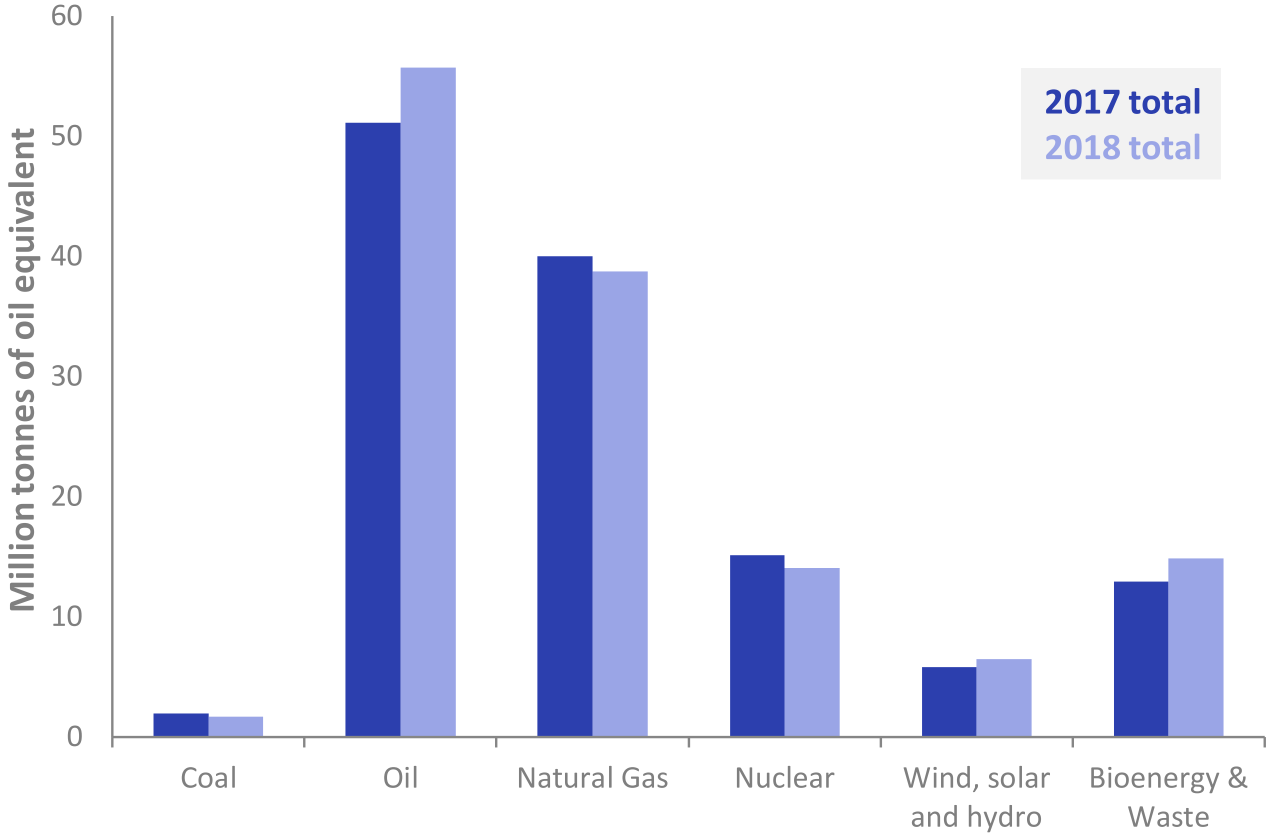
Chart 1.1 Production of indigenous primary fuels (Table 1.1)



Total production in 2018 was 131.5 million tonnes of oil equivalent, 3.7 per cent higher than in 2017. This increase, the fourth in successive years, is due to rises in output from oil, bioenergy and waste, wind and solar which more than offset the decline in UK coal production and reduced output from gas and nuclear. Output from bioenergy and waste and wind, solar and hydro is now nearly 13 times that of coal, when as recently as 2012 coal output was larger.

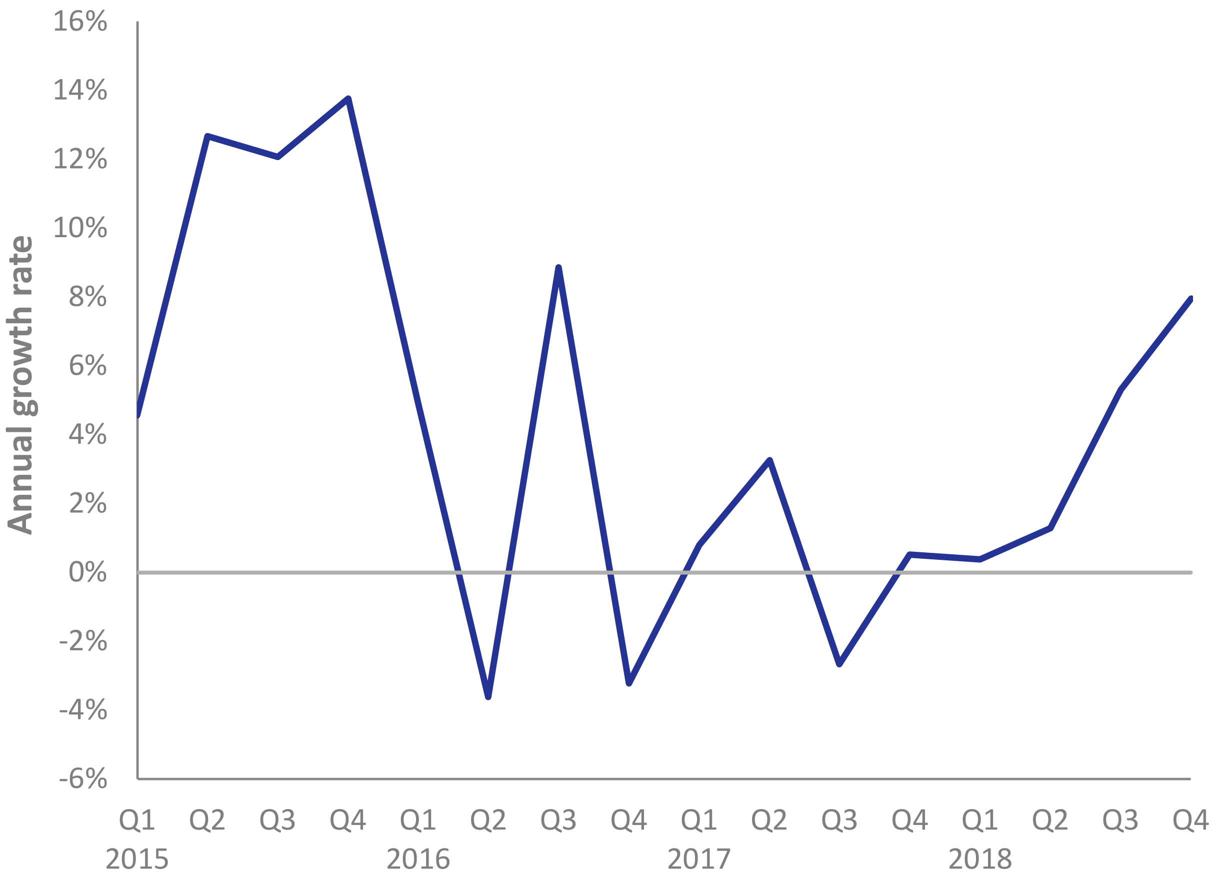
Production of oil rose by 9.0 per cent due to new fields opening on the UKCS, as well as the closure of the Forties pipeline in December 2017, whilst gas fell by 3.1 per cent, with production in the second half of the year impacted by the closure of the Theddlethorpe gas terminal in August 2018.

Production of bioenergy & waste rose by 15 per cent between 2017 and 2018 to a record 14.8 million tonnes of oil equivalent, driven by conversions from coal to biomass at the Drax and Lynemouth power stations.

Primary electricity output fell by 1.8 per cent between 2017 and 2018, within which nuclear output fell by 7.0 per cent due primarily to outages in the fourth quarter of 2018, whilst output from wind, solar and hydro rose by 12 per cent, to a record high level, due to increased wind and solar capacity.

Production of coal fell by 14 per cent, to a new record low.

Chart 1.2 UK production (annual growth rate) (Table 1.1)



Total production in the fourth quarter of 2018 at 34.8 million tonnes of oil equivalent was 7.9 per cent higher than in the fourth quarter of 2017.

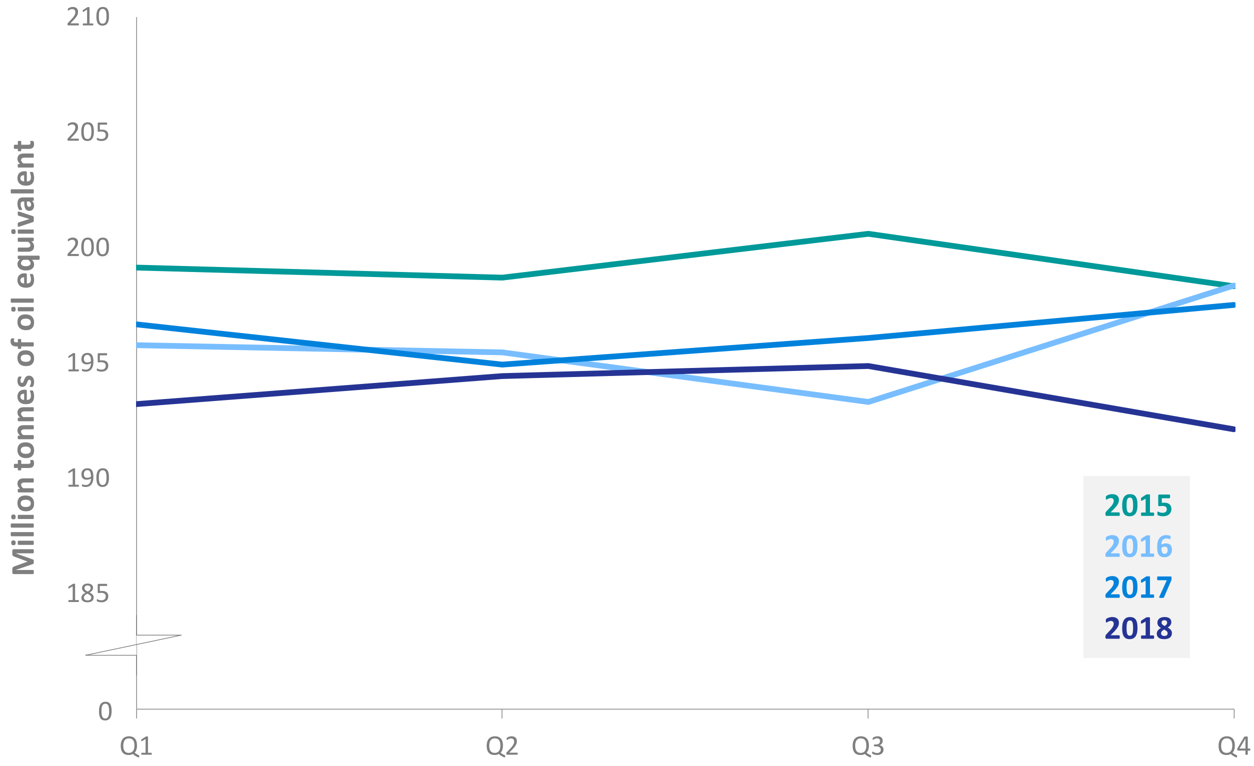
Production of oil rose by 17 per cent, whilst gas fell by 5.1 per cent compared to the fourth quarter of 2017. Oil and gas production levels in December 2018 were 31 per cent higher than in December 2017 due to the closure of the Forties Pipeline System for repair.

Primary electricity output in the fourth quarter of 2018 was 4.9 per cent lower than in the fourth quarter of 2017, within which nuclear electricity output was 12 per cent lower following outages, whilst output from wind, solar and hydro was 10 per cent higher due to increased wind and solar capacity.

Production of bioenergy and waste was 40 per cent higher compared to the fourth quarter in 2017, due mainly to an increase in capacity, mostly from the conversion of Lynemouth power station from coal to biomass in March 2018.

In the fourth quarter of 2018 production of coal was 19 per cent lower than the corresponding period of 2017.

Chart 1.3 Total inland consumption (primary fuel input basis) [(1)] **(Table 1.2)**



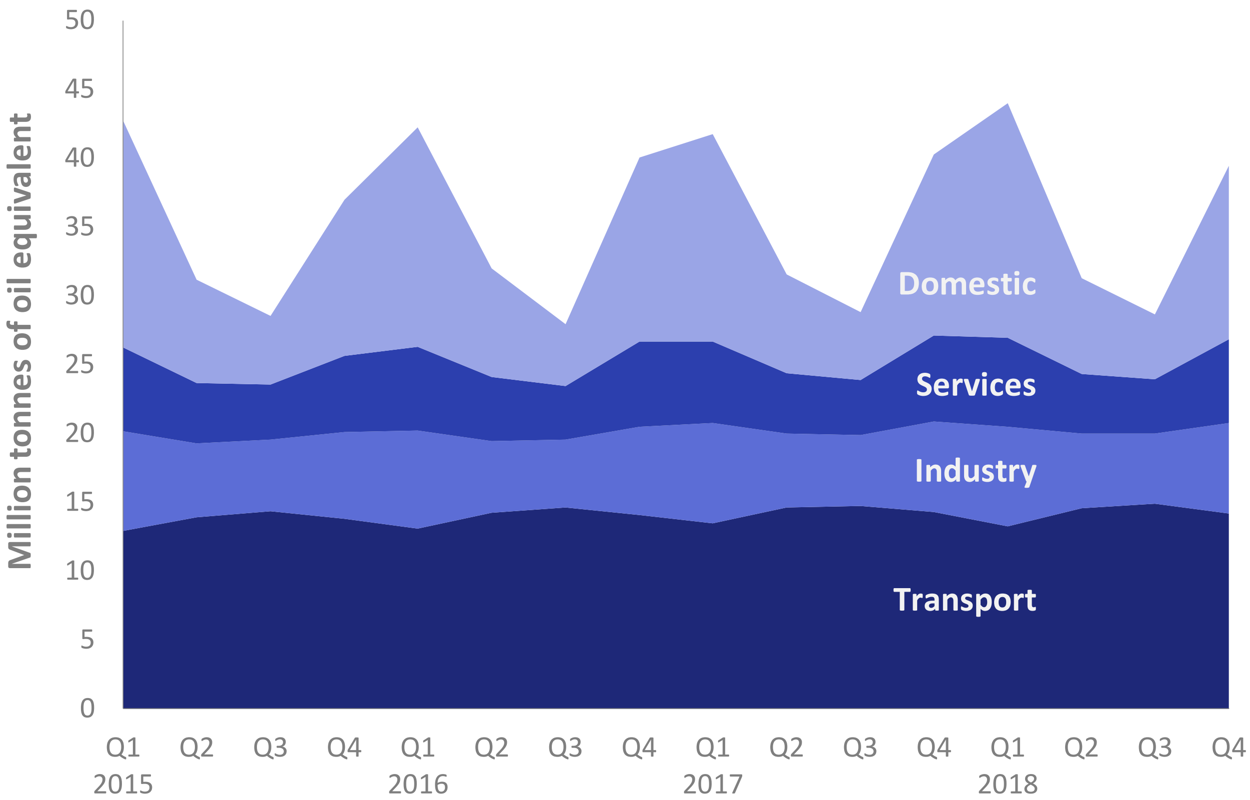
Total inland consumption on a primary fuel input basis (temperature corrected, seasonally adjusted annualised rate), was 193.7 million tonnes of oil equivalent in 2018, a fall of 1.3 per cent from 2017. On an unadjusted basis, consumption was down 0.6 per cent. The average temperature in 2018 was broadly similar to 2017, and BEIS estimate that the number of heating degree days increased by 5.5 per cent from 1,889 to 1,992.

Between 2017 and 2018 (on a seasonally adjusted and temperature corrected basis) oil consumption fell by 1.3 per cent, gas fell by 1.7 per cent as electricity generators made more use of renewable sources, and bioenergy rose by 9.6 per cent. Primary electricity consumption was broadly unchanged, within which nuclear fell by 7.0 per cent but wind, solar and hydro rose by 12 per cent, whilst coal consumption fell by 19 per cent, to a record low.

Total inland consumption on a primary fuel input basis (temperature corrected, seasonally adjusted annualised rate), was 192.1 million tonnes of oil equivalent in the fourth quarter of 2018, a fall of 2.7 per cent compared to the fourth quarter of 2017. On an unadjusted basis, consumption also fell by 3.0 per cent; average temperatures in the fourth quarter of 2018 were 8.6 degrees Celsius, 0.4 degrees higher than the same period a year earlier. Average temperatures in November and December 2018 were respectively 1.2 and 1.8 degrees higher than the equivalent months in 2017; whilst in October 2018 the daily average temperature was 10.7 degrees Celsius, 1.6 degrees Celsius lower than October 2017.

Consumption of coal fell by 32 per cent on an unadjusted basis in the fourth quarter of 2018 compared to a year earlier, whilst gas consumption fell by 4.8 per cent. Primary electricity consumption fell by 1.6 per cent, within which nuclear fell by 12 per cent but wind, solar and hydro rose by 10 per cent due to increased capacity and more favourable weather conditions. These changes in consumption levels reflect the switch from coal and gas to renewable sources for electricity generation in 2018 (see sections 5 and 6).

Chart 1.4 Final energy consumption by user [(Table 1.3a)]



In 2018, total final consumption (including non-energy use) was 0.4 per cent higher than in 2017, but 7.2 per cent lower than 2008.

Total final energy consumption fell by 2.2 per cent between the fourth quarter of 2017 and the fourth quarter of 2018.

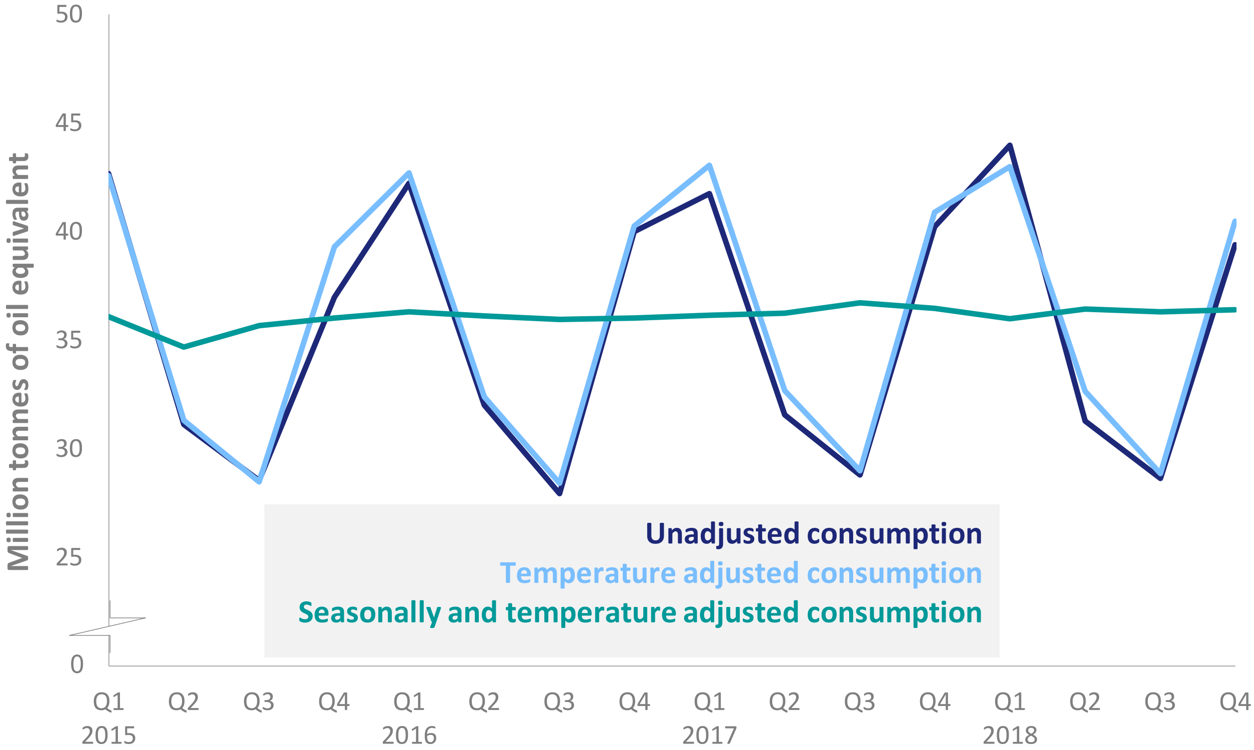
Domestic sector energy consumption fell by 4.4 per cent between the fourth quarter of 2017 and the fourth quarter of 2018 reflecting the warmer weather in the quarter; annually it rose by 2.3 per cent reflecting the notably cold weather in February and March.

Service sector energy consumption fell by 1.8 per cent between the fourth quarter of 2017 and the fourth quarter of 2018; annually it rose by 1.4 per cent.

Industrial sector energy consumption was broadly unchanged between the fourth quarter of 2017 and the fourth quarter of 2018; annually it rose by just 0.1 per cent.

Transport sector energy consumption fell by 0.9 per cent between the fourth quarter of 2017 and the fourth quarter of 2018; annually it fell by 0.5 per cent.

Chart 1.5 Seasonally adjusted and temperature corrected final energy consumption [(Table 1.3c)]

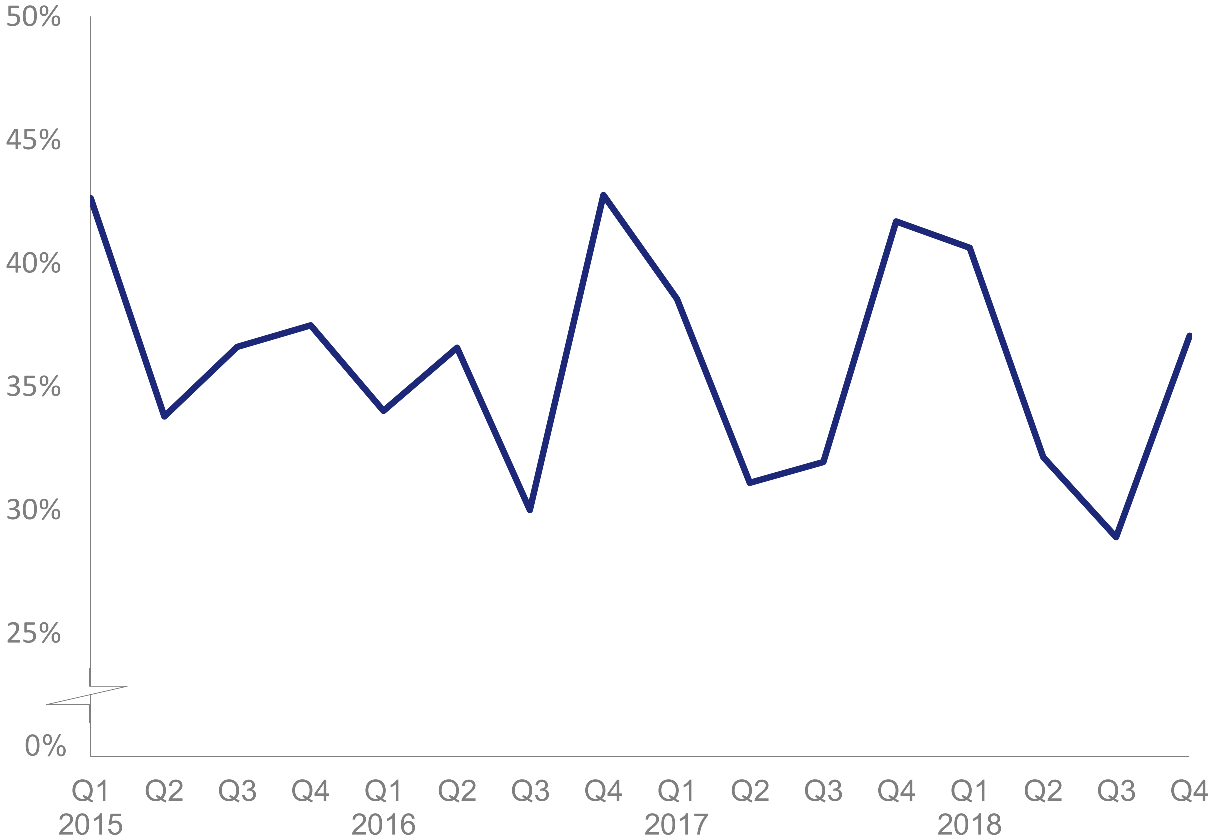


Total unadjusted final energy consumption (excluding non-energy use) rose by 0.7 per cent between 2017 and 2018.

On a seasonally and temperature adjusted basis final energy consumption (excluding non-energy use) is estimated to have fallen by 0.3 per cent driven by falls in domestic and service sector consumption.

Total unadjusted final energy consumption (excluding non-energy use) fell by 2.1 per cent between the fourth quarter of 2017 and the fourth quarter of 2018. On a seasonally and temperature adjusted basis final energy consumption (excluding non-energy use) is estimated to have fallen by 0.2 per cent between the fourth quarter of 2017 and the fourth quarter of 2018.

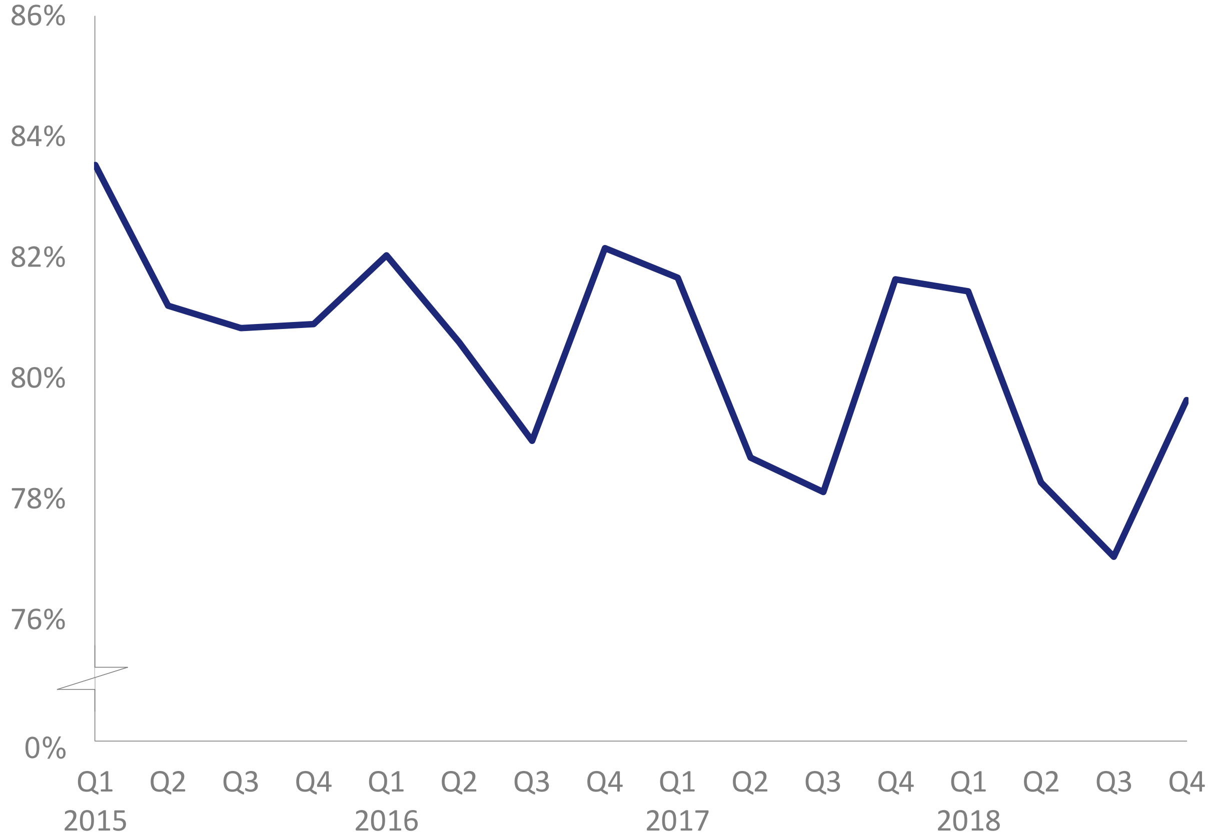
Chart 1.6 Net import dependency [(Table 1.3a)]



Annually, total imports fell by 0.1 per cent to 153.4 million tonnes of oil equivalent, whilst exports rose by 3.3 per cent to 81.8 million tonnes of oil equivalent. As a result, net import dependency fell 1.0 percentage points from 2017 to 35.3 per cent, its lowest level since 2010.

In the fourth quarter of 2018, imports fell by 3.0 per cent, whilst exports rose by 11 per cent. As a result, net import dependency fell 4.6 percentage points from the fourth quarter of 2017 to 37.1 per cent.

Chart 1.7 Fossil fuel dependency (Table 1.3a)



Annually fossil fuel dependency was at a record low of 79.3 per cent, down 0.9 percentage points from 2017.

Dependency on fossil fuels in the fourth quarter of 2018 was 79.6 per cent, down 2.0 percentage points from the fourth quarter of 2017.

Section 2 – Solid Fuels and Derived Gases

Key results show:

Provisional 2018
Overall coal production in 2018 was 2.6 million tonnes, the lowest on record, and down 15 per cent compared to 2017, partly due to one of the large surface mines not producing since April 2017 (it is under 'care and maintenance'), along with lower demand for electricity generation. Deep-mined output was up but accounts for one per cent of production. **(Chart 2.1)**

Coal imports at 9.9 million tonnes were 17 per cent higher compared to 2017. **(Chart 2.1)**

The demand for coal by electricity generators in 2018 was 6.7 million tonnes (a new record low). This was 24 per cent below the demand in 2017. Demand for coal-fired electricity generation continued to decline as production favoured gas, nuclear and renewables over coal. Additionally, generation capacity which had fallen in recent years continued to fall with Eggborough power station closing in September 2018. **(Chart 2.3)**

Total stocks at the end of 2018 were 5.2 million tonnes, which remains steady when compared with 2017. **(Chart 2.4)**

Quarter 4 2018
In the fourth quarter of 2018, overall production was down 20 per cent compared to the fourth quarter of 2017 due to the further contraction of surface mined coal. Deep mined coal remains only a small component of coal production as only a few small deep mines are still operational. **(Chart 2.1)**

Coal imports were up 19 per cent on the levels in quarter 4 2017. **(Chart 2.1)**

The demand for coal by electricity generators in the fourth quarter of 2018 was 40 per cent lower than demand in the fourth quarter of 2017. The decline was due to the rise in renewables reducing the need for coal-fired generation, the closure of Eggborough power station in September 2018 and milder weather in November and December 2018. **(Chart 2.3)**

Relevant tables

2.1: Supply and consumption of coal
2.2: Supply and consumption of coke oven coke, coke breeze and other manufactured solid fuels
2.3: Supply and consumption of coke oven gas, blast furnace gas, benzole and tars

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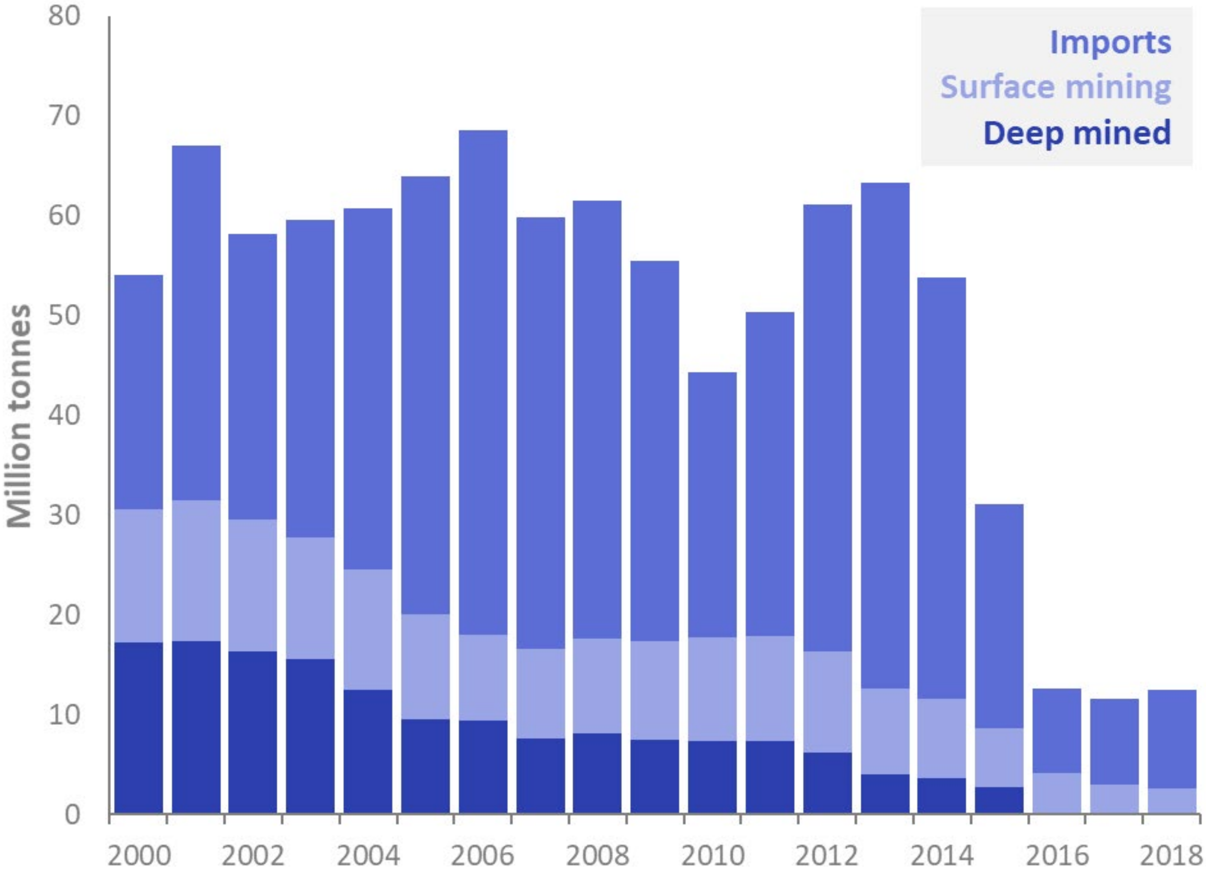
Chart 2.1 Coal supply [(Table 2.1)]



Provisional figures for 2018 show that coal production was 15 per cent down on 2017 at 2.6 million tonnes (a record low), partially due to due to one of the large surface mines not producing since April 2017 (it is under 'care and maintenance'), along with lower demand for electricity generation. Deep-mined output was up although this is less than one per cent of production. Coal use has declined since the early seventies as new fuels have entered the market. In the last ten years UK coal production has fallen by 86 per cent.

Provisional figures for the fourth quarter of 2018 show that coal production fell to 0.1 million tonnes, down 20 per cent on the fourth quarter of 2017. This is a result of mine closures and the prevailing economic trends in the UK's coal industry, which has made imports of coal cheaper than domestic production.

Imports of coal in 2018 rose 17 per cent compared to 2017, a larger than usual increase and reflective of a lower drawdown in stocks during the year.

The decrease in demand reflects the fact that consumption by electricity generators was down by 24 per cent to 6.7 million tonnes (a new record) in 2018.

Table 2A Coal imports by origin

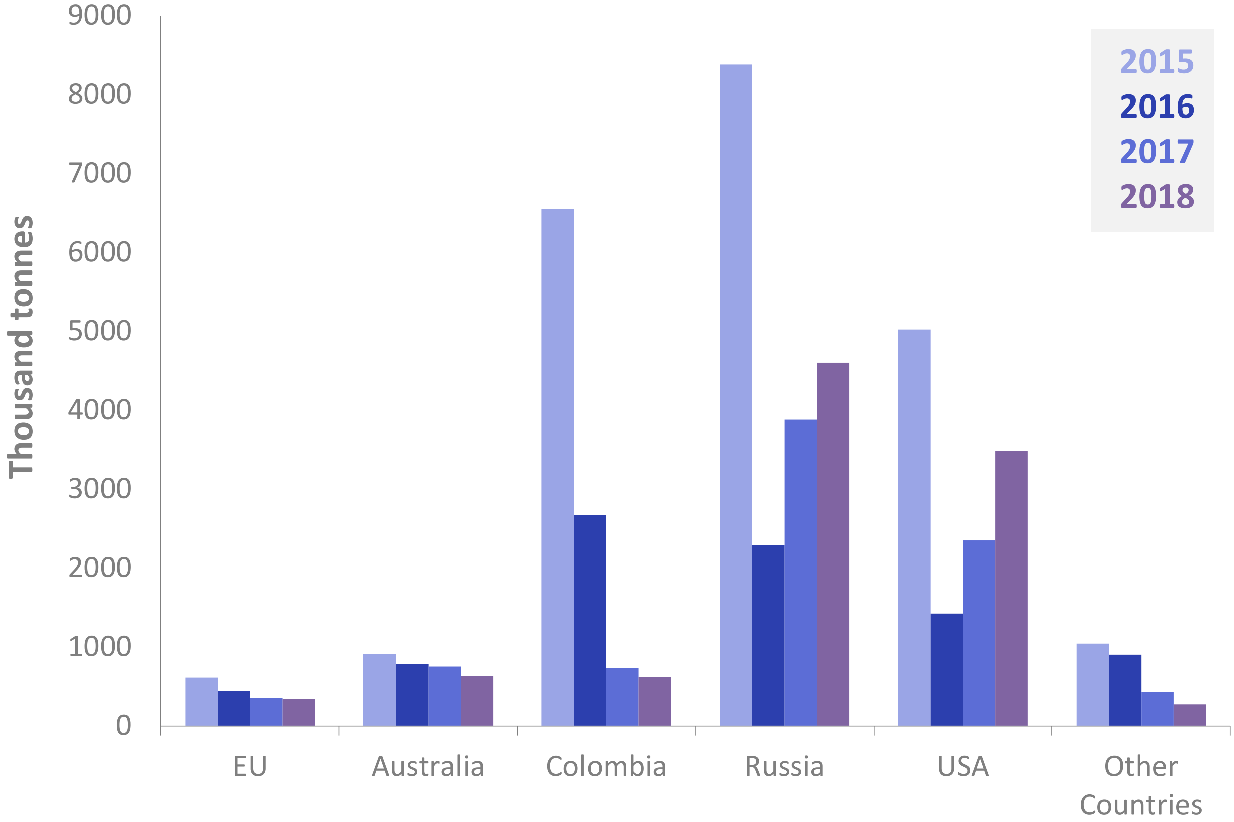
Thousand Tonnes

	2017	2018p	2017 Q4	2018 Q4p
European Union	356	344	94	114
Russia	3,883	4,598	1,092	1,299
Colombia	731	626	428	257
USA	2,352	3,478	598	1,219
Australia	749	630	241	84
Other Countries	427	268	89	39
Total Imports	**8,498**	**9,944**	**2,542**	**3,013**

Coal imports of 9.9 million tonnes in 2018 were up 17 per cent compared to 2017, largely as a result of imports partially replacing the draw-down from stock seen in 2017. Steam coal imports rose by 30 per cent to 7.4 million tonnes, while coking coal imports fell 10.2 per cent to 2.4 million tonnes. Steam coal accounted for 74 per cent of total coal imports in 2018 and coking coal accounted for 24 per cent of coal imports.

In the fourth quarter of 2018, total coal imports increased by 19 per cent to 3.0 million tonnes. Russia (43 per cent) and the USA (40 per cent) accounted for 83 per cent of total coal imports. Steam coal imports in the fourth quarter of 2018 rose by 28 per cent to 2.5 million tonnes and accounted for 84 per cent of total coal imports. Coking coal imports in the fourth quarter of 2017 fell by 18 per cent to 0.4 million tonnes and accounted for 15 per cent of total coal imports.

Chart 2.2 Total coal imports (Table 2.4)

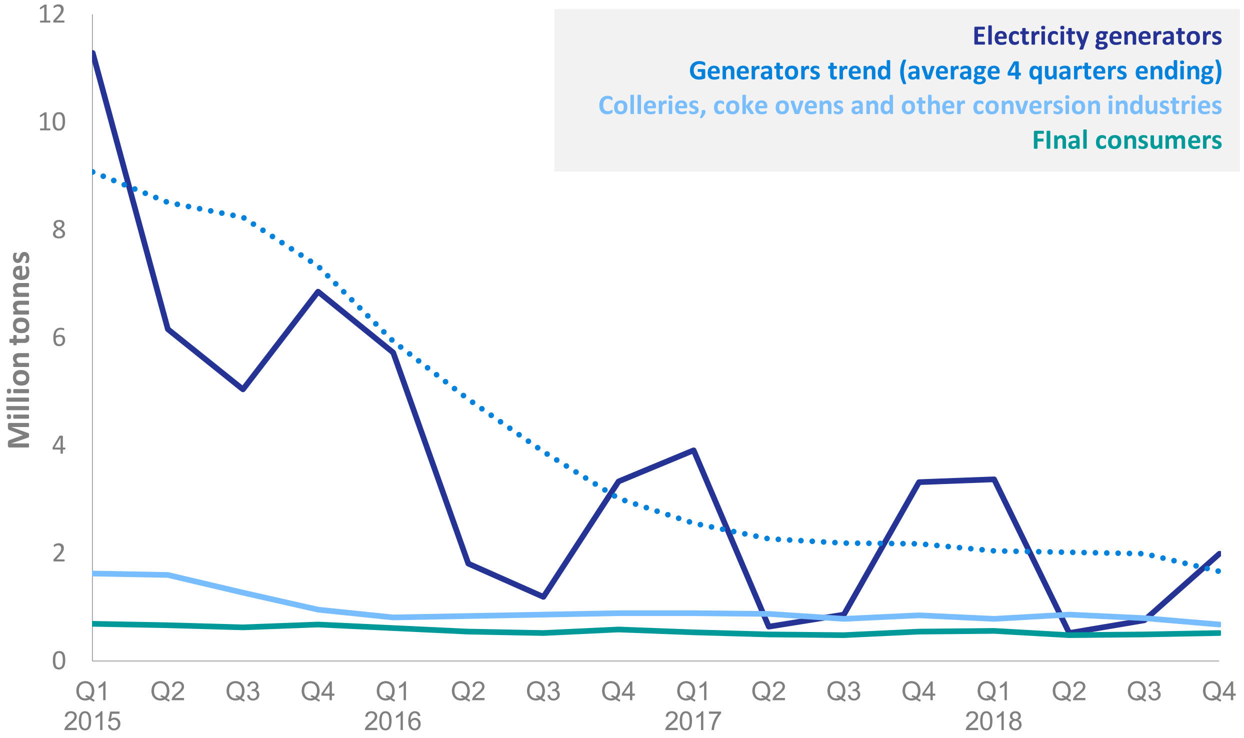


In 2018, 7.4 million tonnes of the coal imported (74 per cent) was steam coal, largely for the power stations market. Russia (49 per cent) and the USA (37 per cent) in 2018 represented 86 per cent of steam coal imports.

Steam coal imports from the USA were 87 per cent higher in 2018 than in 2017, increasing to 2.7 million tonnes. There was also an increase of steam coal imports from Russia of 26 per cent to 3.7 million tonnes. Steam coal imports from Colombia fell by 14 per cent to 626 thousand tonnes.

In the fourth quarter of 2018 all but 3 per cent of UK steam coal imports came from just three counties: Russia (45 per cent), the USA (42 per cent) and Colombia (10 per cent). Steam coal imports from Russia rose 13 per cent to 1.1 million tonnes in the fourth quarter of 2018. Steam coal imports from the USA more than doubled in fourth quarter of 2018 compared to the same period in 2017. Steam coal imports from Colombia fell by 40 per cent to 257 thousand tonnes in the fourth quarter of 2018.

Chart 2.3 Coal consumption [(Table 2.1)]



Total demand for coal in 2018 was 11.8 million tonnes, 17 per cent lower than in 2017, with consumption by electricity generators down by 24 per cent to a new record low of 6.7 million tonnes. Demand for coal-fired electricity generation continued to decline as production favoured gas, nuclear and renewables over coal. Additionally, generation capacity which had fallen in recent years continued to fall with Eggborough power station closing in September 2018. Electricity generators accounted for 56 per cent of total coal use in 2018 compared with 62 per cent in 2017.

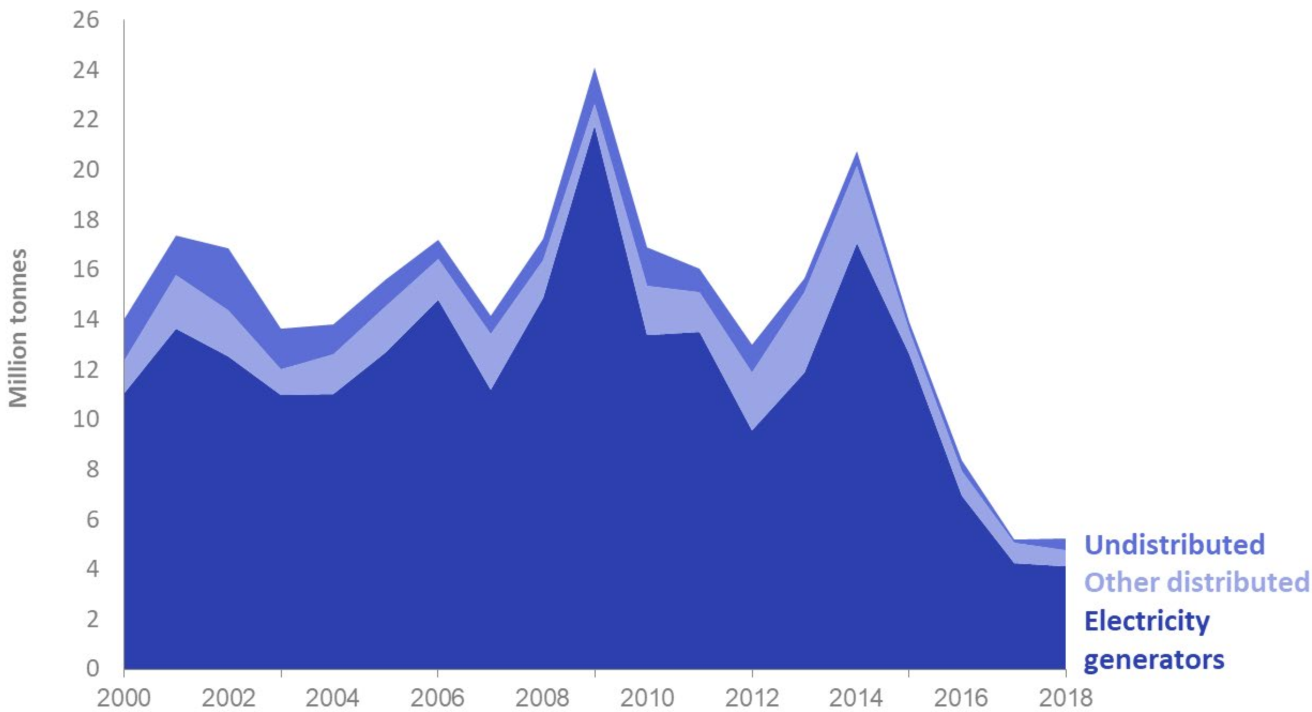
Coal used for coke manufacture fell 6.4 per cent to 1.8 million tonnes, while coal used in blast furnaces fell 11.2 per cent to 1.2 million tonnes.

Total demand for coal in the fourth quarter of 2018, at 3.2 million tonnes, was 32 per cent lower than in the fourth quarter of 2017. Consumption by electricity generators fell by 40 per cent to 2.0 million tonnes as renewables rose reducing the need for coal-fired generation. The closure of Eggborough power station in September 2018 and milder weather in November and December 2018 also contributed to lower coal-fired generation. Coal accounted for just 9.9 per cent of the total electricity supplied by Major Power Producers in the fourth quarter of 2018. Electricity generators accounted for 62 per cent of total coal use in the fourth quarter of 2018; compared to 70 per cent in 2017.

Sales to final consumers (as measured by disposals to final consumers) rose by 0.1 per cent in 2018. Sales to industrial users rose by 0.1 per cent to 1.5 million tonnes, with domestic sales remaining constant at 0.5 million tonnes. Sales to final consumers were down by 5.8 per cent in the fourth quarter of 2018 with decreases in most industrial sales, domestic users, and other final users.

Coal used in blast furnaces was 0.2 million tonnes in the fourth quarter of 2018, a decrease of 31 per cent compared to the fourth quarter of 2017.

Chart 2.4 Coal stocks (Table 2.1)



Coal stocks were stable through 2018, with total stocks of 5.2 million tonnes at the end of 2018 virtually identical to stocks at the end of 2017. Of these stocks, the bulk - 4.1 million tonnes - were held at power stations, down 2.8 per cent on the stocks held at the end of 2017.

Stocks held by producers (undistributed stocks) increased during the fourth quarter of 2018 to 0.4 million tonnes and were 0.3 million tonnes higher than at the end of December 2017.

Section 3 – Oil and Oil Products

Key results show:

Provisional 2018

UK production of crude and Natural Gas Liquids (NGLs) was up 8.9 per cent in 2018 compared with 2017. Production has increased as a result of new projects on the UKCS coming online. Imports of crude and NGLs were stable whilst exports were 17 per cent higher, driven partially by the new projects exporting the majority of production. (**Chart 3.1**)

Production of petroleum products was down 2.9 per cent compared with 2017. Refinery production has been fairly robust through the year although relatively high levels of maintenance have affected the annual total. (**Chart 3.2**)

In 2018 final consumption of petroleum products was down by 1.6 per cent compared with 2017, mainly driven by a 1.2 per cent decrease in demand for transport fuel consumption. This was the first annual decrease in transport demand in five years, with annual road diesel down for the first time since 2009. Aviation turbine fuel was up by 1.0 per cent. **(Chart 3.5)**

Net imports of primary oils (crude, NGLs and process oils) made up 14 per cent of UK supply in 2018 and the UK was a net importer of petroleum products by 13.3 million tonnes, up by 1.1 million tonnes on 2017. The UK is a net importer of road diesel and aviation turbine fuel but a net exporter of motor spirit. **(Chart 3.3)**

Domestic demand over the year increased by 1.5 per cent, caused predominantly by high demand for heating fuels during the severe weather in Q1 2018. **(Chart 3.4)**

Quarter 4 2018

In Q4 2018, UK production of crude oil increased by nearly one-fifth on Q4 2017 because of increasing production through 2018 since new projects coming online towards the end of 2017. Production of NGLs increased by 3.2 per cent. **(Chart 3.1)**

Refinery production was higher by 4.4 per cent in the latest quarter of 2018 compared with the same quarter in 2017 because of maintenance that year. (**Chart 3.2**)

Imports of petroleum products were 13 per cent lower in the latest quarter compared with a year ago, and exports were down by 8.2 per cent. Over the last three months, the UK was a net importer of petroleum products by 2.7 million tonnes. **(Chart 3.2)**

Total deliveries of key transport fuels were lower in Q4 2018 by 1.6 per cent. This was driven by a decrease in demand for road diesel of 1.9 per cent, the third quarter in 2018 to have seen a fall. Before this year the last fall in a quarter was in Q1 2013. Bucking the trend of decline, demand for motor spirit increased by 0.4 per cent for the first time since Q2 2013. Aviation turbine fuel was stable on the same period in 2017. **(Chart 3.5)**

Total stocks for the UK at the end of quarter 4 2018 decreased 4.8 per cent. An 11 per cent decrease in stocks of primary oils was not offset by a marginal increase (0.7 per cent) in products. **(Chart 3.6)**

Relevant tables

3.1: Supply and use of crude oil, natural gas liquids and feedstocks
3.2: Supply and use of petroleum products
3.4: Supply and use of petroleum products: latest quarter
3.5: Biofuels sales and sales through supermarkets
3.6: Stocks of petroleum at end of period

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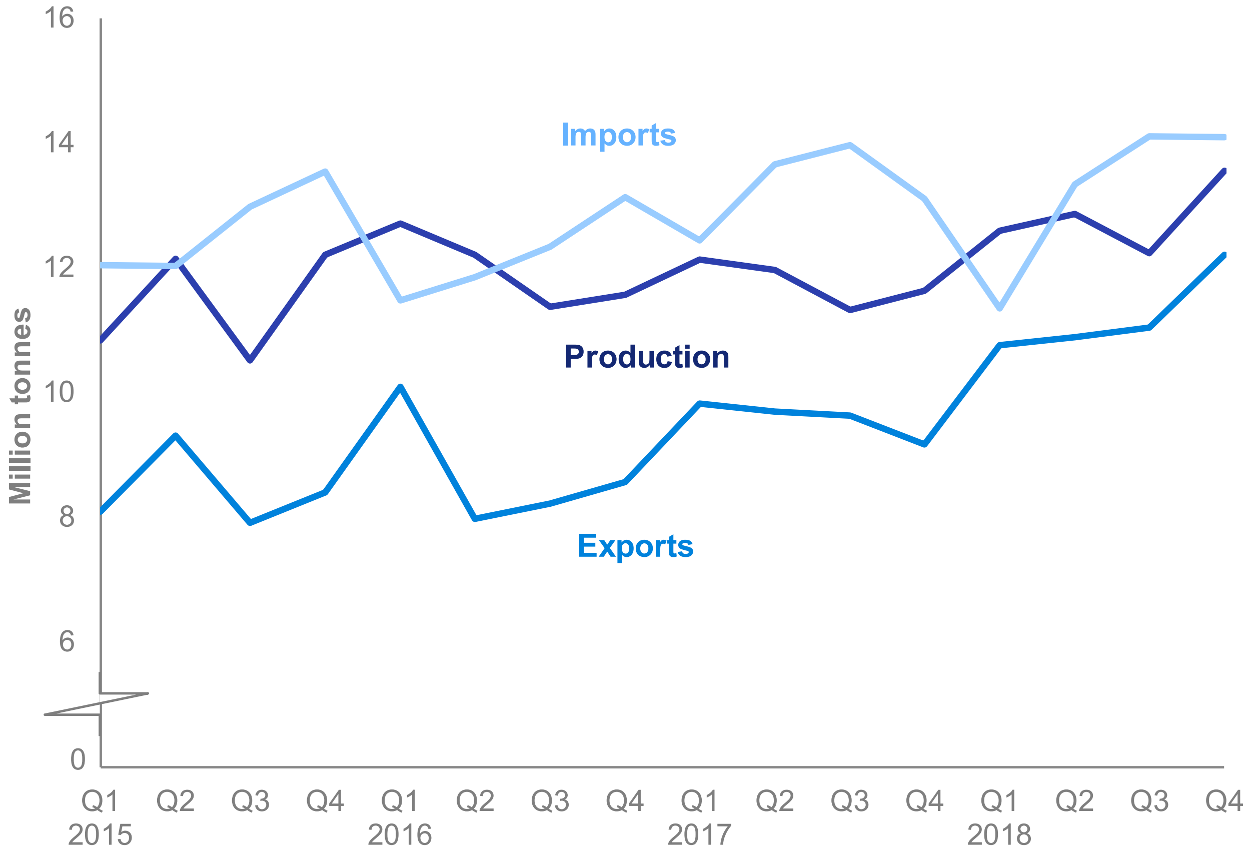
Chart 3.1 Production and trade of crude oil and NGLs (Table 3.1)



Provisional figures for 2018 show that UK crude oil and NGL production was 8.9 per cent higher than 2017. Production levels were greater mainly due to multiple new projects on the UKCS coming online in late 2017 and 2018 and increasing production through the year.

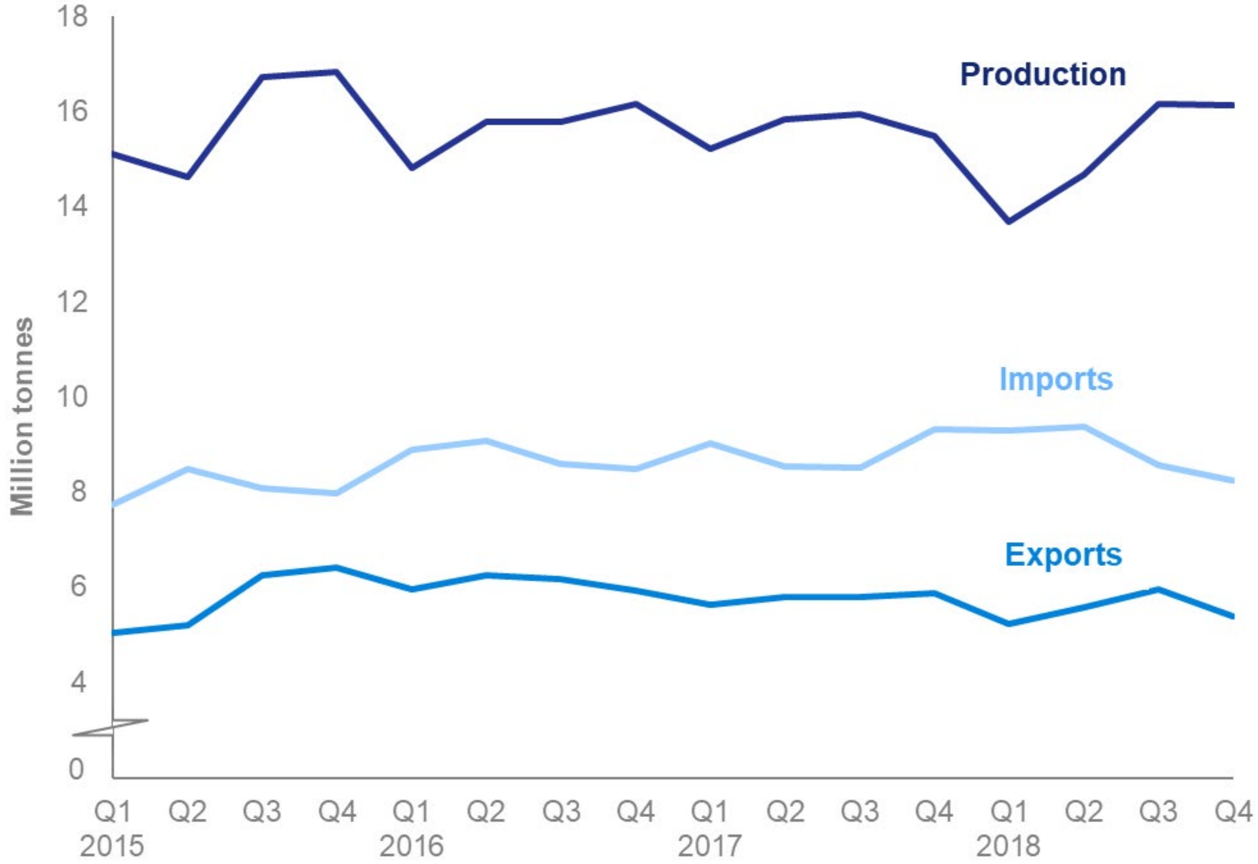
Much of this new production was exported, contributing to the highest annual exports since 2008 following an increase in 2018 of 17 per cent compared to 2017. Strong exports were also partially driven by the favourable price spread for Brent crude, meaning that UK refineries made use of imported crude and process oils as a cheaper alternative. Consequently, UK refinery receipts of indigenous crude fell to the record lowest level in the series, down nearly a third on 2017. Imports of crude oil and NGLs remained stable.

Production from the new projects, combined with the closure of the Forties Pipeline System (FPS) in December 2017, contributed to a Q4 2018 increase in crude production of nearly one-fifth and an increase in exports of primary oils of nearly one-third compared to the same period last year. Production reached the highest quarterly level since Q1 2011 and export volumes reached the highest quarterly level since Q2 2009.

In the broader historical context, production now is around a third of the 1999 peak.

Imports of crude oil and NGLs increased 7.6 per cent in Q4 2018 compared to the same period last year to offset the increase in exports and meet robust refinery demand.

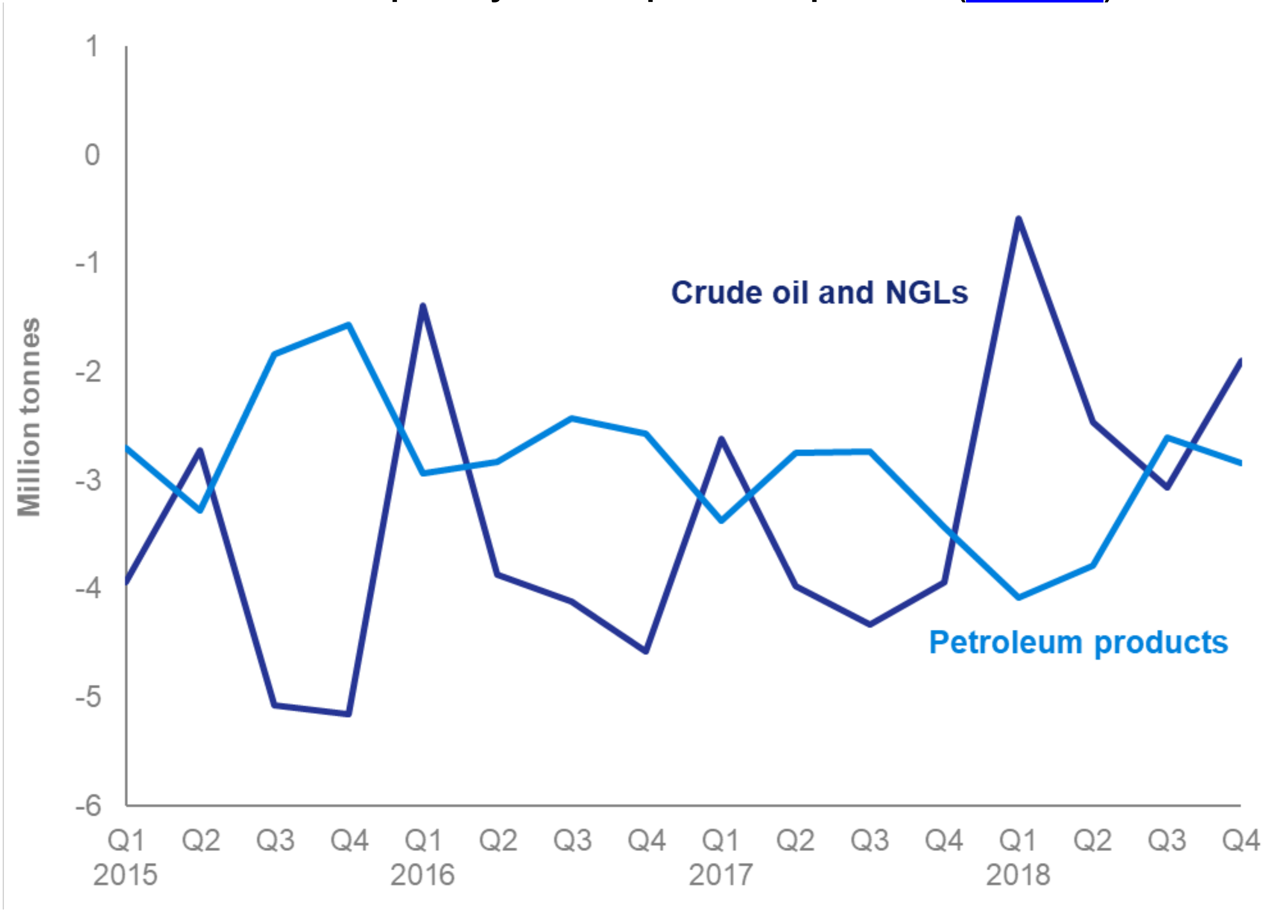
Chart 3.2 Production and trade of petroleum products (Table 3.2)



Indigenous production of petroleum products by refiners in 2018 was down by 2.9 per cent on 2017 following a period of maintenance in the first quarter of 2018. Imports of petroleum products were stable on 2017 whilst exports were down 4.0 per cent. The bulk of imports consist of middle distillates, mainly diesel road fuel and aviation turbine fuel where UK refinery production lags demand, whilst the bulk of exports are petrol.

In Q4 2018 production of petroleum products was higher by 4.4 per cent compared with the same period last year, with imports and exports 13 and 8.2 per cent lower respectively. This was due to refinery maintenance at the end of 2017.

Chart 3.3 Overall trade in primary oils and petroleum products (Table 3.1)

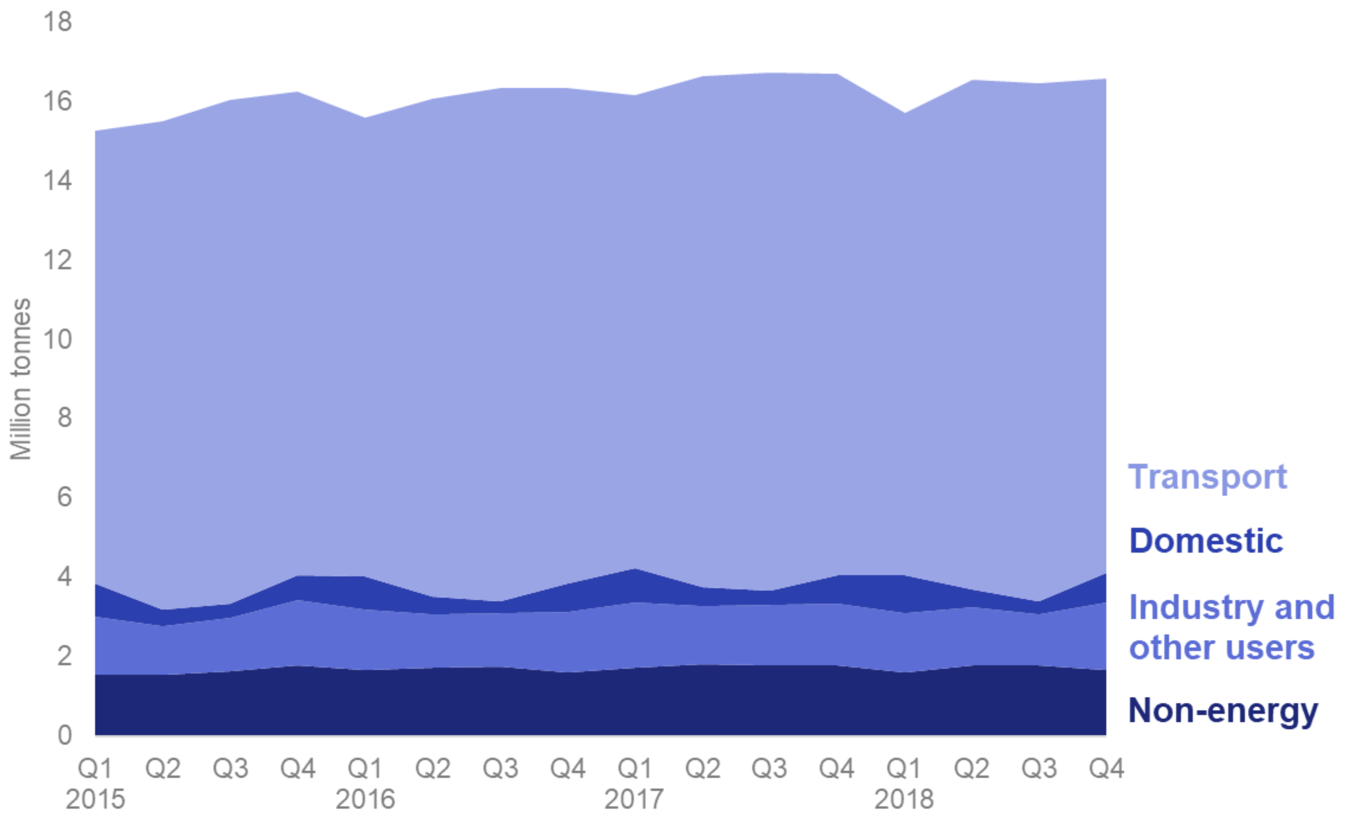


Net imports of primary oils (crude, NGLs and feedstocks) decreased by 6.9 million tonnes to 8.0 million tonnes, mainly due to the large increase in exports in 2018. In 2018 net imports of primary oils fell to 7.7 per cent of UK supply from 15 per cent in 2017.

In 2018 the UK was a net importer of petroleum products by 13.3 million tonnes, up from 12.2 million tonnes in 2017.

In Q4 2018 net imports of all primary oils narrowed to 1.9 million tonnes, a decrease of 2.1 million tonnes on last year. Net imports of petroleum products decreased to 2.7 million tonnes, a decrease of 0.7 million tonnes compared with Q4 2017.

Chart 3.4 Final consumption of oil (Table 3.4)



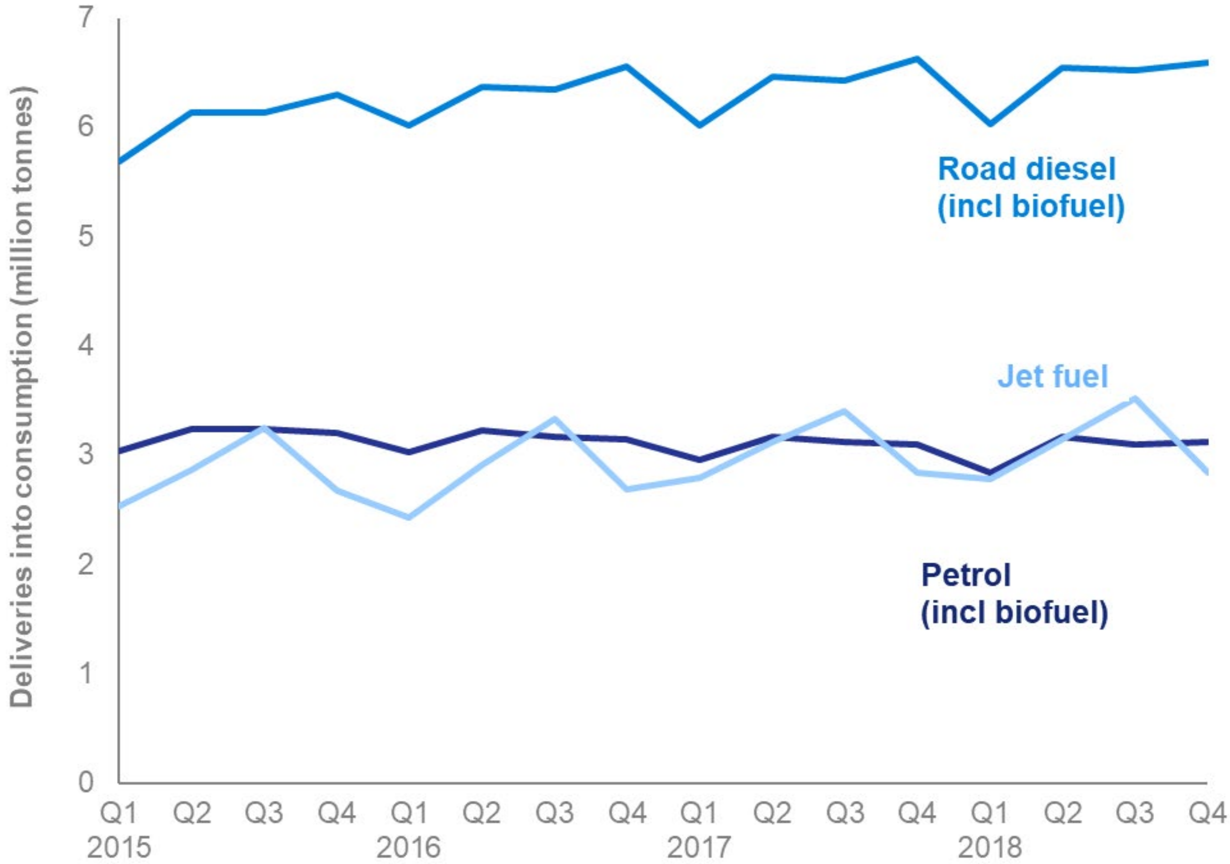
Provisional annual data shows that final consumption of petroleum products was down by 1.6 per cent in 2018 compared with 2017. Within this:

- Transport use, which accounts for more than three-quarters of UK final consumption, was lower by 1.2 per cent, the first decrease in five years. Sales of road diesel were down by 1.0 per cent, the first annual decrease since 2009. Motor spirit consumption decreased by just 1.6 per cent (see Chart 3.5). Trends in sales of petrol and diesel are shifting as the growth rates of both products are beginning to converge following historical growth in diesel demand.
- Non-energy use of oil products was down 3.6 per cent compared with last year despite global trends of a rapid increase. The decrease in the UK has been driven primarily by a decrease in deliveries of other products to petrochemical plants.
- Domestic use was up by 1.5 per cent, related to particularly strong demand for heating fuels during the severe weather in Q1 2018.

In Q4 2018 final consumption of petroleum products was down 1.9 per cent on the same period in 2017. Transport, the main driver of petroleum demand, decreased 1.6 per cent on 2017. Quarterly demand for motor spirit increased by 0.4 per cent for the first time since Q2 2013 whereas demand for road diesel decreased by 1.9 per cent, the third quarter in 2018 to have seen a fall. Before this year the last fall in a quarter was in Q1 2013. The changing trends likely result from recent changes to diesel car taxation and the ban on production of new diesel vehicles from 2040.

Domestic demand fell by 1.6 per cent in the final quarter of the year as warmer temperatures and fewer heating degree days compared to Q4 2017 resulted in lower demand for heating fuels.

Chart 3.5 Demand for key transport fuels (Table 3.4 and Table 3.5)



Annual demand for transport fuels has decreased for the first time since 2013. Within this, demand for road diesel decreased for the first time since 2009 by 1.0 per cent, with petrol also falling 1.6 per cent compared to 2017. Demand for aviation turbine fuel was up 1.0 per cent compared to 2017.

Including biofuels, annual diesel road fuel sales in 2018 were higher by just 0.6 per cent, compared with an average growth of 2.8 per cent in the previous three years. The rate of decline for petrol sales has slowed since 2014 and the decrease (including bioethanol) was just 1.4 per cent in 2018, contrasting with an average decline of around 5 per cent in the five years prior to 2014.

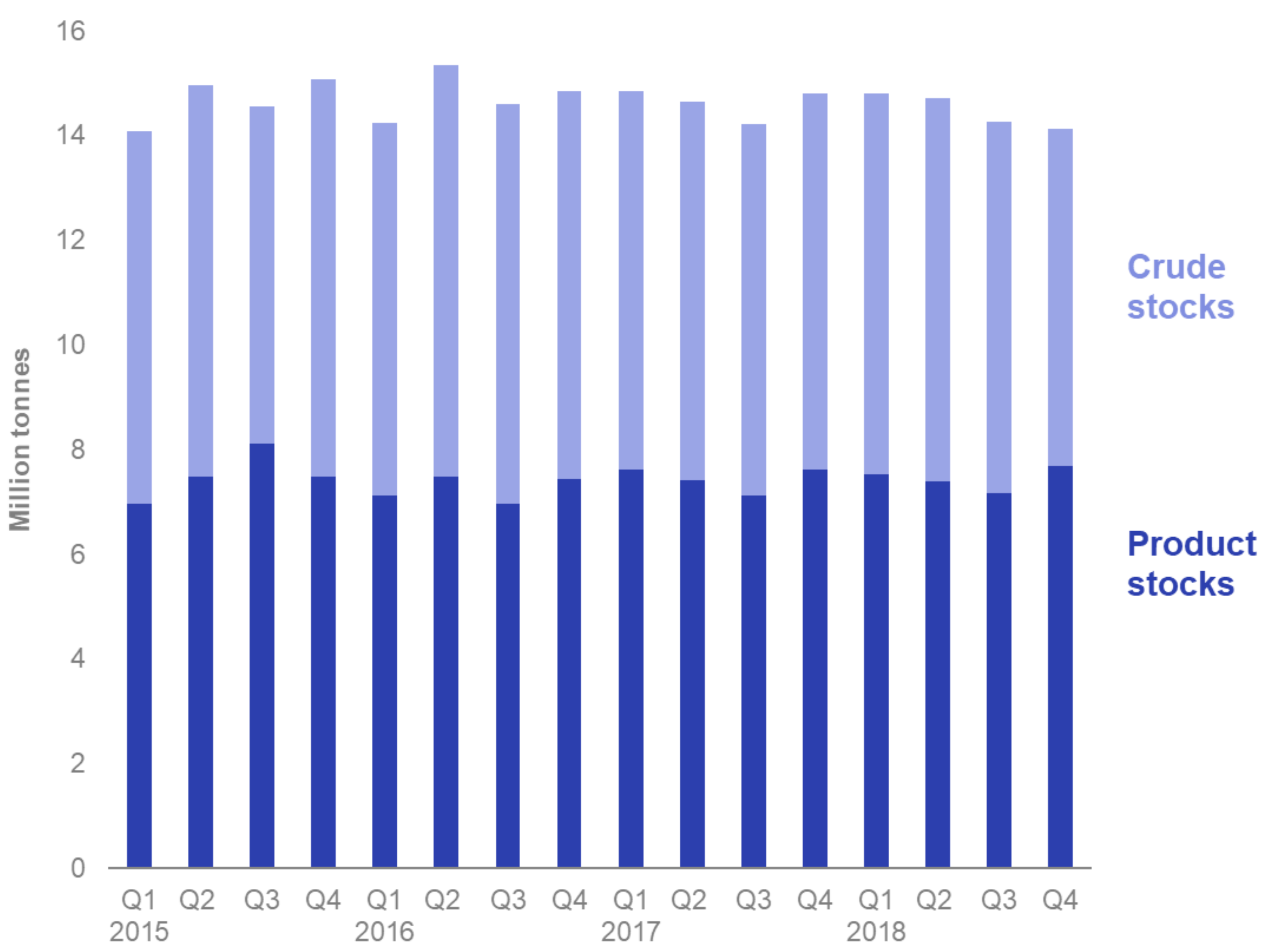
One factor affecting demand is the price paid at pumps, which has increased over the last two years. However, the increase in petrol prices has been slower than for diesel, potentially contributing to the recent stabilisation of demand for petrol and decline for road diesel (BEIS Quarterly Energy Prices, Table 4.1.2).

Another factor that affects demand for each road fuel is the composition of the car fleet. News surrounding diesel pollutants and consequent changes to diesel car tax rates may have caused a shift back towards petrol cars following the downward trend since 1990 when drivers shifted to diesel vehicles. However, recent growth of the diesel fleet has been slowing following drop-offs in new diesel registrations[1] possibly due to tax rate increases. Conversely the number of new petrol registrations has been increasing, and the rate of contraction of the petrol car fleet has slowed to its lowest level since 2004[1].

In Q4 2018 quarterly petrol sales including biofuels increased for the first time since Q2 2013 (by 0.7 per cent) compared with a year earlier. Conversely road diesel sales were lower by 0.5 per cent, the first quarterly decrease since Q1 2013.

[1] www.gov.uk/government/collections/vehicles-statistics

Chart 3.6 UK oil stocks (Table 3.6)



The UK holds oil stocks both for operational and commercial purposes and to meet obligations set out by the European Union (EU) and the International Energy Agency (IEA) to ensure the continuity of oil supply in times of significant disruption. The UK meets these obligations by directing companies to hold stocks of oil over and above what they would need for operational purposes. The UK is required to hold stock equivalent to 61 days of consumption to meet the EU requirements and stock equivalent to 90 days of net imports to meet IEA requirements.

At the end of Q4 2018 the UK held 14.1 million tonnes, equivalent to just under the 61 days of consumption with an additional 10 days of commercial stocks available on top of volumes held towards the obligation. The same volume is equivalent to around 180 days of net imports. UK total oil stocks were down 4.8 per cent on the same period last year, with primary oil stocks down 11 per cent and petroleum product stocks up 0.7 per cent.

There has been a 6.4 per cent decrease to primary oils held for the UK elsewhere in the EU and a 3.7 per cent increase in petroleum products held overseas on the same period last year. The primary driver for these changes is prices as companies seek to minimise the cost of meeting their obligations by securing the best prices for oil held on their behalf.

Further information on how the UK meets its oil stocking obligations are set out at:
www.gov.uk/government/publications/uk-emergency-oil-stocking-international-obligations

Section 4 - Gas

Key results show:

Provisional 2018
In 2018 gross gas production decreased by 3.1 per cent compared to last year, opposing the year-on-year increases since 2013. However, the longer-term trend has been one of decline since the peak in 2000. **(Chart 4.1)**

In 2018, imports of natural gas were down by 2.0 per cent, with LNG imports increasing by 7.3 per cent. In contrast, exports decreased by a third this year to their lowest level since 1998. This decrease drove the 7.9 per cent increase in net imports over the past 12 months. **(Chart 4.4)**

Overall gas demand in 2018 was stable on last year, but this contained a decrease of 4.7 per cent for generation (due to the continued uptake in low carbon sources displacing gas generation) and an increase of 3.1 per cent in final consumption. A large component of this latter increase is demand for heat generation during the 'Beast from the East' in Q1 2018. **(Chart 4.6)**

Quarter 4 2018
UK production in Q4 2018 was down by 5.1 per cent **(Chart 4.1).** Production of associated gas increased by 5.9 per cent whilst dry gas production was 23 per cent higher than Q4 2017. **(Chart 4.2**)

Exports in Q4 2018 were down by nearly half at record low levels in Q4 for the series at 9.6 TWh. Imports of Liquified Natural Gas (LNG) nearly trebled resulting from low demand in Asia. Overall imports decreased by 5.9 per cent, partly due to the sharp decline in pipeline imports from Belgium, which were just 2.7 per cent of levels last year. **(Chart 4.4)**

Across Q4 2018, UK demand for natural gas was down 4.5 per cent in comparison to Q4 2017, to 253 TWh. This is attributed to a fall in demand for electricity generation by 10 per cent and the 3.2 per cent decrease in final consumption in comparison to the same quarter last year. **(Chart 4.6)**

Relevant table

4.1: Natural gas supply and consumption

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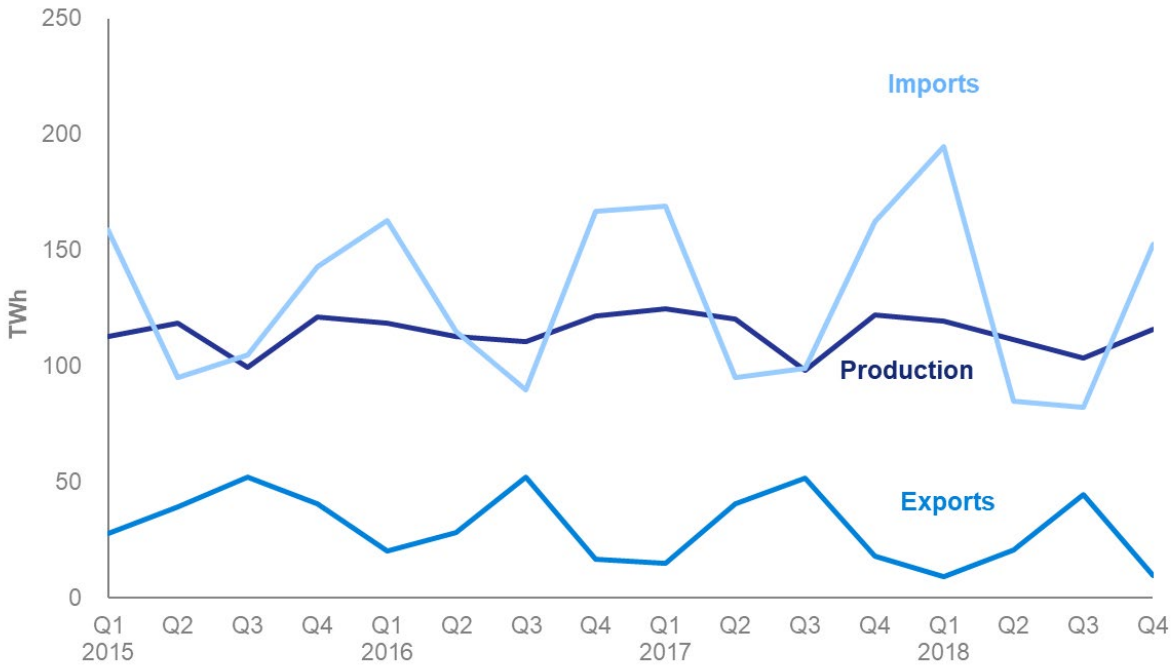
Chart 4.1 Production and imports and exports of natural gas (Table 4.1)



Exports in 2018 decreased by one-third to the lowest level since 1998 when only a small proportion of gas was exported from the UK, and this was only the third time since 2000 that the UK exported less than 100 TWh of gas. Low levels of exports were primarily because exports to Belgium dropped by nearly one-half and exports to the Netherlands fell by a third; these pipelines were used for import flows during the cold weather at the start of the year. Additionally, the long-term capacity contract for the UK-Belgium interconnector ended at the start of October 2018, which led to substantially decreased exports in the final quarter of 2018.

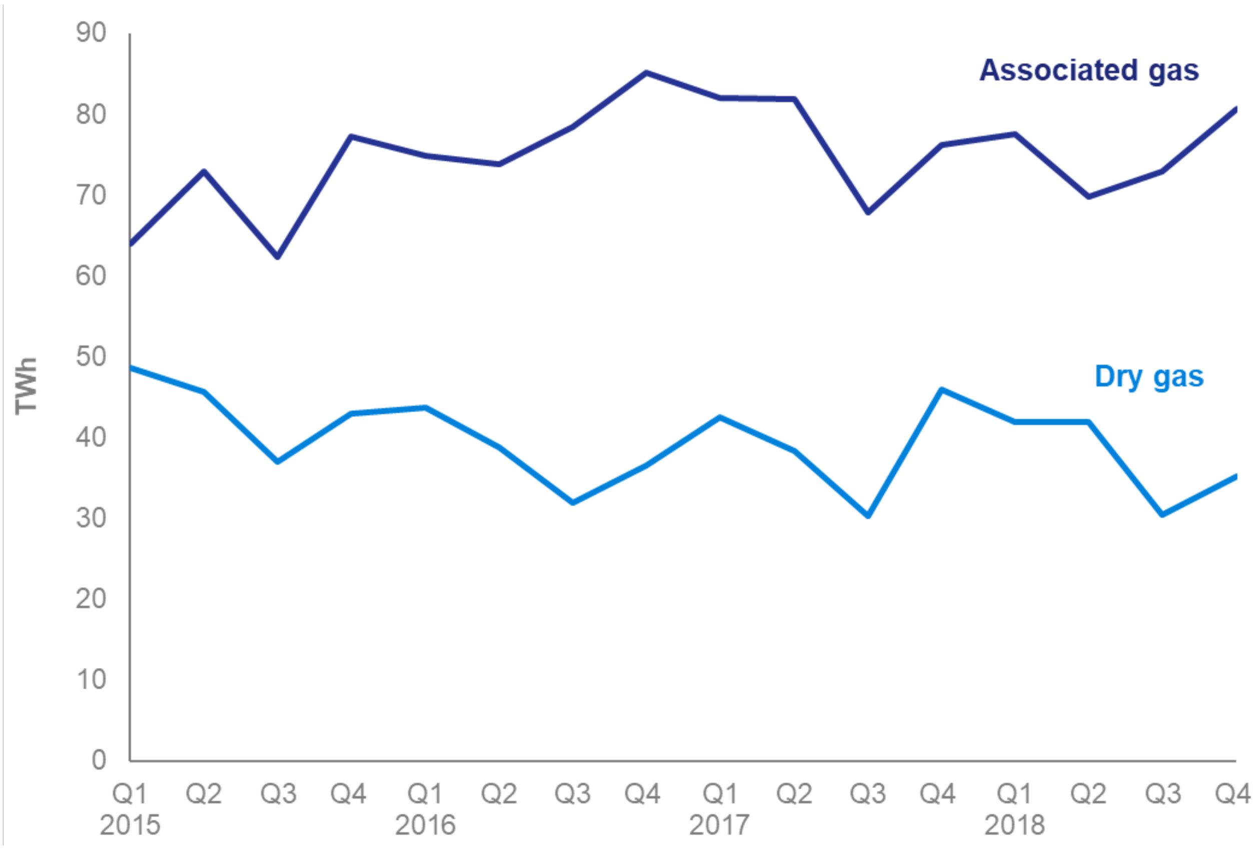
Production of natural gas in 2018 decreased by 3.1 per cent compared with 2017. This opposes the increase in year on year production seen since 2013 and has been driven by the closure of the Theddlethorpe dry gas terminal in August 2018. Imports in 2018 were down by 2.0 per cent on the year before.

A sharp increase in LNG imports in Q4 2018 drove an increase over the year – Q4 saw the highest quarterly total for LNG imports since 2014 and the volume was treble that of Q4 2017. A combination of the Asian market buying Qatari LNG on the forward market, increased shipping costs and new projects coming online through 2018 have meant that we have seen increased volumes arriving in the UK from the US and Russia, thereby benefitting the UK from a more diversified supply portfolio.

Imports in Q4 2018 decreased by 5.9 per cent on the same quarter of 2017. In contrast, exports in Q4 2018 were down by nearly half at record low levels in Q4 for the series at 9.6 TWh, due to the Bacton Zeebrugge Interconnector long term capacity contract terminating in October. For more detail on trade, see Chart 4.4.

Indigenous production of natural gas in Q4 2018 was down by 5.1 per cent, attributed to the closure of the Theddlethorpe terminal as well as comparatively lower levels of production through October and November 2018 after robust levels in the same months of 2017.

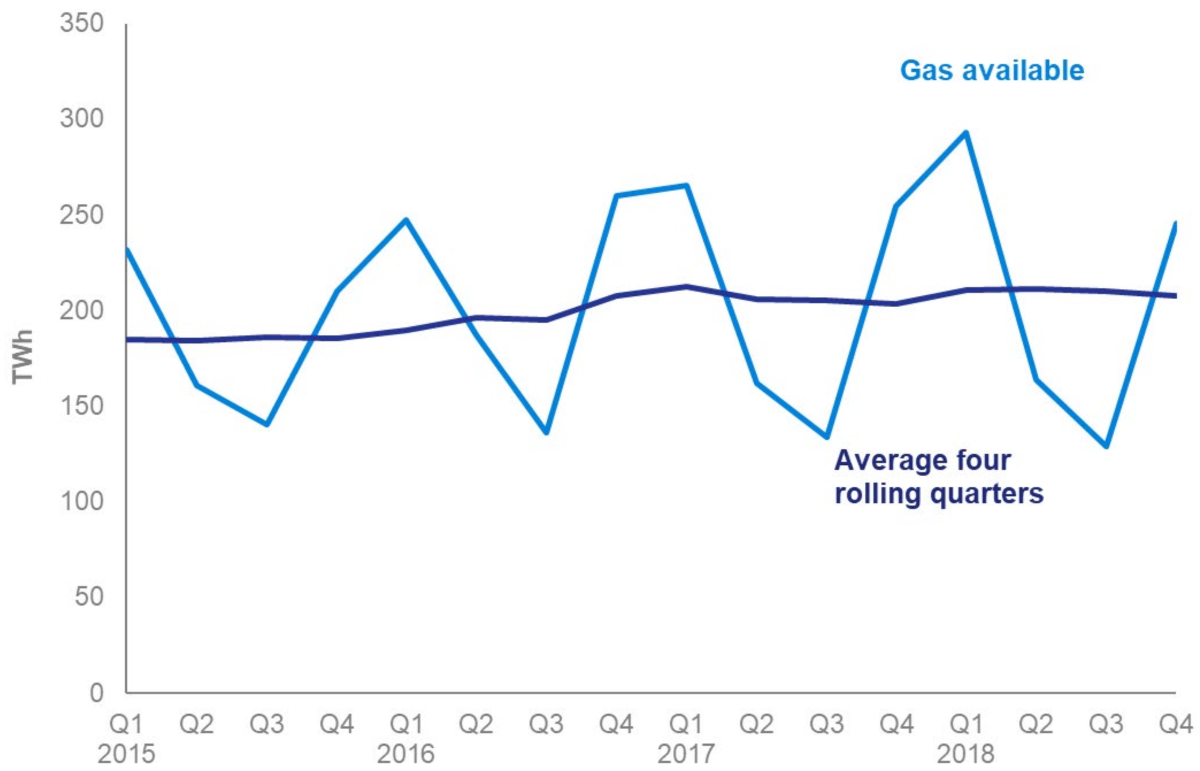
Chart 4.2 Production of dry gas and associated gas (not shown in published tables)



Production of associated gas (natural gas produced from oil fields) in 2018 was down by 2.3 per cent compared to 2017. However, in Q4 2018 associated gas production increased by 5.9 per cent on Q4 2017, from 76 TWh to 81 TWh.

Q4 2018 dry gas production (natural gas composed mainly of methane) decreased by 23 per cent to 35 TWh. 2018 annual dry gas production follows the same trend, decreasing by 2.6 per cent compared to 2017.

Chart 4.3 Gas availability (Table 4.2)

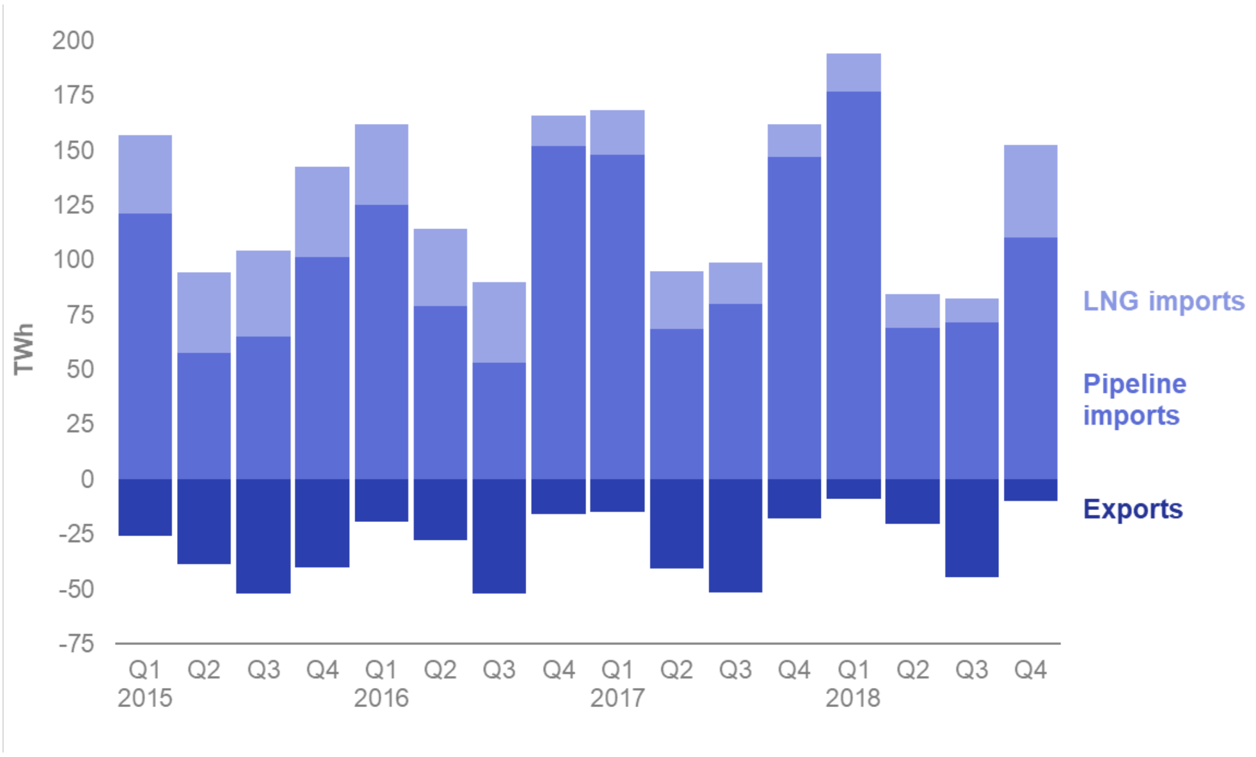


Gas available at terminals is broadly equal to gross gas production minus producers' own use, plus net imports.

Gas availability reflects gas demand and is therefore seasonal, peaking during Q1 and Q4 each year. Compared to the same quarter in 2018, gas availability in Q4 2018 decreased by 3.4 per cent to 246 TWh.

The average availability of gas over four rolling quarters has been gradually rising since the start of 2015, reaching volumes close to 2012/13 levels in 2018.

Chart 4.4 Import and exports (Table 4.3 and Table 4.4)



In 2018, imports of natural gas were down by 2.0 per cent whilst exports decreased by a third, driving the 7.9 per cent increase in net imports over the past 12 months.

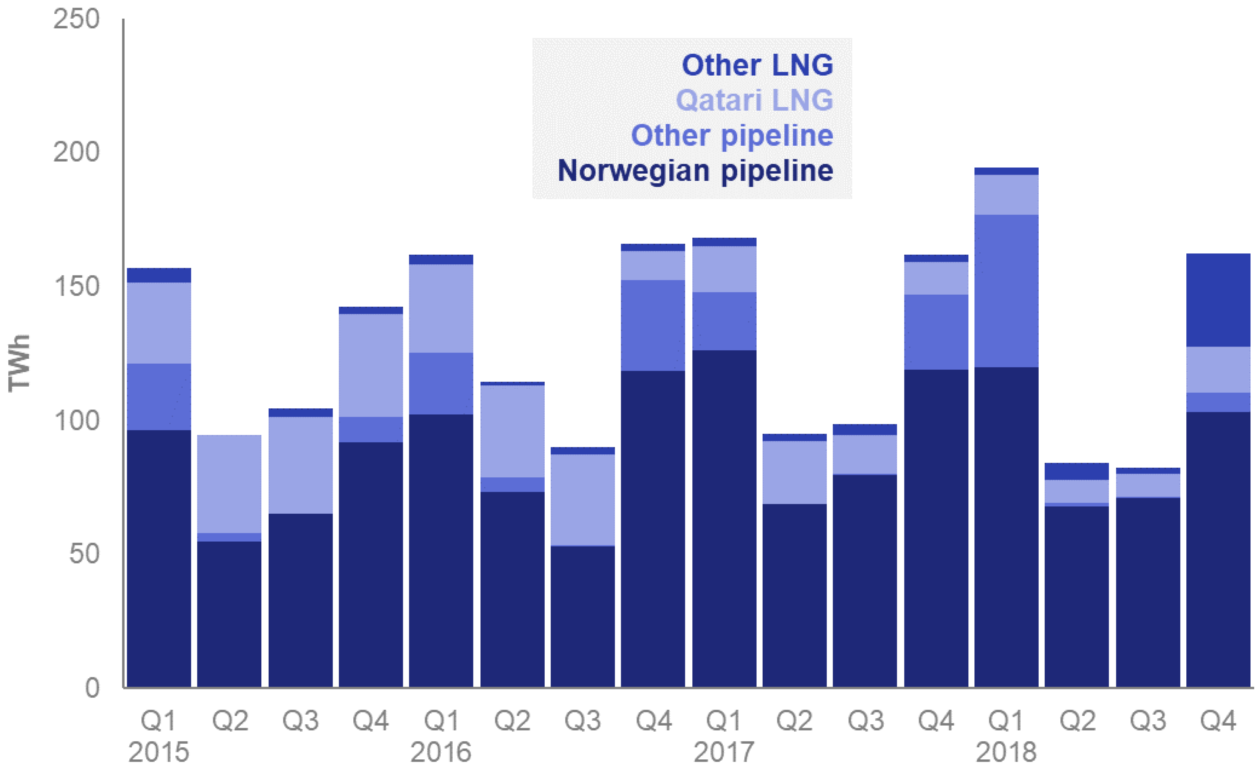
Pipeline imports were down by 3.6 per cent in 2018. In contrast, LNG imports increased by 7.3 per cent, accounting for 17 per cent of the UK's total imports.

The decrease in exports to 83 TWh in 2018 was caused by a substantial contraction in exports to Belgium (down 44 per cent) and a smaller contraction in exports to the Netherlands. Despite this, Belgium remains the largest export market for UK gas, comprising 59 per cent of total gas exports.

Compared to the same quarter of last year, Q4 2018 pipeline imports were down by 25 per cent driven by virtual cessation of imports from Belgium. Meanwhile, imports of LNG nearly trebled as a result of low demand in Asia (due to high stocks and milder winter temperatures) causing a steep downward trend on LNG prices globally. However, Q4 2018 total imports decreased by 5.9 per cent to 153 TWh compared to the same quarter in 2017.

When compared with last year, exports decreased by nearly half to a near record low, due to the Bacton Zeebrugge Interconnector long term capacity contract terminating at the beginning of the October.

Chart 4.5 Imports by origin (Table 4.4)



As noted in Map 4.1, the UK imports natural gas primarily from Norway (predominantly via the Langeled, Tampen Link and Gjoa/Vega pipelines). Smaller volumes are imported from Belgium (via the UK-Belgium Interconnector) and the Netherlands (via the Balgzand to Bacton line).

In 2018, Norway remained the principal source of UK gas imports at 70 per cent, although down from 75 per cent in 2017. After a significant contraction in the amount of LNG imported into the UK in 2017, imports of LNG rose by 7.3 per cent in 2018. Qatari imports fell by more than thirty per cent as the mix of LNG sources continued to diversify, although they remain the largest supplier at 55 per cent.

Most notably in Q4 2018, LNG imports nearly trebled compared with Q4 2017, due to decreased demand from Asia, supply from new projects including in the US and Russia, and low demand in 2017. Like last year, Qatar remains the biggest importer although this December was the first month since March 2009 that Qatar was not the main source of LNG, with Russia being the principal source of LNG in that month. Overall, the market has grown in diversity this quarter with five countries supplying more than 5 per cent of total LNG including Russia, Trinidad and the USA.

Compared to the same quarter last year, there has been a decrease in imports through six of the seven pipelines that bring gas to the UK in Q4 2018. Pipeline imports from Norway were down by 13 per cent, although varying by pipeline. Despite this, Norway remains the major supplier of gas to the UK, with Norwegian pipeline and LNG imports together making up 68 per cent of all Q4 2018 imports. Meanwhile, in Q4 2018, imports from Belgium decreased to 2.7 per cent of levels last year due to the Bacton Zeebrugge Interconnector long term capacity contract terminating at the beginning of October.

A complete country breakdown for physical pipeline and LNG imports is provided in Energy Trends Table 4.4 - *Supplementary information on the origin of UK gas imports*.

Map 4.1: UK imports and exports of gas Q4 2018

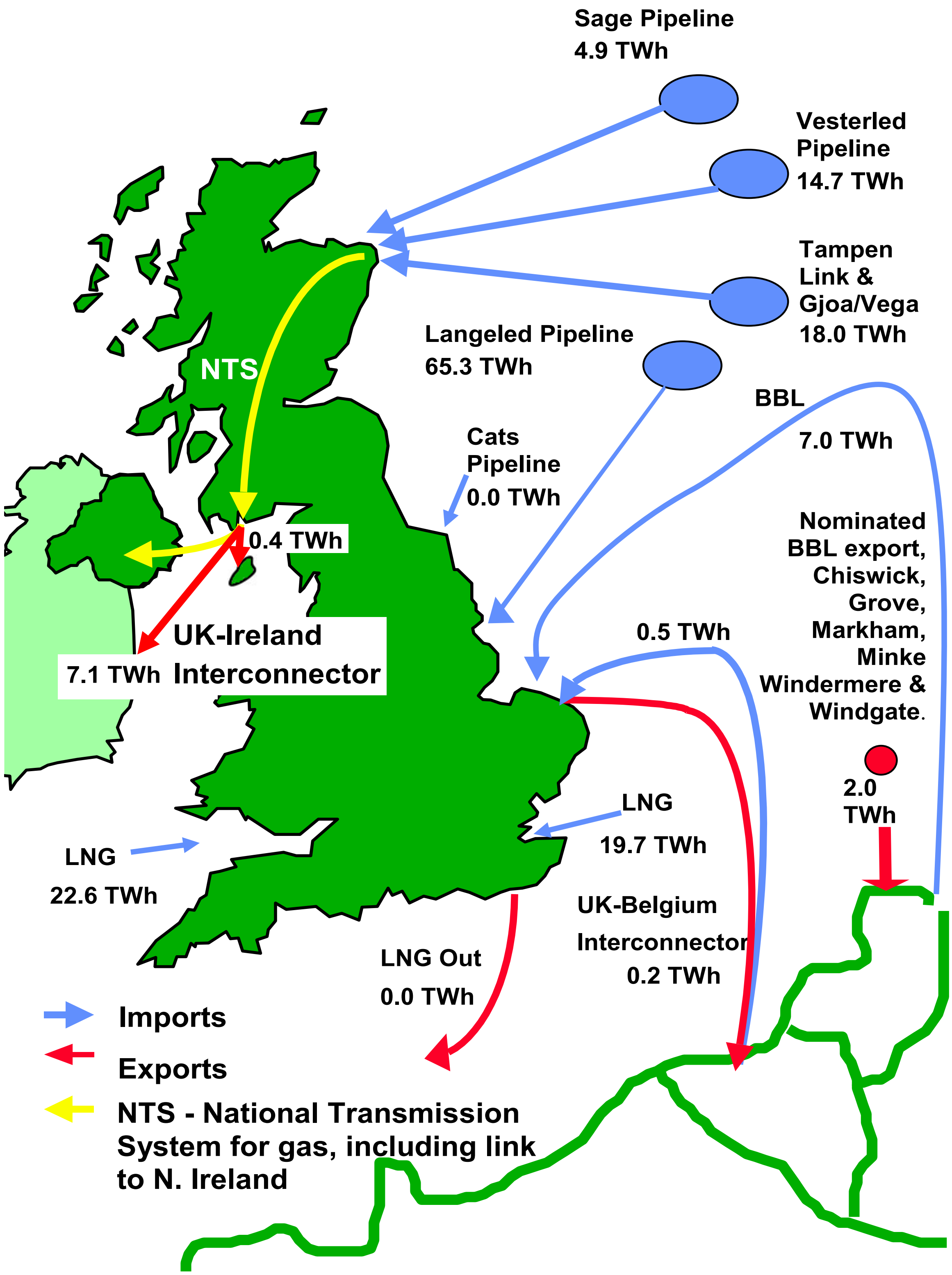
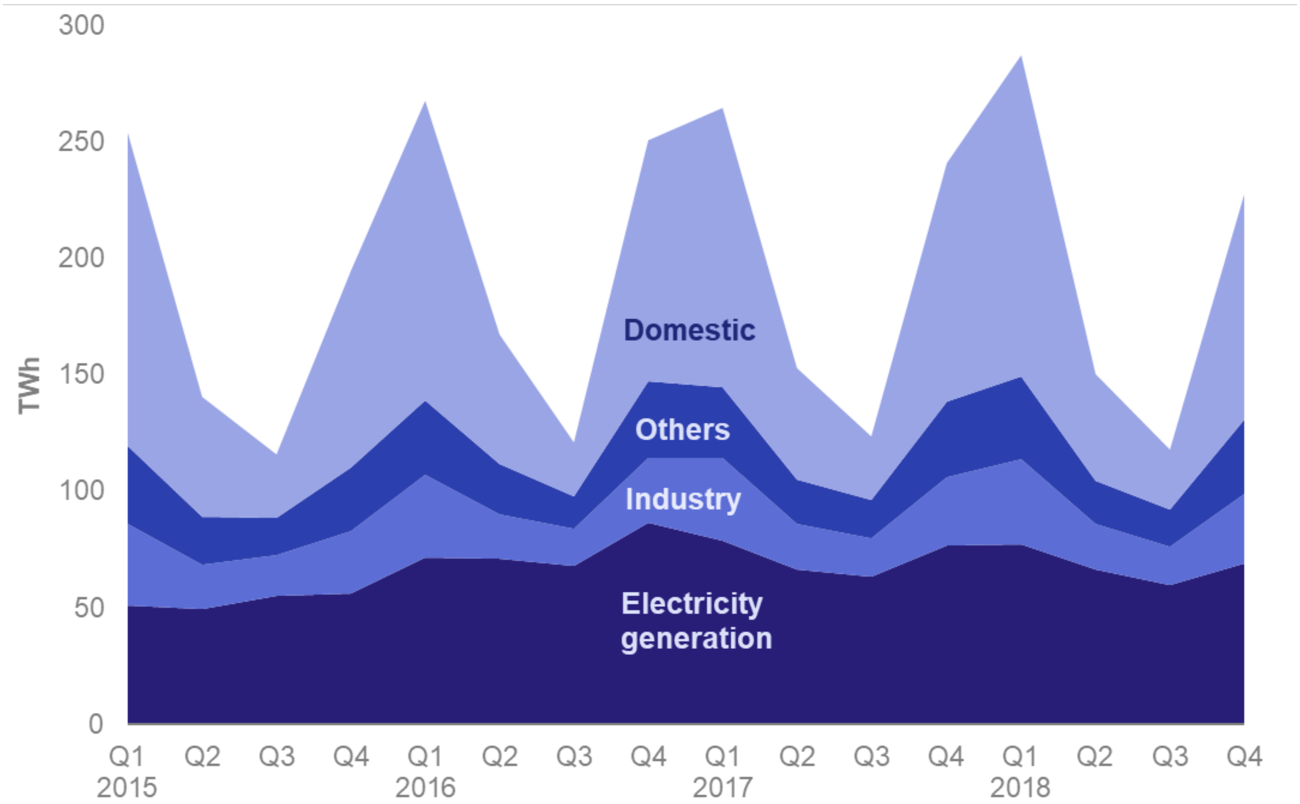


Chart 4.6 UK demand for natural gas (Table 4.1)



In 2018, the UK's overall gas demand was stable on the year before but contained interesting variations within that. Demand for final consumption increased by 3.1 per cent, with domestic and other final users up 3.2 and 3.9 per cent respectively. Domestic demand was influenced by particularly cold weather and subsequent high demand in Q1 2018 as a result of Anticyclone Hartmut (or the 'Beast from the East'), which was partially offset by lower demand later in the year.

In contrast, demand for gas used for electricity generation in 2018 follows the year-on-year decrease by 4.7 per cent due to the continued uptake in low carbon electricity sources such as renewables and nuclear.

Across Q4 2018, UK demand for natural gas was down 4.5 per cent in comparison to Q4 2017, to 253 TWh. The principal cause was the decrease in demand for gas used for electricity generation, which fell by 10 per cent.

Similarly, final consumption of gas decreased by 3.2 per cent with domestic use and other final users down by 5.0 per cent and 2.6 per cent respectively, driven by the fewer heating degree days in this period compared with Q4 2017.

A complete breakdown for gas demand is provided in Energy Trends table 4.1 - *Natural gas supply and consumption.*

Section 5 - Electricity

Key results show:

Provisional 2018
In 2018, total UK electricity demand was broadly stable compared to 2017 at 354 TWh, with final consumption similarly stable at 301 TWh. Other final user (including commercial and transport) consumption was the only sector which increased compared to 2017. Industrial (including iron and steel) consumption declined by 0.3 per cent, while domestic consumption was broadly stable (-0.1 per cent). **(Table 5.2 and Chart 5.5)**

Total supply was stable for 2018 compared to 2017, given the stability in demand. Indigenous production was 1.4 per cent lower in 2018 than 2017 from 339 TWh to 334 TWh. Net imports were 30 per cent higher in 2018 than 2017 at 19 TWh, with this increase reflecting the full operation of the interconnector with France that was under repair in 2017. The level of net imports in 2018 is higher than the last two years, but lower than 2015 and 2014. **(Chart 5.4)**

Low carbon generation accounted for 52.8 per cent of generation in 2018, which was 2.7 percentage points higher than 2017 – this was a record high. The growth in renewables generation contributed significantly to this low carbon growth, with renewables accounting for 33.3 per cent of generation in 2018, reflecting increased capacity. The growth in low carbon in 2018 was despite a decline in nuclear generation, due to maintenance. **(Chart 5.3)**

Electricity generation's fuel mix continued to shift away from fossil fuels, due to the growth in renewable generation. Coal's share of generation was 5.0 per cent in 2018, down 1.6 percentage points on 2017. The share of generation from gas was 1.0 percentage point lower than in 2017 at 39.4 per cent, reflecting volatility in gas prices in 2018. **(Chart 5.1)**

Quarter 4 2018
In the fourth quarter of 2018, total demand was 92 TWh, which was 1.3 per cent lower than in Q4 2017. This decline occurred in all the sectors. **(Chart 5.6)**

Renewables share of generation increased to 37.1 per cent in Q4 2018, an increase of 7.0 percentage points on Q4 2017. This increase was driven by increased capacity. The share of generation from fossil fuel sources declined, with coal's share of generation at 5.7 per cent, which was 3.4 percentage points lower than Q4 2017. Gas remained the dominant fuel type with a 37.9 per cent share of generation, though 2.1 percentage points lower than Q4 2017. The share for renewables in Q4 2018 was very similar to gas, only 0.8 percentage points lower. **(Chart 5.2)**

Fuel use was 4.8 per cent lower in Q4 2018 than Q4 2017, due to increased renewable generation and lower fossil fuel generation. Coal use declined the most at 40 per cent, while gas use declined 10 per cent, compared to Q4 2017. (**Chart 5.7**).

Relevant tables

5.1: Fuel used in electricity generation and electricity supplied
5.2: Supply and consumption of electricity

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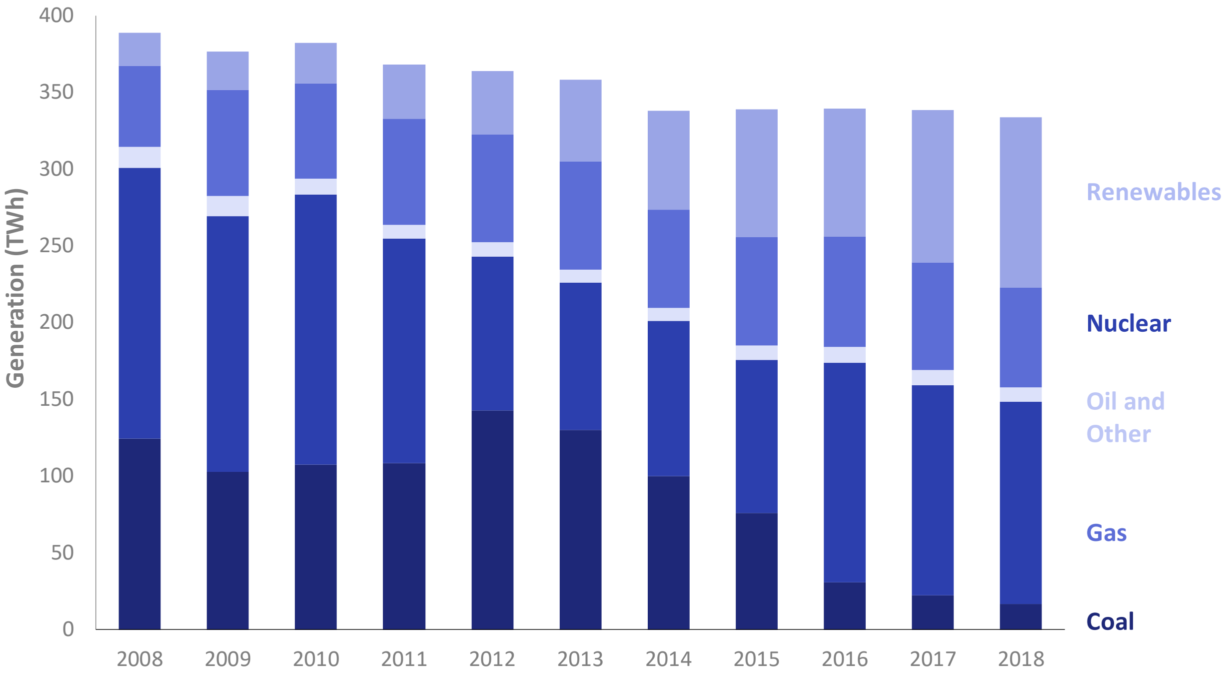
Chart 5.1 Electricity generated by fuel type (Table 5.1)



During 2018, total electricity generated decreased from 339 TWh in 2017 to 334 TWh in 2018, a decline of 1.4 per cent, the largest decline since 2014. Electricity generation is down 14 per cent since 2008, but within that are significant changes in the mix of fuels used to generate electricity.

The principal trend has been the move away from coal to renewables sources. Generation from coal decreased from 124 TWh in 2008 to 17 TWh in 2018, a decrease of 86 per cent. The trend for gas is more variable but has remained strong, with gas being the most dominant fuel source. Over the same period, electricity generation from renewables increased from 22 TWh in 2008 to 111 TWh, an increase of over 400 per cent. This increase in generation was due to a 550 per cent increase in total renewables capacity between the end of 2008[1] and end of 2018[2].

On an annual basis between 2017 and 2018, generation from coal decreased by 25 per cent, to reach a record low in 2018. Generation from gas decreased by 3.9 per cent in 2018 compared to 2017, partly due to increased gas prices in quarter 3 making gas less profitable. Declines in fossil fuel generation were driven by increased renewables generation, up 12 per cent on 2017. Generation from wind and solar increased by 14 per cent on 2017, due to increased capacity (9.9 per cent for wind and 2.5 per cent for solar)[3]. Bioenergy generation increased by 12 per cent, due to increased capacity (+27 per cent) and reduced outages. However, nuclear generation in 2018 was 7.5 per cent lower than 2017, due to outages

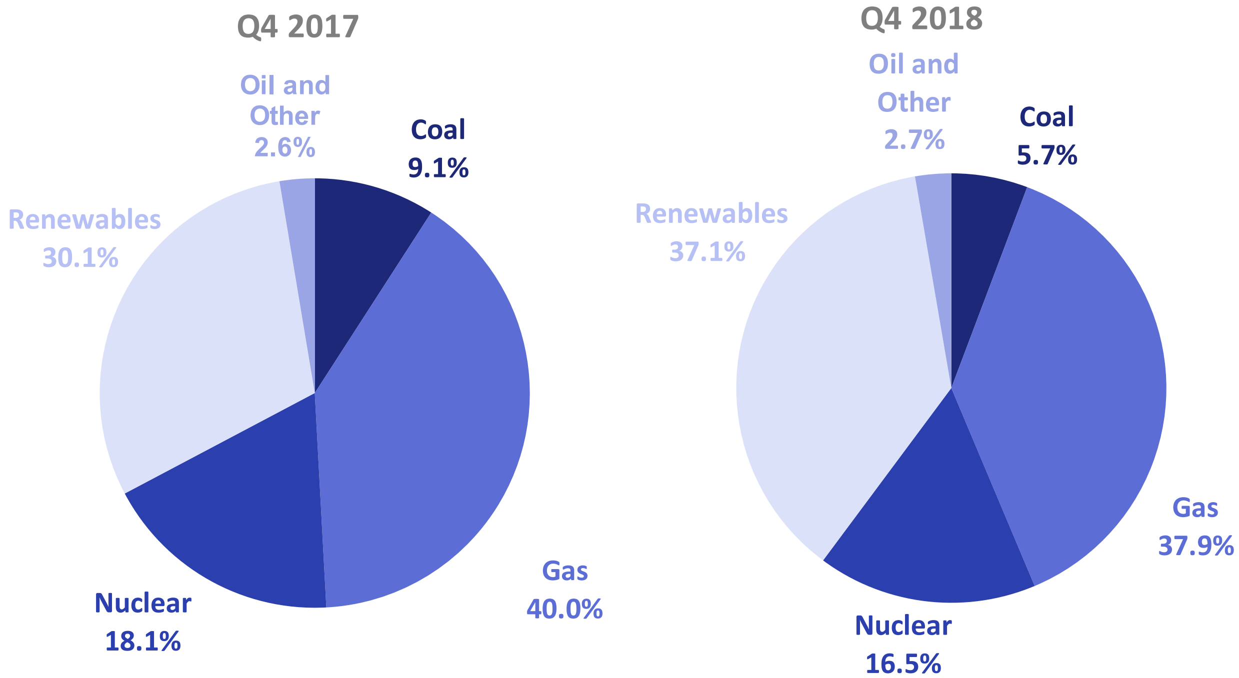
In 2018, the generation mix consisted of 5.0 per cent from coal (-1.6 pp on 2017), 39.4 per cent from gas (-1.0 pp), 19.5 per cent from nuclear (-1.3pp) and 33.3 per cent from renewables (+3.9 pp). Further, renewables increased their share of low carbon generation to 63 per cent in 2018, up from 29 per cent in 2008 and 59 per cent in 2017.

[1] Renewables capacity value for 2008 was 6,835 MW, taken from DUKES 6.4 available here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/729373/DUKES_6.4.xls

[2] Renewables capacity value for 2018 was 44,427 MW taken from Energy Trends 6.1 available here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/766384/ET_6.1.xls

[3] Average daily sun hours for 2018 increased by 14.7 per cent on 2017 to 4.7 hours, while wind speeds were very similar (-0.1 knots) – see Energy Trends tables 7.3 and 7.2, respectively: www.gov.uk/government/statistics/energy-trends-section-7-weather

Chart 5.2 Quarterly shares of electricity generation (Table 5.1)



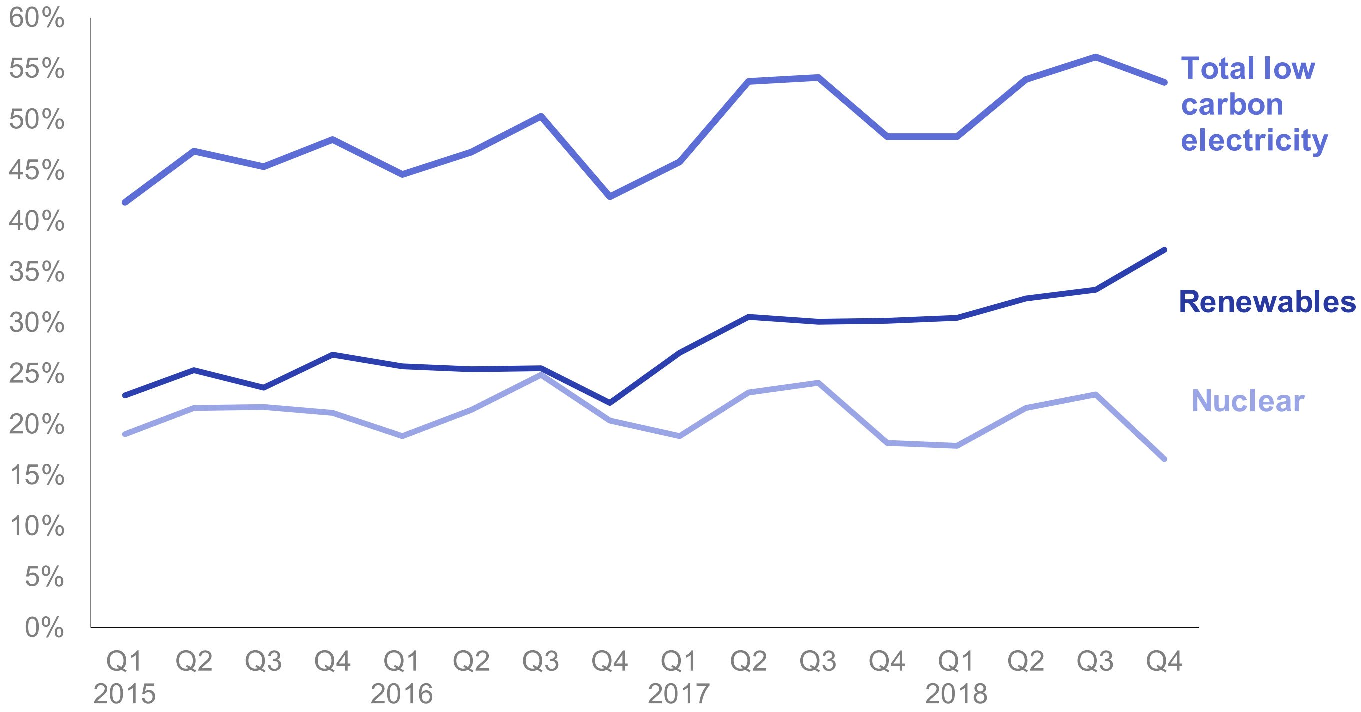
In the fourth quarter (October to December) of 2018, only renewables had an increase in electricity generation share. Renewables share of electricity generation increased from 30.1 per cent in Q4 2017 to 37.1 per cent in Q4 2018 (+7.0 pp) - the highest renewables share of any quarter. The share from wind and solar increased by 3.1 pp to 23.3 per cent, as average daily sun hours increased 16.5 per cent compared to Q4 2017 and capacity increased by 9.9 per cent for wind and 2.5 per cent for solar. Bioenergy generation increased by 3.6 pp to 11.5 per cent, due to a 27 per cent increase in capacity.

Fossil fuel’s share of generation in Q4 2018 declined by 5.4 pp compared to Q4 2017, contributed to by decreases of 3.4 pp from coal and 2.1 pp from gas. Continued nuclear maintenance resulted in a 1.6 pp decrease in nuclear’s share of generation to 16.5 per cent.

The share of generation from Major Power Producers (MPPs) decreased slightly from 87 per cent in Q4 2017 to 85 per cent in Q4 2018.

See Chapter 6 (Renewables) and table 6.1 for a more detailed breakdown of renewable generation at: www.gov.uk/government/statistics/energy-trends-section-6-renewables.

Chart 5.3 Low carbon electricity's share of generation (Table 5.1)



In 2018, the share of electricity generation from low carbon sources reached 52.8 per cent (+2.7 pp on 2017). This increased share of generation was driven by increased renewable generation.

Low carbon electricity generation (from nuclear and renewables sources) continued to grow in quarter 4 2018. Over half of electricity generated was from low carbon sources (53.6 per cent) – a record high for a fourth quarter - continuing the trend from quarters 2 and 3 2018. The share from low carbon was 5.4 pp larger than in Q4 2017.

The increased low carbon share was driven by an increase in renewables generation, with renewables accounting for 69 per cent of low carbon generation in Q4 2018, up from 62 per cent in Q4 2017. The increased renewables generation was largely driven by increased capacity.

Nuclear generation declined in Q4 2018 compared to Q4 2017, due to the continuation of outages as maintenance work continued. Nuclear generation decreased from 17 TWh in Q4 2017 to 15 TWh in Q4 2018 (-12.9 per cent), resulting in a 1.6 pp decrease in nuclear's share of total electricity generation.

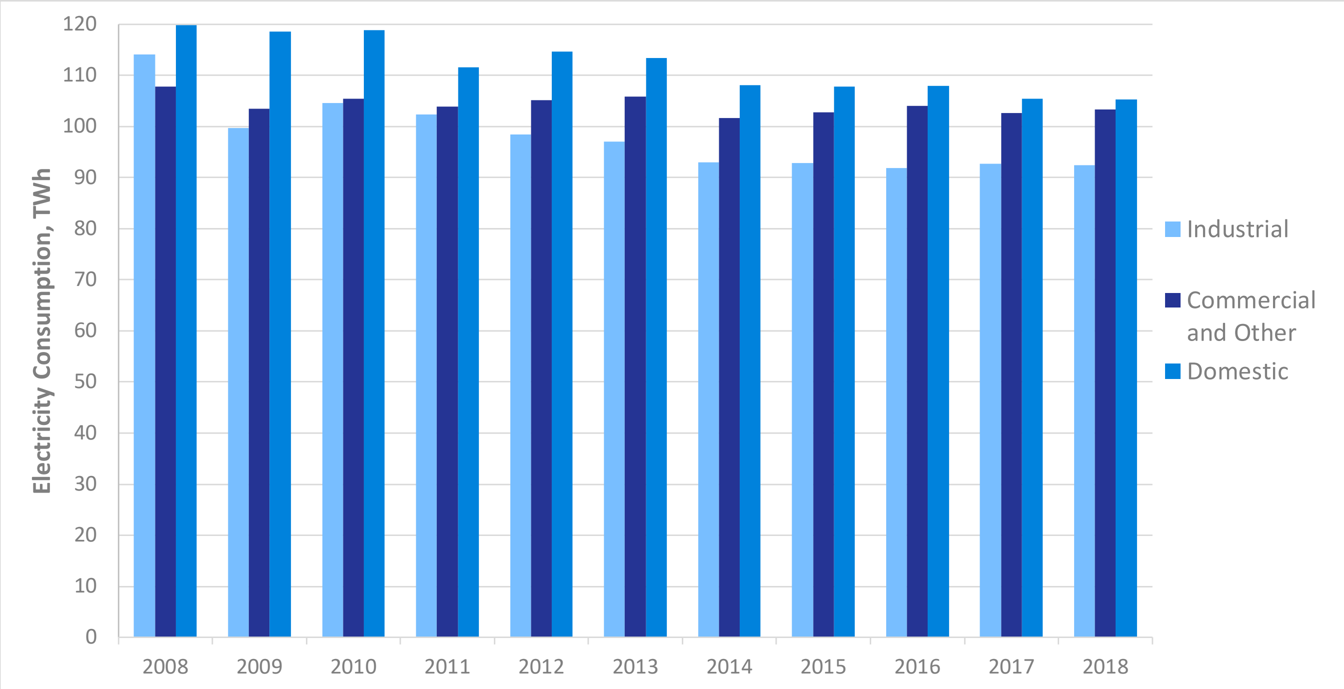
Chart 5.4 UK trade in electricity (Table 5.6)

In 2018, net imports were 19 TWh, an increase of 30 per cent on 2017. The increased net imports were largely driven by the 17 per cent increase in imports to 21.3 TWh in 2018, but also due to a 35 per cent reduction in exports to 2.2 TWh. Imports from France to the UK and Ireland to Northern Ireland each increased by 40.9 per cent and 39.2 per cent respectively; for the French imports this reflects the interconnector being fully operational in 2018 after repairs. However, imports from the Netherlands and Ireland to Wales, each decreased by nearly 10 per cent. Exports from the UK increased for all the interconnectors, apart from with France. Exports to France were reduced in comparison to 2017, when high electricity prices in France led to particularly high exports from the UK. The level of net imports in 2018 were higher than 2016 and 2017, but lower than in 2015 and 2014.

In Q4 2018, total imports increased 24 per cent, while exports decreased 57 per cent; this combination resulted in an overall 128 per cent increase in net imports. France to UK and Ireland to Northern Ireland imports both increased by 87 per cent and 79 per cent, respectively. However, imports from the Netherlands and Ireland to Wales decreased by 25 per cent and 31 per cent, respectively. Exports on each interconnector increased, except to France reflecting the expensive prices at the end of 2017 in France driving up exports from the UK.

In December 2018, the NEMO interconnector between Belgium and the UK began commissioning services, becoming fully operation on 31st January 2019. The June edition of Energy Trends will contain the first data on the electricity trading via this interconnector.

Chart 5.5 Annual Electricity final consumption (Table 5.2)



Final consumption in 2018 was 301 TWh, which was broadly stable compared to 2017 (+0.1 per cent). There were consumption decreases in the domestic and industrial sectors, but an increase for other final users (covering commercial and transport sectors).

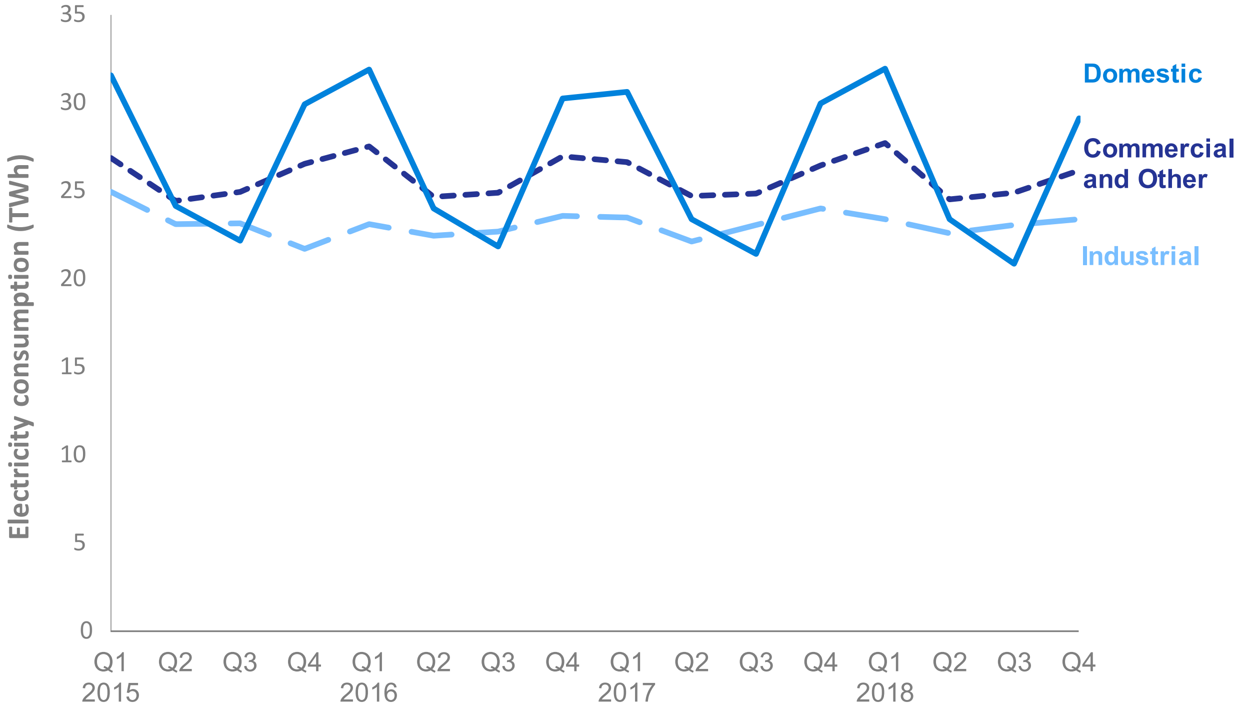
Since 2008, final consumption decreased from 342 TWh in 2008 to 301 TWh in 2018 (-12 per cent). The largest decrease in consumption occurred in 2014, when total consumption decreased by 4.3 per cent on the previous year, partly due to warmer temperatures (+1.2 degrees Celsius). Industrial consumption (including iron and steel) decreased by 19 per cent since 2008 to reach 92 TWh. Other final user consumption (including transport) was 4.3 per cent lower in 2018 than 2008, while domestic consumption was 12 per cent lower; these decreases partly reflect the annual average temperature being 0.6 degrees Celsius warmer (+6.4 per cent), but also the implementation of efficiency measures.

On an annual basis, total final consumption was broadly stable between 2017 and 2018 at 301 TWh (+0.1 per cent). Commercial consumption was the only sector with an increase (+0.6 per cent) between 2017 and 2018 with 103 TWh consumed; this reflect the increase in the Index of Services published by the Office for National Statistics. Industrial consumption declined by 0.3 per cent to 92 TWh, while domestic consumption was broadly stable at 105 TWh (-0.1 per cent).

For domestic consumption, the stability observed between 2017 and 2018 reflects the stability in the average annual temperature between the two years. However, consumption varied on a quarterly basis reflecting the temperature variability. While Q1 2018 was significantly colder than Q1 2017, resulting in a 4.2 per cent increase in domestic consumption compared to Q1 2017, Q3 and Q4 2018 had higher average temperatures than the previous year leading to consumption decreases.

Temperatures in 2018 were the same as in 2017 10.6 degrees Celsius – see Energy Trends table 7.1 at: www.gov.uk/government/statistics/energy-trends-section-7-weather.

Chart 5.6 Electricity final consumption (quarterly) (Table 5.2)

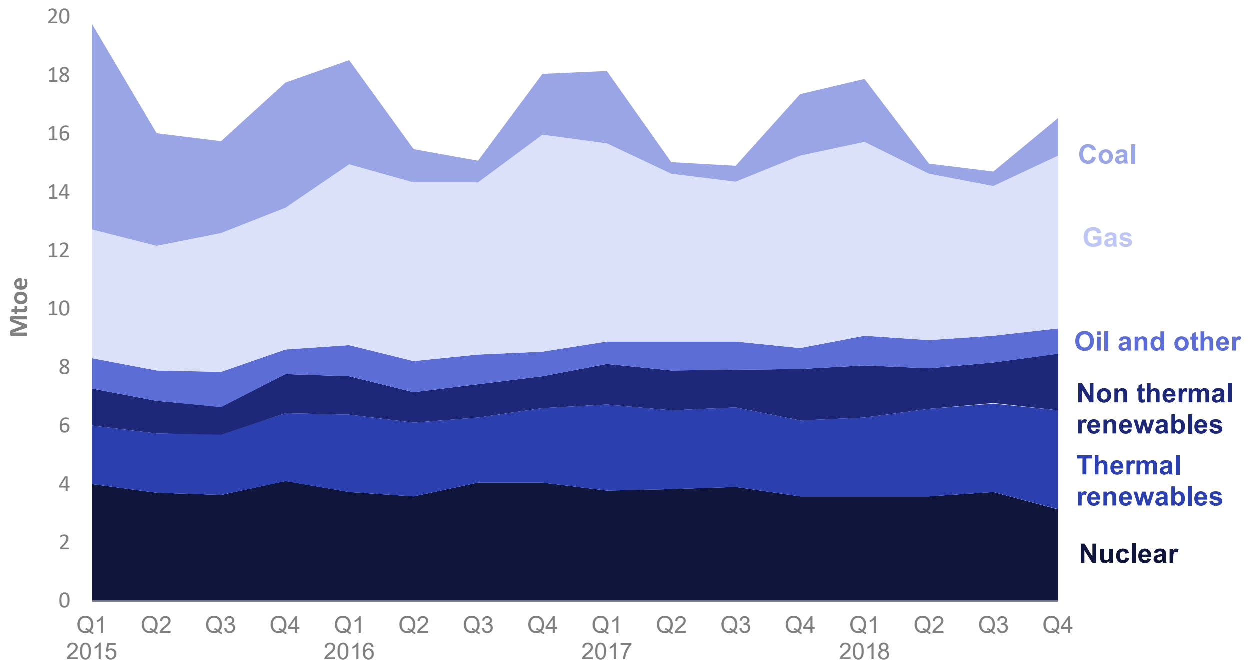


For the fourth quarter of 2018, final consumption was lower than in the same period in 2017. Final electricity consumption in Q4 2018 was 79 TWh down from 80 TWh in Q4 2017, (-2.1 per cent).

Consumption in each of the three main sectors decreased in the fourth quarter of 2018. Domestic consumption decreased by the most (-2.8 per cent) from 30 TWh in Q4 2017 to 29 TWh in Q4 2018 which reflects the warmer temperature during the quarter. Industrial consumption (including iron and steel) decreased by 2.5 per cent to 23 TWh in Q4 2018. Other final users' (including commercial and transport) consumption decreased by 1.0 per cent in the fourth quarter of 2018 compared to the preceding year; this in part reflected the warmer temperatures.

The average temperature was 0.5 degrees Celsius warmer in the fourth quarter of 2018 compared to the same period a year earlier – see Energy Trends table 7.1 at: www.gov.uk/government/statistics/energy-trends-section-7-weather.

Chart 5.7 Fuel used for electricity generation (Table 5.1)



Generators use of fuel for electricity generation continued to decline in 2018. When compared to 2017, fuel use by all generators decreased by 2.1 per cent in 2018 to reach 64 mtoe. This decline was driven by a reduction in fossil fuel and nuclear generation. (Note that for wind and other primary renewable sources the fuel used is assumed the same as the electricity generated, unlike thermal generation where conversion losses are incurred).

Coal use for electricity generation declined by 24 per cent in 2018 to 4.2 mtoe – a record low for coal use. Gas use declined 4.7 per cent to 23 mtoe, the lowest level since 2015; this reduction in gas use was partly a result of higher gas prices in Q3 2018 making it less profitable. Nuclear sources fell by 7.0 per cent in 2018 in comparison to 2017 - the lowest level since 2014. These reductions in fuel use were moderated by increases in production from all non-thermal renewable sources, except hydro, and increased net imports.

The type of fuel used for electricity generation varies seasonably, shown in Chart 5.7 above. The chart indicates the reduction in fuel used over time, but also the seasonality between fuel types. Fuel use increases in winter months due to increased demand, as a result of the colder weather. In 2018, fossil fuel use peaked in Q1, due to the exceptionally cold weather caused by the Beast from the East, when temperatures were 30 per cent lower than in Q1 2017. In contrast, renewable sources peaked in Q4, reflecting increased capacity.

In the last quarter of 2018, fossil fuel use decreased. Coal use decreased by 40 per cent compared to Q4 2017, down to 1.3 mtoe – a record low usage level for quarter 4. Gas use declined by 10 per cent on Q4 2017 to 5.9 mtoe – the lowest gas use since Q4 2015. This decline in gas use reflected lower demand and increased use of renewables. The outages at nuclear plants continued in Q4 2018 resulting in a 12 per cent reduction in use to 3.1 mtoe – the third lower nuclear use level. However, use from wind and solar increased by 10 per cent, while bioenergy use increased 31 per cent, due to increased capacity and reduced outages.

Section 6 - Renewables

Key results show:

Provisional 2018
2018 was a record year for renewable electricity generation which increased by 11.8 per cent compared to 2017, from 99.3 TWh to 111.1 TWh, largely due to increased capacity. **(Table 6.1)**

Renewables' share of electricity generation was a record 33.3 per cent and an increase of 3.9 percentage points on the 29.3 per cent share in 2017. This reflects the higher renewable generation and slightly lower overall electricity generation in 2018, compared to 2017. **(Table 6.1 and Chart 6.1)**

In 2018, on the 2009 Renewable Energy Directive basis, renewable generation (normalised accounting for variable weather and including generation from the biogas component of the grid) was a record 31.7 per cent of gross electricity consumption, an increase of 3.6 percentage points on 2017's share. **(Table 6.1)**

Renewable electricity capacity was 44.4 GW at the end of 2018, a 9.7 per cent increase (3.9 GW) on a year earlier, largely due to increased offshore wind and plant biomass capacity. **(Chart 6.3)**

Quarter 4 2018
Renewables' share of electricity generation was 37.1 per cent in 2018 Q4, up 7.0 percentage points on the 30.1 per cent share in 2017 Q4, reflecting higher renewable generation and lower overall electricity generation.

Renewable electricity generation was 32.7 TWh in 2018 Q4, an increase of 18 per cent on 27.8 TWh in 2017 Q4. This was driven by record bioenergy, onshore and offshore wind generation, a result of increased capacity. **(Chart 6.2).**

In 2018 Q4, 58 MW of capacity eligible for the Feed in Tariff scheme was installed, increasing total FiTs capacity to 6.5 GW, across 961,431 installations. **(Chart 6.5)**

Relevant tables

6.1: Renewable electricity capacity and generation
6.2: Liquid biofuels for transport consumption

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Table 6.1 Renewable electricity shares – 2017 and 2018 (provisional)

	2017	2018p
Renewable generation (TWh)	99.3	111.1
Total electricity generation (TWh)	338.6	333.9
International basis	**29.3%**	**33.3%**
Normalised renewable generation (TWh)[1]	98.4	111.2
Gross electricity consumption (TWh)	350.5	350.5
2009 Renewable Energy Directive basis	**28.1%**	**31.7%**

[1] Includes generation from the biogas component of gas in the grid

In 2018, renewables provided a third of electricity generation (33.3 per cent) up from 29.3 per cent in 2017, due to increased capacity. Overall electricity generation fell by 4.4 per cent.

Total electricity generated from renewables in 2018 increased by 11.8 per cent on 2017, from 99.3 TWh to a record 111.1 TWh. On a Directive basis, generation rose from 98.4 TWh in 2017 to 111.2 TWh in 2018.

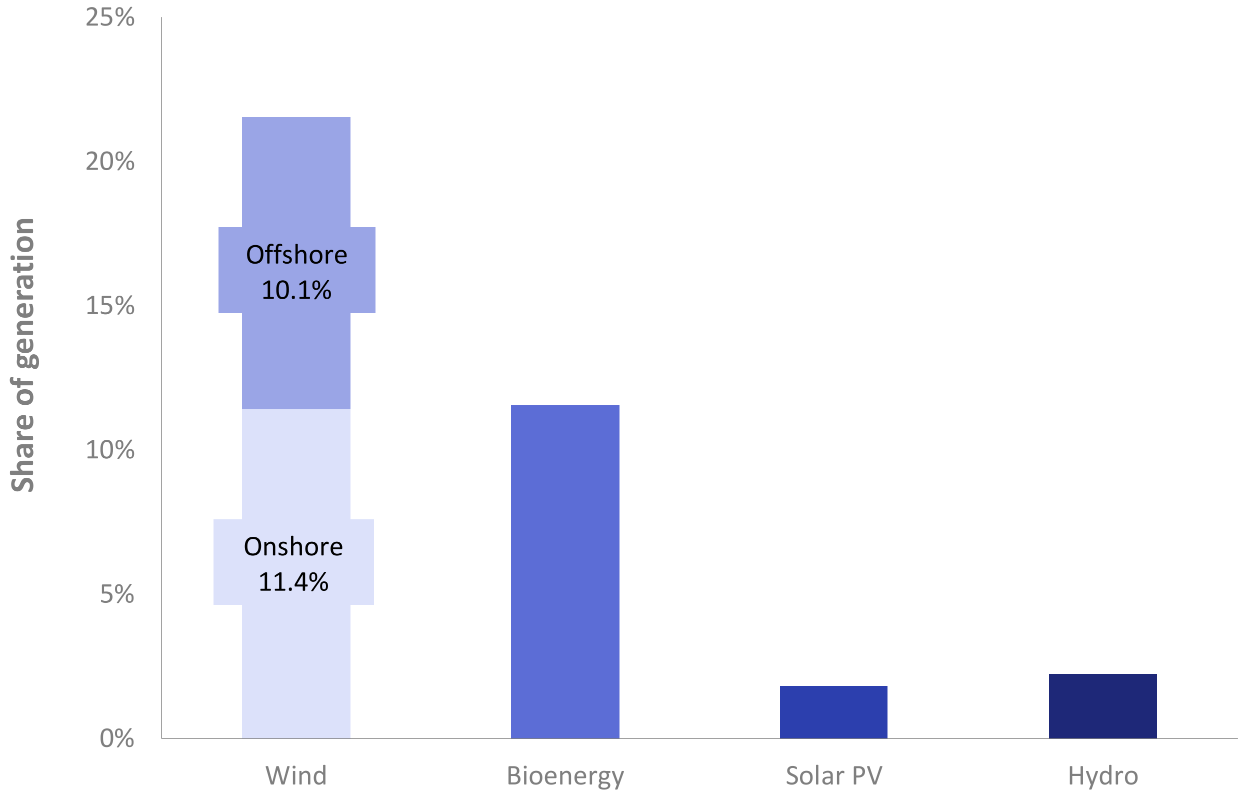
On the 2009 Renewable Energy Directive (RED) basis, the electricity share was 31.7 per cent, compared with 28.1 per cent in 2017. The RED measure uses normalised wind and hydro generation, to account for variable generation due to weather conditions and includes generation from biogas' share of gas in the grid. Under this measure, wind generation was reduced due to higher load factors for 2018, whilst the reverse was true for hydro; normalised generation was increased due to low load factors in 2018.

For more information on normalisation, and the various measures of renewable electricity's shares, please see the June 2018 special feature article "Renewable energy in 2017", at:
www.gov.uk/government/statistics/energy-trends-june-2018-special-feature-article-renewable-energy-in-2017

In 2018 Q4, renewables' share of electricity generation increased by 7.0 percentage points to 37.1 per cent, from the 30.1 per cent share in 2017 Q4. Total electricity generation and electricity demand figures (all generating companies) can be found in tables ET 5.1 and ET 5.2, at:
www.gov.uk/government/statistics/electricity-section-5-energy-trends.

Overall quarterly electricity generation was 88.1 TWh in 2018 Q4, down by 4.4 per cent on a year earlier (as mild average temperatures in November and December led to lower demand over the quarter. However, total electricity supply only fell 2.2 per cent, as net imports more than doubled compared to Q4 2017). A small amount of the increase in renewables share can be attributed to this drop in electricity generation.

Chart 6.1 Renewables' share of electricity generation – 2018 Q4 (Table 6.1)



In 2018, generation from onshore wind increased by 4.6 per cent, from 29.1 TWh in 2017 to a record 30.4 TWh. Offshore wind generation also reached a record level, increasing by 28 per cent, from 20.9 TWh to 26.7 TWh. This was due to increased capacity.

Hydro generation decreased by 7.8 per cent compared to 2017, from 5.9 TWh to 5.5 TWh.

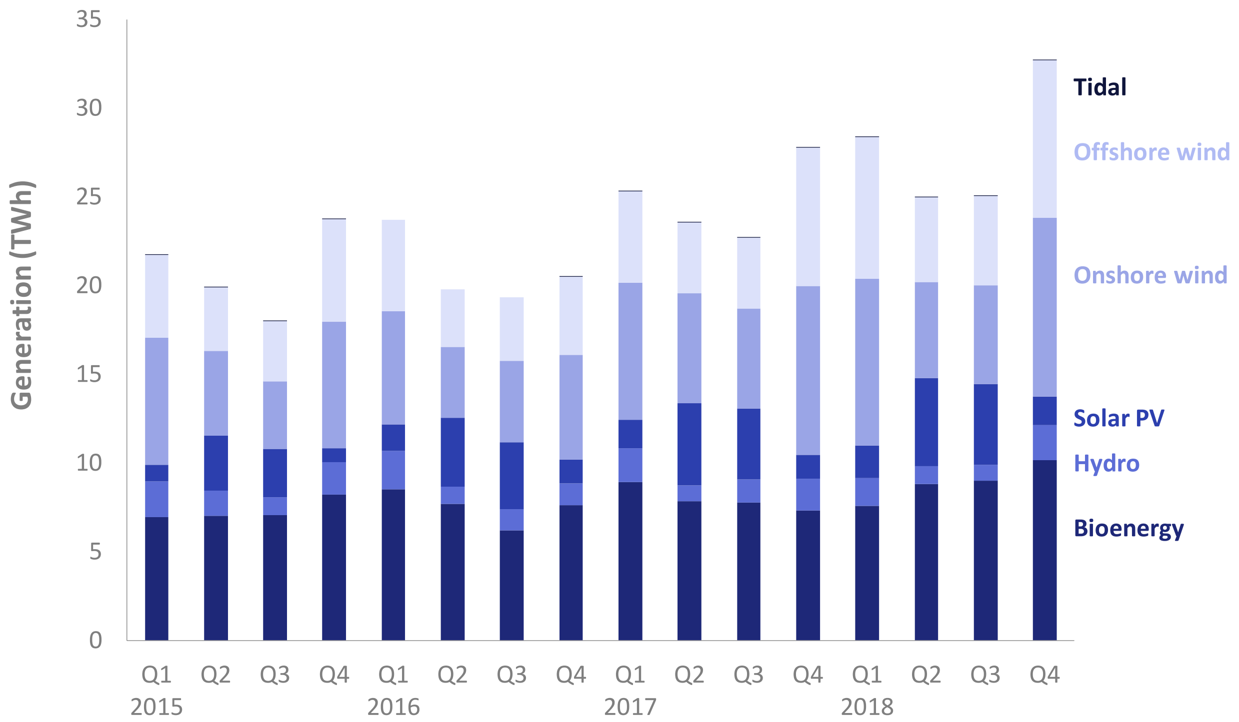
In 2018, generation from bioenergy[1] increased by 12 per cent, from 31.8 TWh in 2017 to a record 35.6 TWh. This was largely due to generation from plant biomass which increased by 21 per cent from 20.1 TWh to 24.3 TWh. Elsewhere, generation from waste increased by 3.2 per cent due to increased capacity whereas generation from anaerobic digestion decreased by 7 per cent, due to a decrease in capacity. Generation from sewage gas by 0.1 per cent with animal biomass generation decreasing by 0.6%.

In 2018, 32 per cent of renewables generation was from bioenergy, 27 per cent from onshore wind, 24 per cent from offshore wind, 12 per cent from solar PV, and 5 per cent from hydro.

Total electricity generation figures (all generating companies) can be found in table ET 5.1, at: www.gov.uk/government/statistics/electricity-section-5-energy-trends.

[1] landfill gas, sewage gas, biodegradable municipal solid waste, plant biomass, animal biomass, anaerobic digestion and co-firing (generation only)

Chart 6.2 Renewable electricity generation (Table 6.1)



Total electricity generated from renewables in 2018 Q4 was up by 18 per cent on 2017 Q4, from 27.8 TWh to 32.7 TWh, driven by record generation from wind.

In 2018 Q4, generation from onshore wind increased by 6 per cent to a record 10.1 TWh. Generation from offshore wind increased by 14 per cent, from 7.8 TWh to a record 8.9 TWh. The increase in generation from both onshore and offshore wind was due to increased capacity.

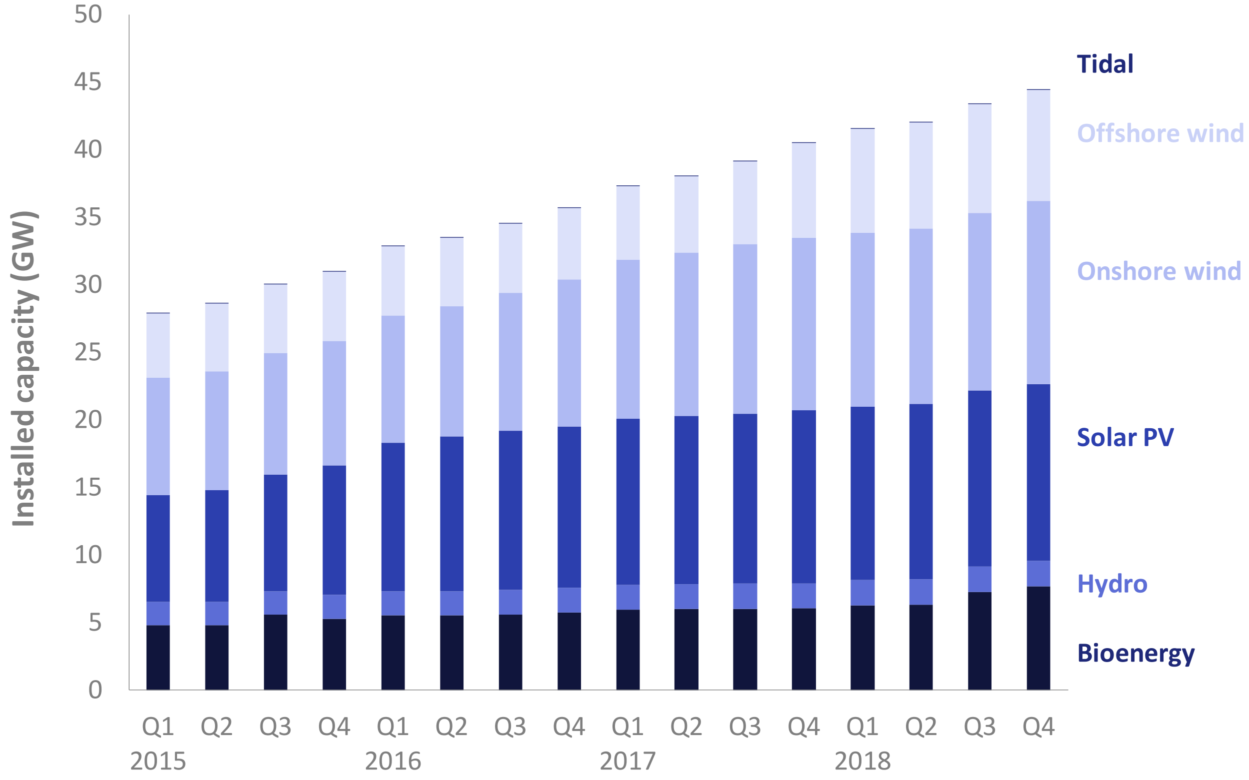
Solar PV generation increased by 19 per cent. Although there was only 2.5 per cent of additional capacity in 2018 Q4 compared to a year earlier, solar generation was helped by higher load factors, a result of 0.4 more sun hours per day than in 2017 Q4.

Generation from bioenergy increased by 39 per cent, from 7.3 TWh in 2017 Q4 to 10.2 TWh in 2017 Q4. Within this, there was a large increase in generation from plant biomass as new capacity came online.

In 2018 Q4, hydro generation increased by 9.3 per cent on a year earlier to 2.0 TWh, the highest Q4 level since 2011.

In 2018 quarter 4, bioenergy had the largest share of generation with 31 per cent (10.2 GWh), marginally ahead of onshore wind (10.1 GWh). Offshore wind accounted for 27 per cent of generation so that total wind and bioenergy provided 89 per cent of renewable generation.

Chart 6.3 Renewable electricity capacity (as at end of quarter) (Table 6.1)



At the end of 2018 Q4, the UK's renewable electricity capacity totalled 44.4 GW, an increase of 9.7 per cent (3.9 GW) on that installed at the end of 2017 Q4, and up 2.3 per cent (1.0 GW) on that installed at the end of the previous quarter. At the end of 2018 Q4, onshore wind had the highest share of capacity at 30.5 per cent (13.5 GW), followed by solar photovoltaics at 29.5 per cent (13.1 GW), offshore wind (18.5 per cent), bioenergy (17.3 per cent) and hydro (4.2 per cent).

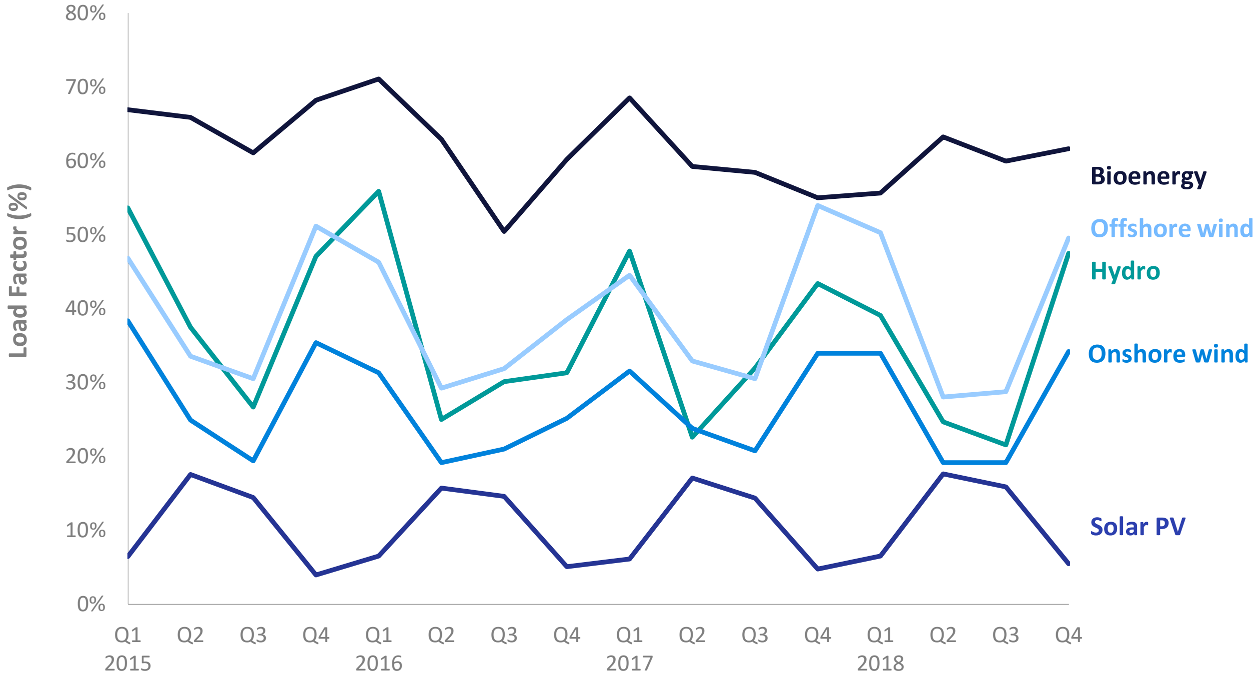
During 2018, onshore wind capacity increased by 0.7 GW, while offshore wind capacity increased by 1.2 GW, with several large sites opening, or continuing to expand during the year. This included the extension at Walney, the world's largest offshore wind farm.

Solar PV capacity increased by 0.3 GW during 2018, compared to a 0.9 GW increase during 2017. Around half of the increase in 2018 came from small scale Feed in Tariff[2] sites, with new applications being made before the scheme closes in March 2019.

Bioenergy capacity increased by 27 per cent (1.6 GW), mostly due to a 1.6 GW increase in plant biomass capacity. This was driven by the conversion to biomass of a unit at Drax and the conversion of Lynemouth power station to biomass from coal.

[2] To note that renewable generation and capacity figures include installations accredited on all support schemes (Renewables Obligation, Feed in Tariffs, Contracts for Difference), as well as those not eligible for support or are commissioned but awaiting support accreditation. This should particularly be noted for solar PV (and onshore wind), where figures consist of many installations across several or all of these categories.

Chart 6.4 Renewable electricity load factors (Table 6.1)



In 2018, onshore wind's load factor averaged 26.4 per cent, a 1.7 percentage point decrease on 2017 due to a decrease in average wind speed. Load factors for offshore wind increased by 1.2 percentage points from of 38.9 per cent, to 40.1 per cent.

Hydro's load factor in 2018 decreased by 3.2 percentage points, from 36.5 per cent in 2017 to 33.2 per cent in 2018.

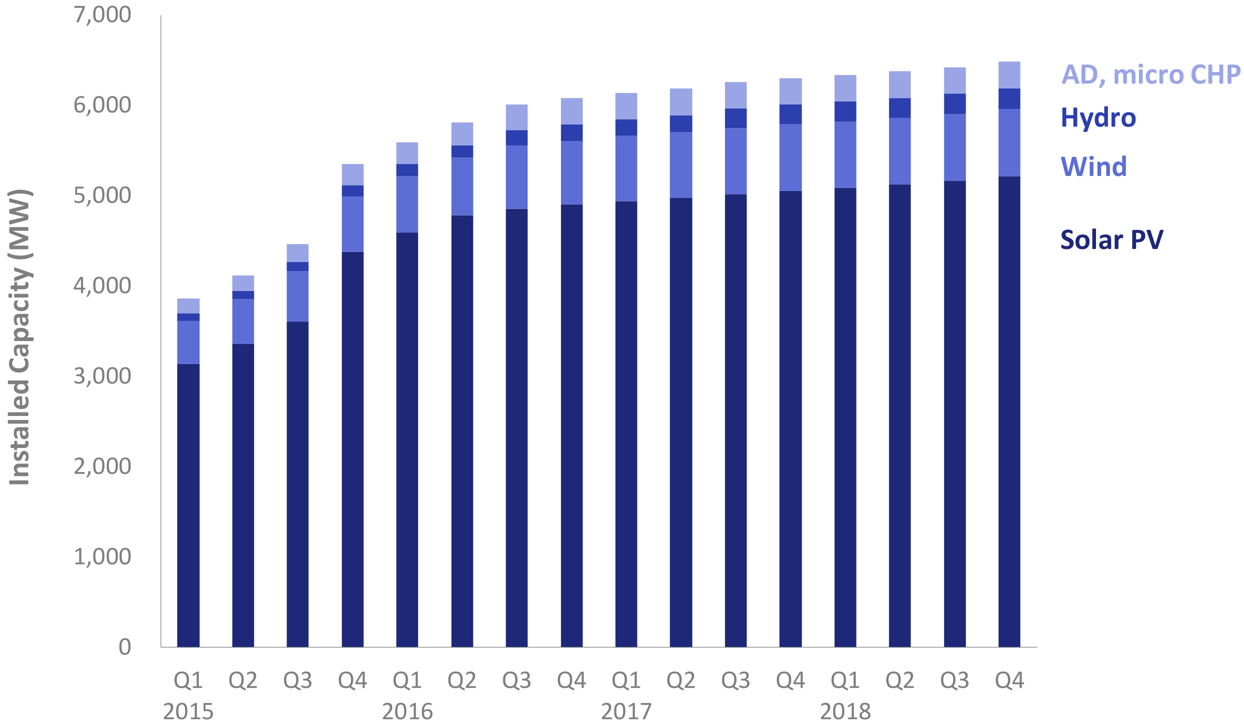
Onshore wind's load factor in 2018 Q4 stood at a three-year high of 34.2 per cent, a 0.2 percentage point increase on a year earlier, average wind speeds were 9.2 knots, 0.2 knots lower than in the same period a year earlier[3] but were still higher than the long term average, as wind speeds in Q4 are typically higher than Q2 or Q3. Offshore wind's load factor decreased by 4.4 percentage points compared to 2017 Q4, from 53.9 per cent, to 49.5 per cent, this may be because new sites had come online in the second half of 2018 which took time to ramp up production.

Hydro's load factor in 2018 Q4 was 47.5 per cent, a 4.1 percentage point increase on a year earlier, due to 6 per cent more rainfall (in the main hydro catchment areas) than 2017 Q4.

Bioenergy's load factor increased to 61.6 per cent in 2017 Q4, up from 55.0 per cent in 2017 Q4 and 1.6 percentage points higher than the previous quarter.

[3] Load Factors are calculated using an average of capacity at the start and end of the quarter. Therefore, they can be influenced by the time in the quarter when any new capacity came online.

Chart 6.5 Feed in Tariffs: eligible installed capacity (as at end of quarter)



At the end of 2018 Q4, 6.5 GW of capacity was installed and eligible for the GB Feed in Tariff (FiT) scheme[4]. This was an increase of 0.9 per cent (58 MW) on that installed at the end of 2018 Q3, and 2.9 per cent (180 MW) higher than the amount installed at the end of 2017 Q4. 89 per cent of FiT capacity installed across the year was solar PV.

In terms of number of installations, at the end of 2018 Q4, there were 961,448 installed and eligible for the FiT scheme, a 1.3 per cent increase on the 949,181 installed at the end of the previous quarter, and a 4.2 per cent increase on the 923,101 installations a year earlier.

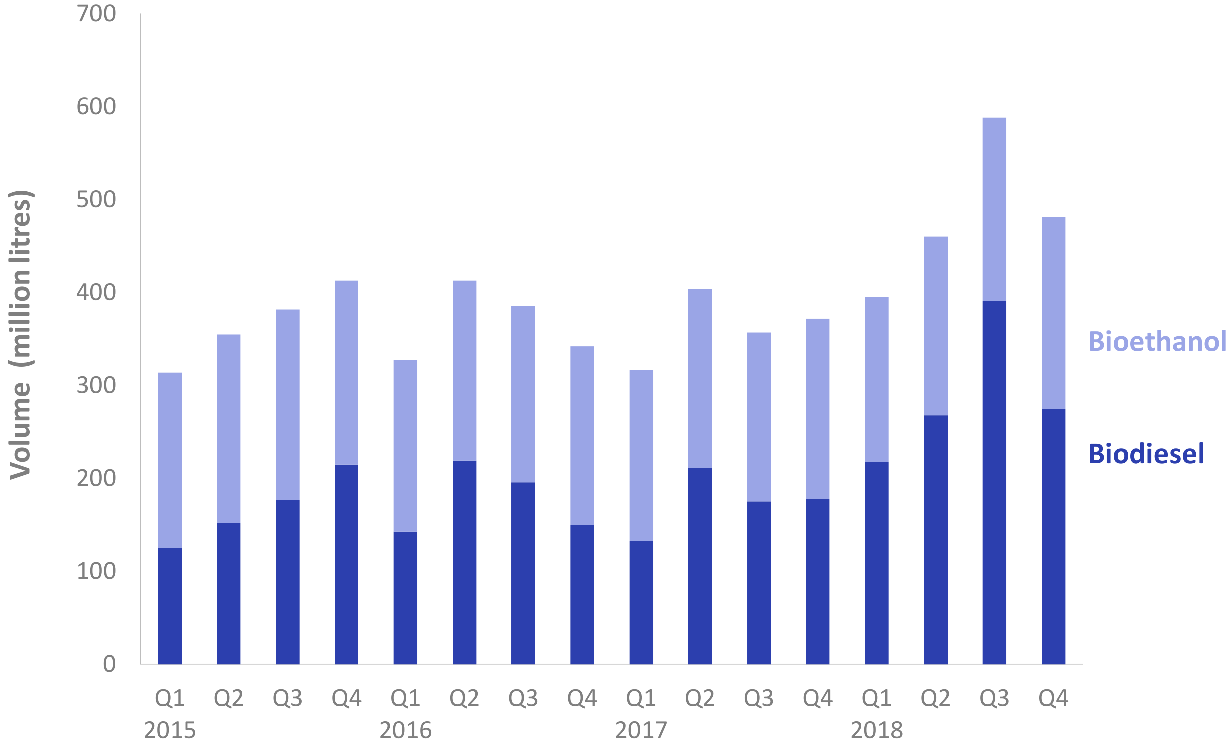
Solar photovoltaics (PV) represent the majority of both installations and installed capacity confirmed on FiTs, making up, respectively, 99 per cent and 80 per cent of the total.

Renewable installations eligible for FiTs (all except Micro CHP) represented 15 per cent of all renewable installed capacity.

Statistics on Feed in Tariffs can be found at:
www.gov.uk/government/collections/feed-in-tariff-statistics

[4] Data are for schemes accredited under the Microgeneration Certification Scheme (MCS) and ROOFIT, which are pre-requisites for registering for the FiT scheme; not all of these installations will eventually be confirmed onto the FIT scheme.

Chart 6.6 Liquid biofuels for transport consumption (Table 6.2)



In 2018, 1,925 million litres of liquid biofuels were consumed in transport, an increase of 33 per cent on 2017's 1,450 million litres. Bioethanol consumption increased, by 2.6 per cent, from 753 million litres to 773 million litres. Biodiesel consumption increased by 65 per cent, from 697 million litres in 2017 to 1,152 million litres in 2018, a new record high.

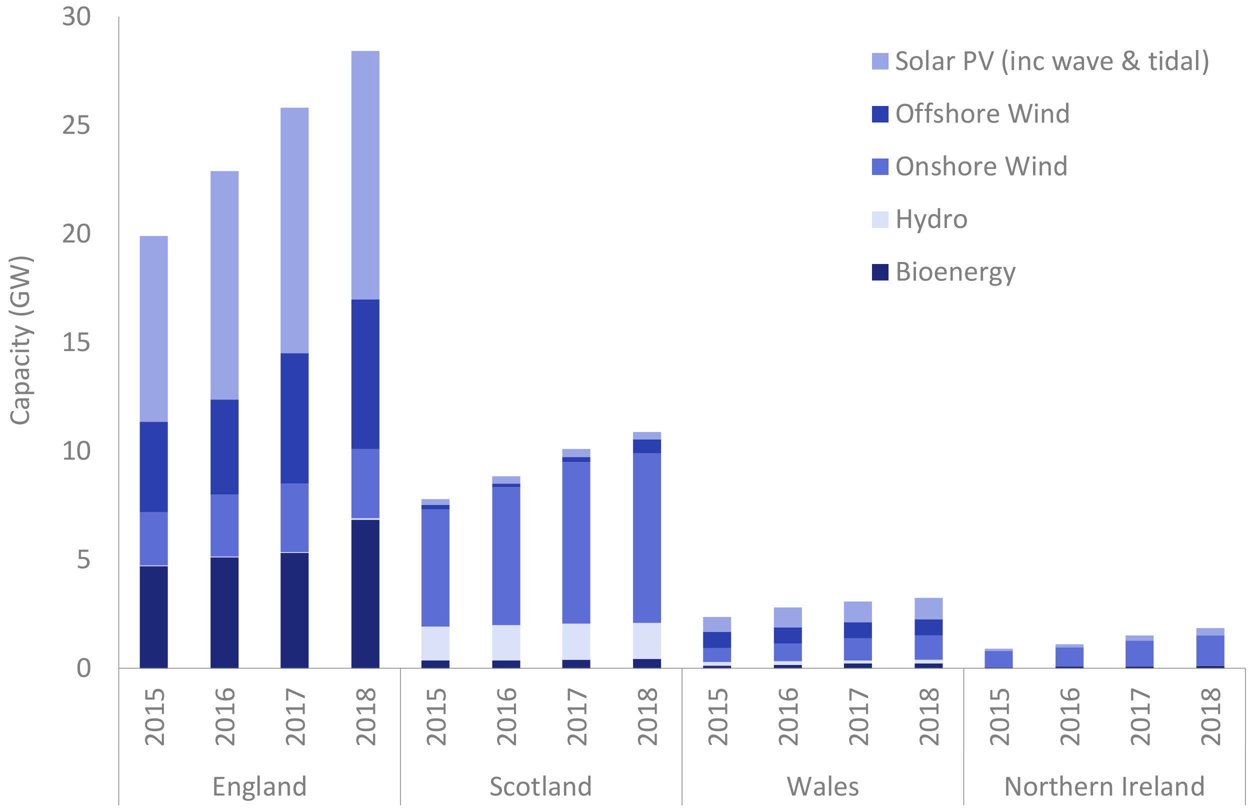
In 2018, in volume terms, bioethanol contributed to 40 per cent of biofuel consumption, compared with 60 per cent from biodiesel.

In 2018, in volume terms, bioethanol accounted for 4.6 per cent of motor spirit, and biodiesel 3.8 per cent of total diesel; the combined contribution to total road fuels was 4.1 per cent, up from 3.1 per cent in 2017.

In 2018 Q4, 482 million litres of liquid biofuels were consumed in transport, an increase of 29 per cent on the 372 million litres in 2017 Q4. Biodiesel consumption increased by 54 per cent, from 178 million litres, to 275 million litres. Bioethanol consumption in 2018 Q4 increased by 6.7 per cent, from 194 million litres, to 207 million litres in 2018 Q4.

In 2018 Q4, the largest share of consumption was from biodiesel (57 per cent), with the remaining 43 per cent from bioethanol. Biodiesel share increased 9 percentage points on a year earlier.

Chart 6.7 Renewable electricity capacity, by UK country



At the end of 2018, England's renewable electricity capacity was 28.4 GW, an increase of 10 per cent (2.5 GW) on that at the end of 2017, with plant biomass (1.6 GW), offshore wind (0.9 GW) and solar (0.2 GW) being the main contributors to the increase.

Scotland's capacity was 10.9 GW, an increase of 8 per cent (0.8 GW) on a year earlier, 88 per cent of this increase was due to additional wind capacity.

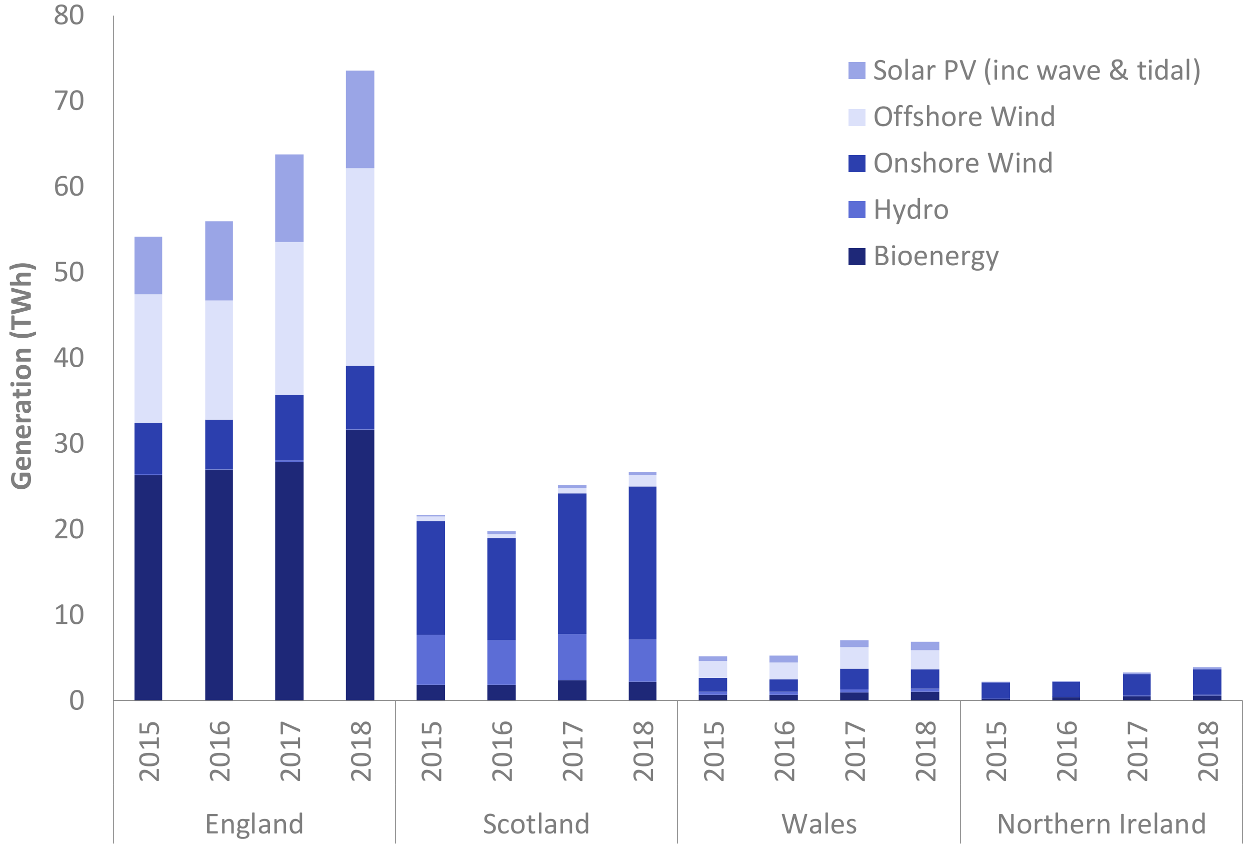
Wales's capacity was 3.2 GW, an increase of 5 per cent (0.15 GW) on that at the end of 2017, with 70 per cent of this increase due to additional onshore wind capacity.

Northern Ireland's capacity was 1.9 GW, an increase of 22 per cent (0.3 GW) on a year earlier, with 64 per cent of this increase attributable to new wind farms, and 30 per cent due to new solar capacity (both small and large solar).

At the end of 2018, England accounted for 64 per cent of UK renewable electricity capacity; Scotland's share was 25 per cent, Wales's was 7.3 per cent and Northern Ireland's stood at 4.2 per cent.

Quarterly renewable electricity statistics by UK country can be found in table ET 6.1, at: www.gov.uk/government/statistics/energy-trends-section-6-renewables

Chart 6.8 Renewable electricity generation, by UK country



In 2018, renewable electricity generation in England was 73.5 TWh, an increase of 15 per cent (9.9 TWh) on 2017. Of this extra generation, 4.9 TWh came from onshore and offshore wind, due to increased capacity.

Generation in Scotland was 26.7 TWh, an increase of 6 per cent (1.5 TWh) on 2017; 2.1 TWh of this additional generation was from wind.

Generation in Wales was 6.9 TWh, a decrease of 3 per cent (0.2 TWh) on 2017. This was the result of a 0.4 TWh fall in wind generation.

Generation in Northern Ireland was 4.0 TWh, an increase of 21 per cent (0.7 TWh) on 2017, 0.4 TWh (63 per cent) of this increase was from wind.

In 2018, England accounted for nearly two thirds (66 per cent) of UK renewable electricity generation; Scotland's share was 24 per cent, Wales's was 6.2 per cent and Northern Ireland's 3.6 per cent.

Diversity and security of gas supply in the EU, 2017

Introduction

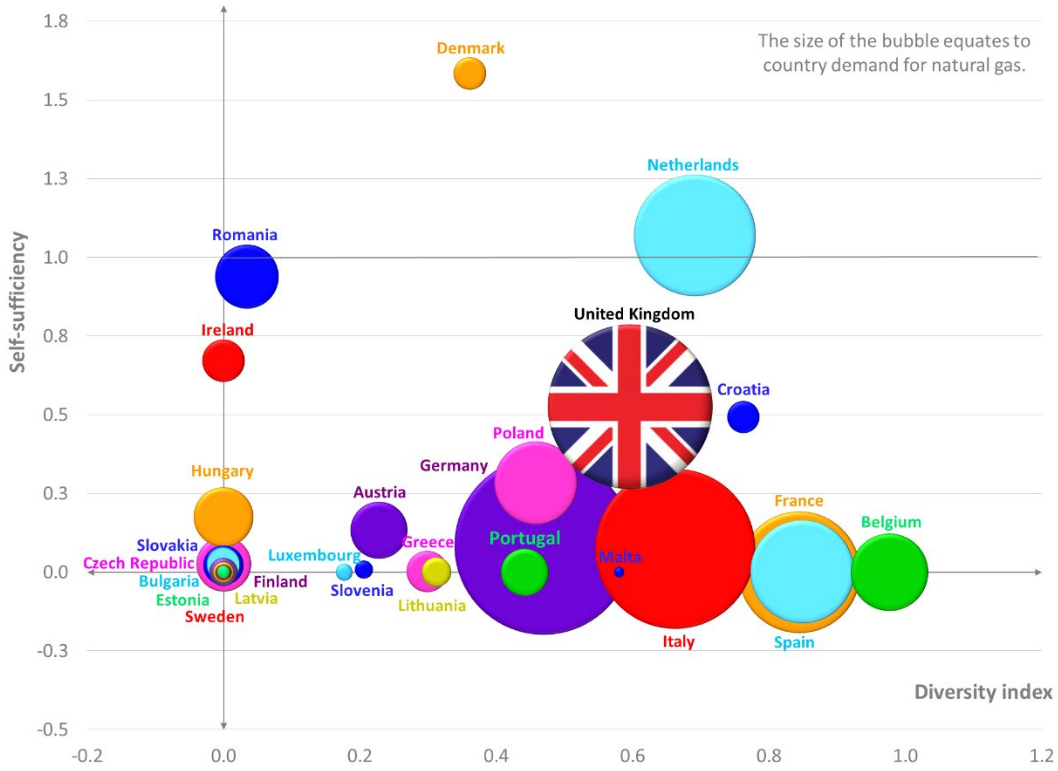
Countries meet their natural gas needs through a combination of indigenous production and trade through pipeline and Liquefied Natural Gas (LNG)[1]. This article is a comparative assessment of how EU countries met their natural gas demand in 2017, using International Energy Agency Statistics[2]. The aim is to determine how the UK's resilience of supply compared to other EU countries.

Total EU indigenous gas production was 132 billion cubic metres (bcm) in 2017. The UK's indigenous production contributed nearly a third to overall EU production, second only to the Netherlands who contributed 35 per cent. Total EU gas demand was 485 bcm in 2017 and Germany was the largest consumer at nearly one-fifth of this, with the UK ranked second at 17 per cent. Demand in the EU is relatively high compared to production (just over one-fifth of demand could currently be met by production), meaning that the EU imports gas to meet the shortfall. These imports arrive predominantly via the European gas pipeline network (around 90 per cent of imports arrive this way), as well as from a wider diversity of sources of shipped LNG.

Diversity and security of gas supply in the EU, 2017

Two methods have been used in this article to assess the diversity and security of EU gas supply; self-sufficiency and an index of diversity, which considers both the number of import sources and the political stability of these sources[3]. Chart 1 shows the relationship between a country's demand, indigenous production, diversity of its gross imports and the political stability of the countries of import to gauge the UK's position relative to other EU countries.

Chart 1: Diversity and security of gas supply in EU Countries, 2017



[1] LNG is a natural gas that has been cooled to a liquefied state for ease of transportation (usually by ship)
[2] www.iea.org/statistics/monthly/
[3] Appendix 2 shows further detail on the methodology

A score of one for self-sufficiency indicates that a country produced as much gas as it used, and the size of each bubble indicates that country's level of demand. A diversity score has been calculated using the number and political stability (using World Bank governance indicators) of a country's import sources (see Appendix 1 for scores and Appendix 2 for method).

Self-sufficiency

The UK had a self-sufficiency rating of 0.53 (Chart 1), meaning it could have met more than half its demand through indigenous production in 2017, comparing favourably with the EU average of 0.22[4].

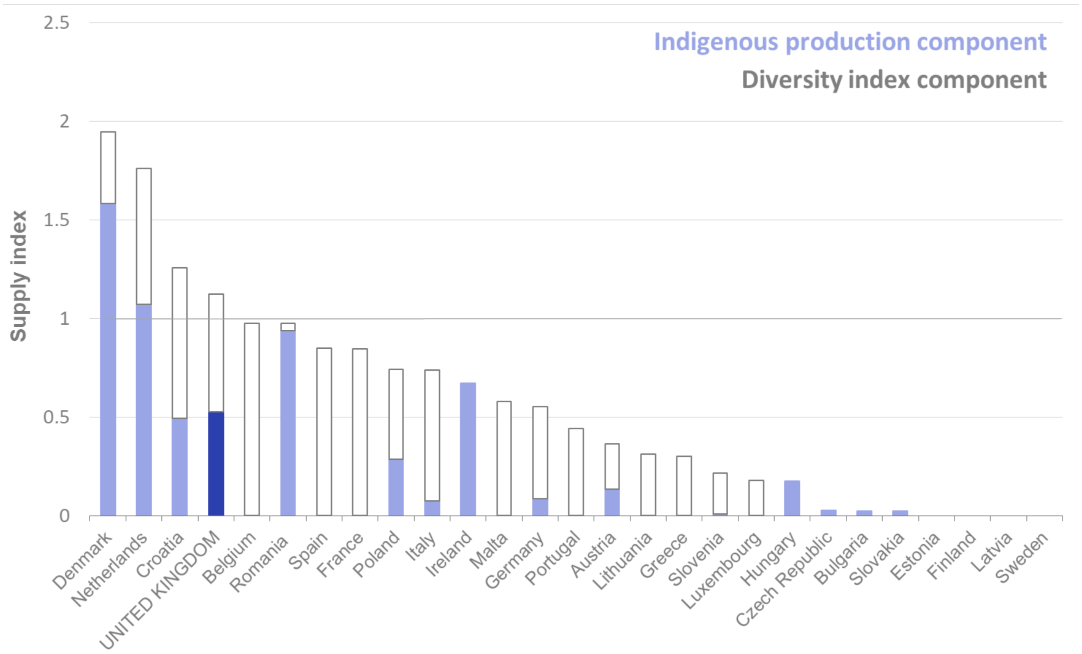
Within the EU only Denmark (who consumed less than two thirds of their indigenous production) and the Netherlands were net exporters of gas in 2017. Both countries send exports (via pipeline) predominantly to nearby Western European countries. All other EU countries met demand through imports, with ten countries producing no natural gas indigenously. Cyprus was the only country in the EU to have no gas consumption in 2017 and thus had no need to import gas despite no indigenous production.

Diversity of supply

The UK placed highly in the ranking of EU countries for diversity of supply, with a diversity index twice that of the EU average at 0.6 compared to the EU average of 0.3. The UK imported gas from 11 countries in 2017 and ranked fourth overall for security of supply in the EU (Chart 2). Norway is the predominant supplier of gas to the UK, meeting 40 per cent of supply (and three-quarters of total imports). Both Denmark and the Netherlands ranked highest because they were self-sufficient.

Chart 2 compares EU countries by self-sufficiency and diversity of imports, combined to show the relative contribution of production, and import diversity and security, to give a simple indication of the overall security of supply score. Appendix 1 shows the underlying data.

Chart 2: Security of supply of gas for EU countries, 2017



Cyprus has been excluded because it has zero consumption of gas

[4] Self-Sufficiency is calculated through indigenous production divided by inland consumption (calculated) using IEA statistics. There are 6 countries in the EU which are not OECD countries and therefore calculated data is not available for them in the IEA database. For these countries inland consumption (observed) has been used.

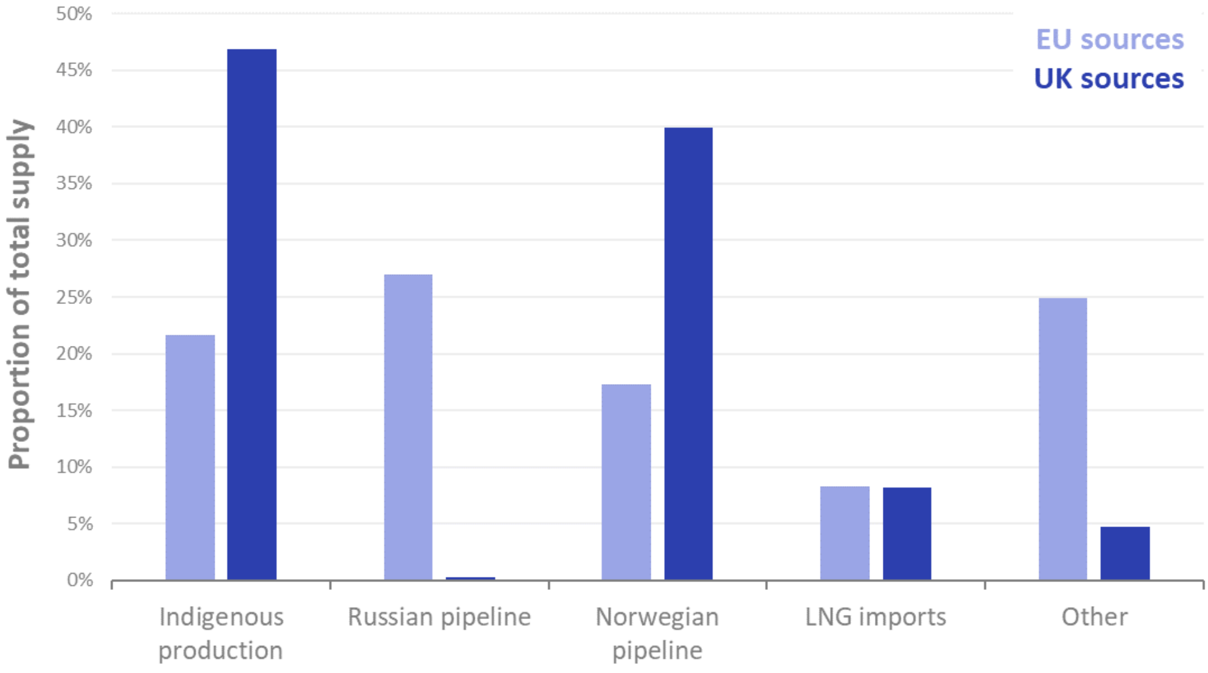
There are five countries with an overall supply index of zero (Cyprus, Estonia, Finland, Latvia and Sweden). A score of zero indicates that the country has no indigenous production and receives gas from a single import source. For Estonia, Finland and Latvia this single import source was Russia, whilst Sweden only imported from Denmark. Cyprus receives a default diversity index of 0 but as described they also did not have any consumption.

Sources of EU and UK gas

The EU met on average just over a fifth of its supply through indigenous production (Chart 3). EU countries benefit from an established gas pipeline infrastructure, enabling countries to meet most of their consumption through imports via pipeline with around eight per cent of demand being met through LNG shipments. LNG is natural gas that has been cooled to a liquified state to make it easier for it to be stored and transported by ship before being regasified and transferred to the natural gas pipeline system.

The EU typically receives around a quarter of its supply from Russia through pipelines (Chart 3). There are no direct pipeline connections between the UK and Russia; the only gas to arrive this way comes via the Netherlands (~0.3 per cent of supply, see Appendix 2). The current legacy pipeline infrastructure (built during the USSR) means that Central and Eastern European countries receive almost all their supply from Russia. Most Eastern European countries are taking steps to increase their diversity of supply, including through access to LNG terminals or expansion of existing pipeline networks. It should also be noted that the origin of all this gas is not necessarily Russian, since Russia acts as a transit country for gas from Kazakhstan and Turkmenistan to reach European markets. Eighteen EU countries imported gas from Russia and for seven EU countries, Russia was their sole import origin.

Chart 3: Sources of all EU and UK gas as a proportion of supply, 2017



The second largest source of gas for the EU is Norway, principally via pipeline, which makes up nearly one-fifth of EU supply. In comparison the UK received 40 per cent of total supply from Norway, who do not have pipeline connections to Russia. The reason is largely because of the UK's proximity to Norway, resulting in some shared infrastructure in the North Sea. Norwegian flows arrive in the UK predominantly via the major pipelines Langeled, Flags and Vesterled.

Chart 4: Sources of EU and UK gas, 2017

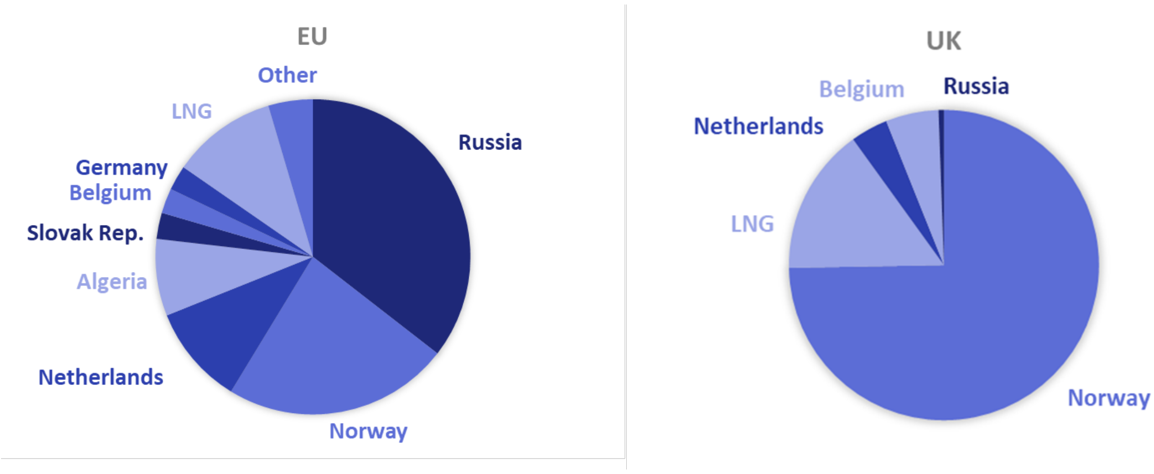


Chart 4 shows the source of EU and UK gas as a proportion of total imports. The EU sourced 37 per cent of its total imports from Russia in 2017, and at 23 per cent Norway was the second largest supplier to the EU. Roughly 10 per cent of EU imports are sourced through the Maghreb–Europe, Medgaz, Trans-Mediterranean, Galsi and Greenstream Pipelines from Northern Africa. The EU then imports smaller quantities from an array of sources with 13 countries[5] being included in "other" clearly displaying the diversity of EU sources, of which the majority is transported through pipelines.

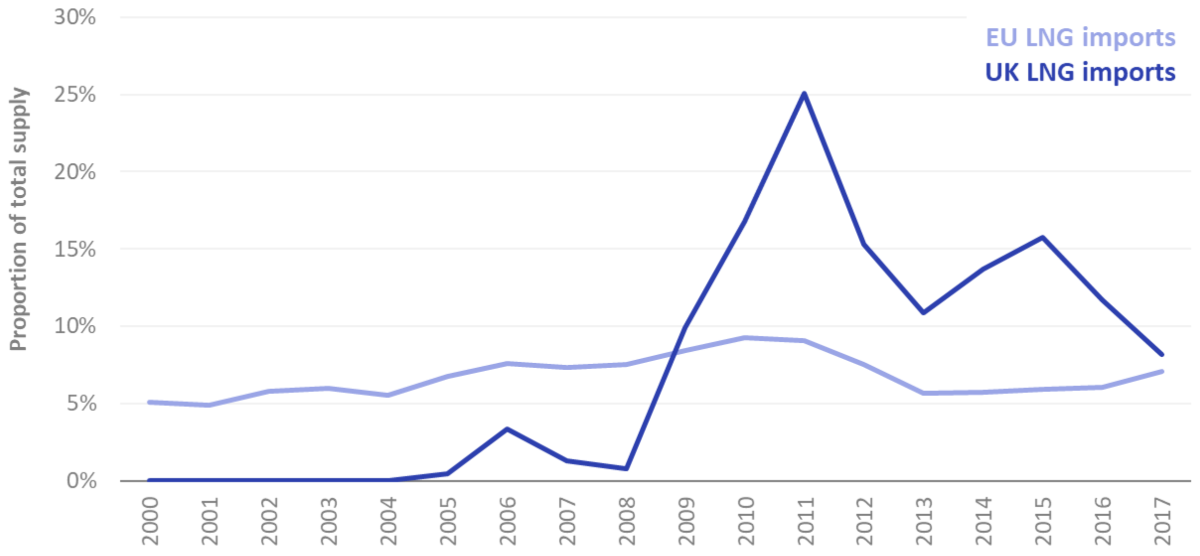
Liquified Natural Gas (LNG)

Global LNG markets play a vital role in responding to disruptions. Uncontracted volumes of LNG play a role in providing volumes to those countries that need it. In the event of a supply shock in Europe, additional supply would typically come from Qatar. However, were supply from Qatar to be disrupted then other flexible supply sources could be used to meet demand. The US is one example, with recent start-ups of LNG projects exporting volumes that will be mostly traded on the short-term/spot market. Other sources would also be available, for instance Nigeria, which has proven to be flexible during the Fukushima accident. Demand for LNG has grown since the turn of the century, since when new start-ups have made more supply globally available.

Prior to 2000 (from the earliest data available in the series), the only countries in the EU to import LNG were Belgium, France, Italy and Spain. This had increased to 11 countries by 2017, including the UK. Spain was predominantly the highest importer of LNG in the EU between 2000 and 2017, reaching a peak of 30 bcm in 2008 (the highest of any EU country to date).

[5] United Kingdom, Libya, Austria, Denmark, France, Hungary, Nigeria, Turkey, Slovenia, Croatia, Czech Republic, Spain, Portugal (listed in order of volume imported.)

Chart 5: EU and UK annual LNG imports as a proportion of total supply



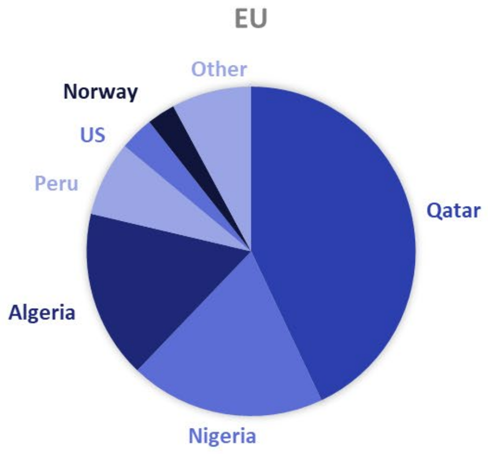
Average LNG imports to the EU have fluctuated between five and ten per cent of supply since 2000. The UK first imported LNG in 2005, when it made up less than 0.5 per cent of total supply (Chart 5), before reaching a peak of 25 per cent in 2011 (and nearly half of UK imports). The top four importers of LNG in the EU - France, Italy, Spain and the UK - all reached a peak between 2008 and 2011, with falling supply since then likely related to reductions in investment around the late 2000's and increased prices due to strong demand from Asia.

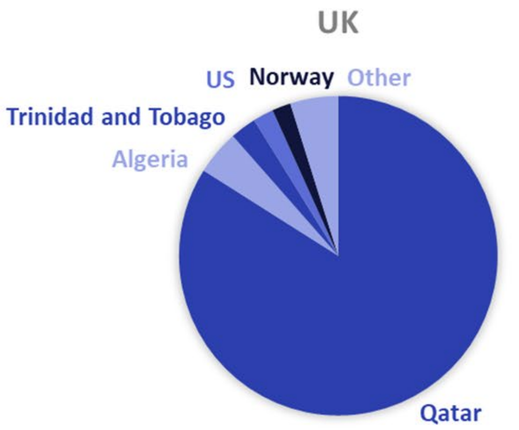
This downward trend continued so that in 2017 UK LNG imports had fallen to eight per cent of supply, the lowest level since 2008 and only marginally higher than the EU average of seven per cent. However, more recently, rising oil prices and demand from rapidly growing economies such as China and India have resulted in renewed investment and a subsequent diversification of supply sources as new projects have come online globally, including in the US and Russia. This increase to the variety of LNG sources provides additional resilience by increasing the diversity of the UK's and EU's supply portfolio.

This recent renewed investment has been reflected in a recent rise as volumes of LNG to France, Italy and Spain began increasing in 2016 and 2017, and from a more diverse range of sources (Chart 6). While it falls outside the scope of this article, LNG supply also increased to the UK in 2018 – please see Chapter 4 of Energy Trends (March 2019) and Energy Trends Table 4.4 for further information on 2018 UK data.

The UK received a similar proportion of gas imports from LNG as the EU average in 2017 (15 per cent and 12 per cent respectively). Chart 6 compares sources of UK LNG in 2017 to the EU. Compared to 2011 when 97 per cent of LNG was received from Qatar, Chart 6 demonstrates the increased diversity of LNG supply sources to the UK in 2017.

Chart 6: Sources of EU and UK LNG imports, 2017





('EU Other' includes Angola, Egypt, Russia, Netherlands, Equatorial Guinea, Belgium transhipments and non-specified imports. 'UK Other' includes imports from Peru, Nigeria, Russia and non-specified imports.)

A significant portion (more than 40 per cent) of EU LNG was imported from Qatar in 2017, which was the world's third largest net exporter of gas (of which 102,000mcm was LNG). For the UK this figure was 82 per cent, which was the lowest level in recent years as the UK has diversified its LNG portfolio, thereby benefiting the resilience of supply.

Summary of findings

The EU could on average have met just over a fifth of demand through indigenous production in 2017 and this supply was supplemented with imports from pipelines (70 per cent of supply) and LNG imports (8.4 per cent of supply) to meet remaining demand. This varies on a country-by-country basis, but most countries in the EU have a diverse range of import sources, overall receiving pipeline gas from 18 countries and LNG imports from 12 countries.

In contrast, with a self-sufficiency score of 0.53, the UK could have met just over half of demand through indigenous production, which is substantially higher than the EU average and creates the foundation for a strong security of supply rating. In terms of the supply portfolio, the UK imported just under half its gas via pipeline with a further 8.3 per cent from imports of LNG from a range of sources in 2017. This resulted in the UK being placed fourth overall in EU countries for security of supply, with two of the three countries with higher scores benefitting from complete self-sufficiency. Continued increases to the range of supply sources (for example further diversifying sources of LNG imports) will continue to improve the UK's resilience of supply.

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Appendices

Appendix 1: Natural Gas data, 2017

	Self-Sufficiency	Diversity x Political Stability	Demand (mcm)
Austria	0.13	0.23	9,488
Belgium	0.00	0.98	17,634
Bulgaria	0.02	0.00	3,313
Croatia	0.49	0.76	3,008
Cyprus	0.00	0.00	-
Czech Republic	0.03	0.00	8,727
Denmark	**1.58**	0.36	3,052
Estonia	0.00	0.00	493
Finland	0.00	0.00	2,327
France	0.00	0.84	43,517
Germany	0.08	0.47	93,351
Greece	0.00	0.30	4,953
Hungary	0.18	0.00	10,367
Ireland	0.67	0.00	5,235
Italy	0.07	0.66	75,151
Latvia	0.00	0.00	1,210
Lithuania	0.00	0.31	2,487
Luxembourg	0.00	0.18	791
Malta	0.00	0.58	286
Netherlands	**1.07**	0.69	43,329
Poland	0.28	0.46	20,097
Portugal	0.00	0.44	6,514
Romania	0.94	0.03	11,902
Slovakia	0.02	0.00	4,679
Slovenia	0.01	0.21	907
Spain	0.00	0.85	31,349
Sweden	0.00	0.00	753
United Kingdom	0.53	0.60	80,065
EU Average	**0.22**	**0.32**	**17,321**

Source: IEA (http://data.iea.org/)
Items in **bold** highlight those countries where indigenous production exceeded domestic consumption.

Appendix 2: Methodology

Self-sufficiency

Data for natural gas was extracted from the IEA database. Self-sufficiency was determined from data on indigenous production and consumption (indigenous production (mcm) ÷ consumption (mcm)).

Diversity indices

The diversity index used here is a product of a standard diversity index and an index for political stability. As a basic index for measuring diversity, we used the Shannon-Wiener diversity index. The Shannon-Wiener index is of the form:

$$\sum_{i=1}^{n} -x_i ln(x_i)$$

Where x is the proportion of total natural gas supply represented by the i^{th} source country and n represents the final source country. A value below 1 signifies a country that is dependent on a small range of import sources, a value above 1 represents a country with a wider range of import sources. The minimum value of zero denotes a country that has one imported fuel source or relies entirely on indigenous production (or a country with no imports).
The Shannon-Wiener was chosen here as it places weight on the diversity of contributions from smaller countries and reduces the impact of larger nations.
Political stability was determined using data from the World Bank worldwide governance indicators. Specifically, the index reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism. These data were standardised between 0 and 1.
Source: World Bank (http://info.worldbank.org/governance/wgi/index.aspx#home)
Once Shannon-Wiener and political stability indices were determined, these were multiplied and summed:

$$\sum_{i=1}^{n} -x_i ln(x_i) b_i$$

Where b is an index of political stability of producing country. This is called the SWNI (Shannon-Weiner-Neumann index), in line with previous work. Each SWNI index was normalised between 0 and 1, in order to have a standardised index. This was done by working out a maximum diversity score, by assuming maximum diversity was equivalent to importing products in line with proportional contributions of exporting countries (e.g. if a single country were responsible for exporting 50 per cent of all natural gas, and five other countries were responsible for 10 per cent each, we assumed maximum import diversity at a ratio of 5:1:1:1:1:1). This maximum diversity score then acted as our upper score of 1, with all other scores divided by this maximum to standardise the data.

Other sources of gas

Sometimes, due to a variety of reasons, countries may report an import of natural gas from a "Non-Specified/Other" source country. Where the source IEA data did not specify the origin country for a gas import, we used Border Point Data which is publicly available at www.iea.org/gtf/. This data is collected by the IEA and shows gas flows in Europe on a monthly basis.

The UK sourced 4 per cent of its natural gas imports through pipeline from the Netherlands in 2017. However, the Netherlands sourced a substantial amount through pipeline from Russia, meaning for transparency purposes the proportion of Netherlands' imports from Russia was applied to UK imports from the Netherlands as an estimate of the volume of pipeline gas that the UK imports from Russia.

Proposed change to method of reporting UK Liquefied Natural Gas imports

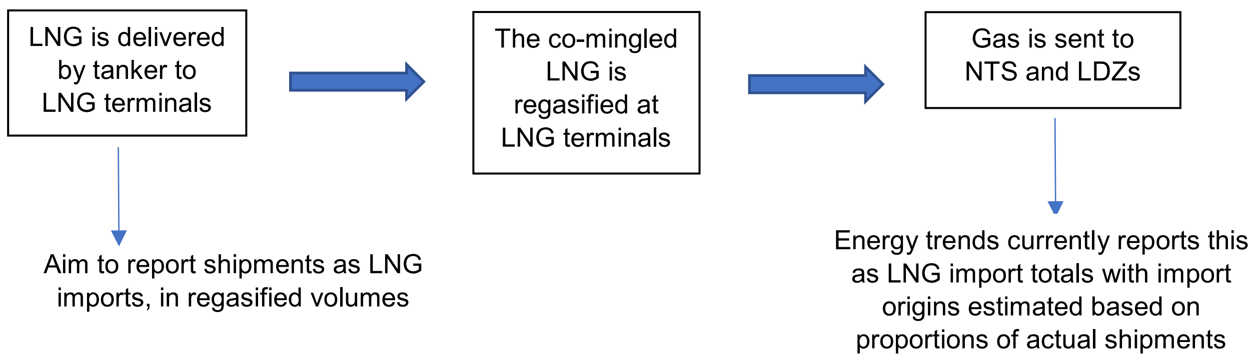
Background – process of receiving and utilising Liquefied Natural Gas (LNG) in the UK

The UK imports LNG through three terminals, the Isle of Grain terminal near Rochester and the Dragon and South Hook terminals in Milford Haven. LNG is imported by tanker where it is then stored at the terminal until it is converted to a gaseous state and sent into the National Grid Transmission System (NTS) and to local distribution networks (LDZs).

The total for gas imports in Energy Trends Table 4.2 includes LNG, and total LNG imports are reported separately in Energy Trends Tables 4.1 and 4.3. A detailed breakdown of these imports is reported in Energy Trends Table 4.4.

The current method of reporting LNG imports in UK energy balances is to show volumes of regasified LNG as they enter the NTS, rather than when they arrive in the UK and are placed into storage. The country of origin is then derived by determining the mix of LNG within the storage units that have accumulated from previous months (see Figure 1 for further detail).

Figure 1: methods of reporting LNG imports



The proposed change of method is to report actual shipments of LNG as they enter the terminals from tankers and are placed into storage. We intend to implement this change of method in Energy Trends June 2019, with revisions to the back series. The total gas supply will be unaffected because revisions will also be made to reflect actual stock levels at terminals before the LNG entered the NTS. Imports, stocks and gas supplied of LNG will be included in Tables 4.1, 4.2 and 4.3 on a regasified basis in gas totals.

Reasons for the proposed change.

Firstly, it is usual practice in energy balances to report trade volumes as energy enters or leaves the country and we suggest that the proposed change to reporting will lead to clearer and more transparent statistics. We have worked with terminals to improve the data we collect, and the proposed change has become possible due to more detailed data now available compared to when the current reporting method began.

Secondly, the current reporting method requires an estimation of imports by origin in Energy Trends Table 4.4. We receive LNG from many different countries including Qatar, Russia, Trinidad & Tobago, the US, Algeria and Norway among other sources. In the current method all volumes of LNG are co-mingled at LNG terminals and the final output from the terminal to National Grid and

LDZs must be estimated based on the previous imports received by the terminal. This adds an additional level of estimation into our import balances that increases the complexity.

Finally, a related concern is the delay in reporting imports of LNG. The current method uses the mix of LNG stock to calculate the outgoing origin mix of gas through that month. This means that LNG deliveries early in a given month will not feature until the following month's data has been reported. As a result, there can be a disconnect between widely reported ship arrivals and the gas from those shipments being seen as 'entering' the UK.

Next steps

We are working to refine the methodology and will be consulting with internal users over the next month. Our intent is to implement this change for both future deliveries and revise the back-series for June 2019.

As ever, we welcome comments on this proposed methodological change.

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Nuclear electricity in the UK

This article looks at nuclear electricity in the UK, examining how its position within the UK energy mix has shifted from the 1950's to 2018, and how nuclear capacity is likely to change in the future. Please note that all data for 2018 are provisional and may be subject to revisions.

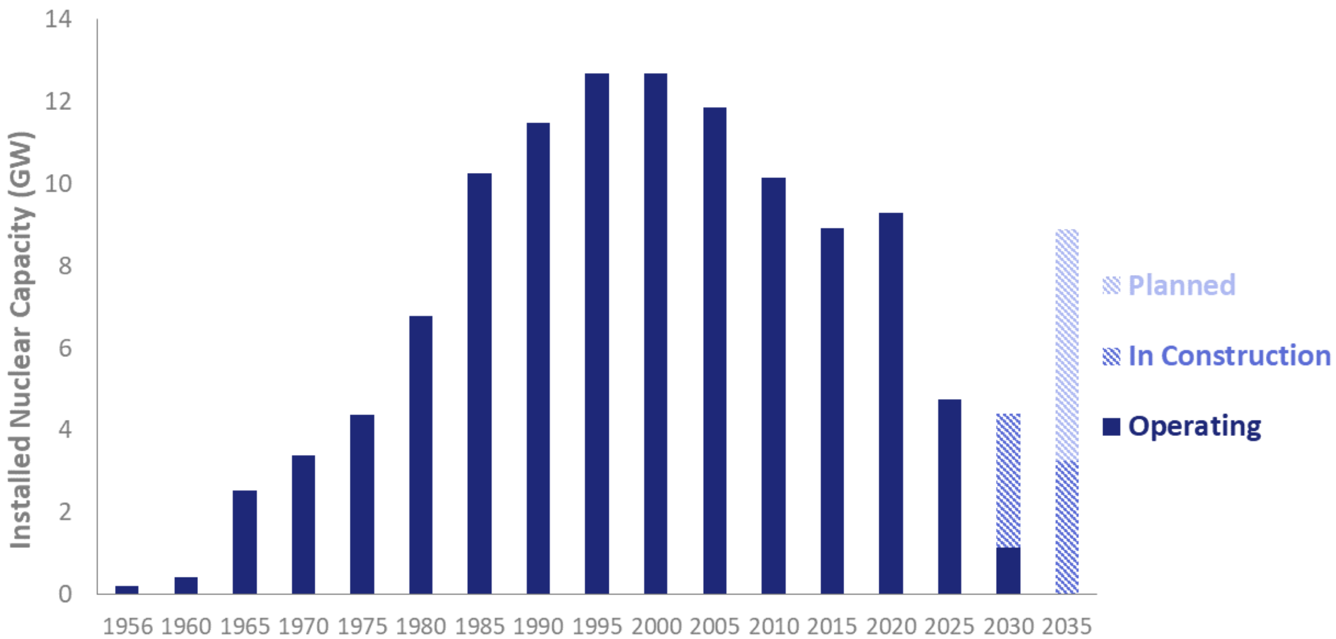
Key points

- The UK currently has eight operational nuclear power stations, which supplied 18.7 per cent of total electricity supply in 2018.
- Nuclear installed capacity peaked at 12.7 GW in 1995, with the opening of Sizewell B – the last nuclear reactor to be opened in the UK. In this year, nuclear accounted for more than a quarter of total electricity supply.
- Construction is underway for a new 3.2 GW nuclear power plant at Hinkley Point C, with the developer forecasting that Reactor One will begin commercial operations at the end of 2025.
- There are plans for further nuclear plants at Sizewell C and Bradwell B. Meanwhile, planned new build projects at Wylfa in Anglesey (Hitachi) and Moorside (Toshiba) were, respectively, paused and stopped by their sponsors, although new build remains an option at both sites.
- In 2017, the UK's average nuclear load factor was 77.4 per cent, 0.9 percentage points (pp) above the European average. However, for 1970 to 2017, the UK's average load factor was 67.4 per cent, 5.2 pp below the European average.

Nuclear power stations in the UK

Chart 1 shows how the UK's nuclear capacity has varied over time and how new planned and plants under construction will affect nuclear capacity in the future.

Chart 1: UK installed nuclear capacity: operating, under construction and planned plants, 1956-2035[1]



In 1956, Calder Hall opened in the UK as the world's first commercial nuclear power station and began to supply nuclear electricity to the public supply grid for the first time. This was a small-scale Magnox reactor, a design which was progressively scaled up and optimised, as 10 further Magnox power stations were opened in the subsequent 15 years. The design life of these reactors was

[1] Plant installed capacity, by connection – United Kingdom, July 2018 (DUKES 5.12), www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes

originally 20 years but the majority ran for at least twice as long, with the final Magnox reactors closing just four years ago at Wylfa.

They were followed by seven Advanced Gas-cooled Reactor (AGR) power stations, which opened between 1976 and 1988, each with an installed capacity of over 1 GW. The most recently opened plant in the UK is Sizewell B, the UK's only Pressurised Water Reactor (PWR) power station, which began generating in 1995. With the additional 1.2 GW of capacity provided by Sizewell B, nuclear installed capacity peaked in 1995 at 12.7 GW, pushing nuclear's share of supply to a peak of 26.9 per cent in 1997.

Since then, no new plants have opened and eight have closed. This means that the UK's nuclear capacity in 2018 was more than a quarter smaller than its peak in 1995, leaving its share of supply at 18.7 per cent. However, further nuclear plants have been proposed. Of those, Hinkley Point C is currently the only approved nuclear power station, with construction already in progress on the site, for a proposed opening of the first reactor at the end of 2025.

Both the Magnox and AGR were British designs. The two pairs of reactors at Hinkley Point C and Sizewell C will be European Pressurised Reactors (EPRs), whilst Bradwell B plans to use the Chinese-designed Hualong One. Oldbury B and Wylfa Newydd were due to use the Advance Boiling Water Reactor (ABWR), designed by GE-Hitachi, however, both projects were suspended in January 2019.

Table 1: Nuclear power stations in the UK supplying electricity to the public distribution network, 1956 - 2035

Power Station	Opening Date	Closure Date	Installed Capacity (MW)	Current Status	Reactor Type
Calder Hall	1956	2003	220	Closed	Magnox
Chapelcross	1959	2004	196	Closed	Magnox
Berkeley	1962	1989	276	Closed	Magnox
Bradwell	1962	2002	242	Closed	Magnox
Hunterston A	1964	1989	180	Closed	Magnox
Dungeness A	1965	2006	450	Closed	Magnox
Trawsfynydd	1965	1991	470	Closed	Magnox
Hinkley Point A	1965	2000	500	Closed	Magnox
Sizewell A	1966	2006	420	Closed	Magnox
Oldbury	1967	2012	434	Closed	Magnox
Wylfa	1971	2015	980	Closed	Magnox
Hinkley Point B	1976	2023	1061	Operational	AGR
Hunterston B	1976	2023	1074	Operational	AGR
Hartlepool	1983	2024	1207	Operational	AGR
Heysham I	1983	2024	1179	Operational	AGR
Dungeness B	1983	2028	1120	Operational	AGR
Heysham II	1988	2030	1254	Operational	AGR
Torness	1988	2030	1250	Operational	AGR
Sizewell B	1995	2035[2]	1216	Operational	PWR
Hinkley Point C 1	2025	2086	1630	In construction	EPR
Hinkley Point C 2	2026	2087	1630	In construction	EPR
Sizewell C	*2030 - 2035*	*2090 - 2095*	*3340*	Proposed	Hualong One
Bradwell B	*2030 - 2035*	*2090 - 2095*	*2300*	Proposed	Hualong One

[2] Site owner plans to apply for 20 year extension.

Nuclear electricity's changing position in the UK energy mix

As the UK's nuclear capacity has changed over time, so too has its position within the UK energy mix. Chart 2 shows how the proportions of electricity supplied by nuclear, fossil fuels and renewables have varied since 1955. Please note that Chart 2 excludes net imports and pumped storage, whilst non-biodegradable waste is included in fossil fuels, so the shares of supply discussed here may differ from those quoted in other parts of Energy Trends.

Chart 2: Electricity supply from nuclear, fossil fuels[3] and renewables, 1955-2018[4,5]

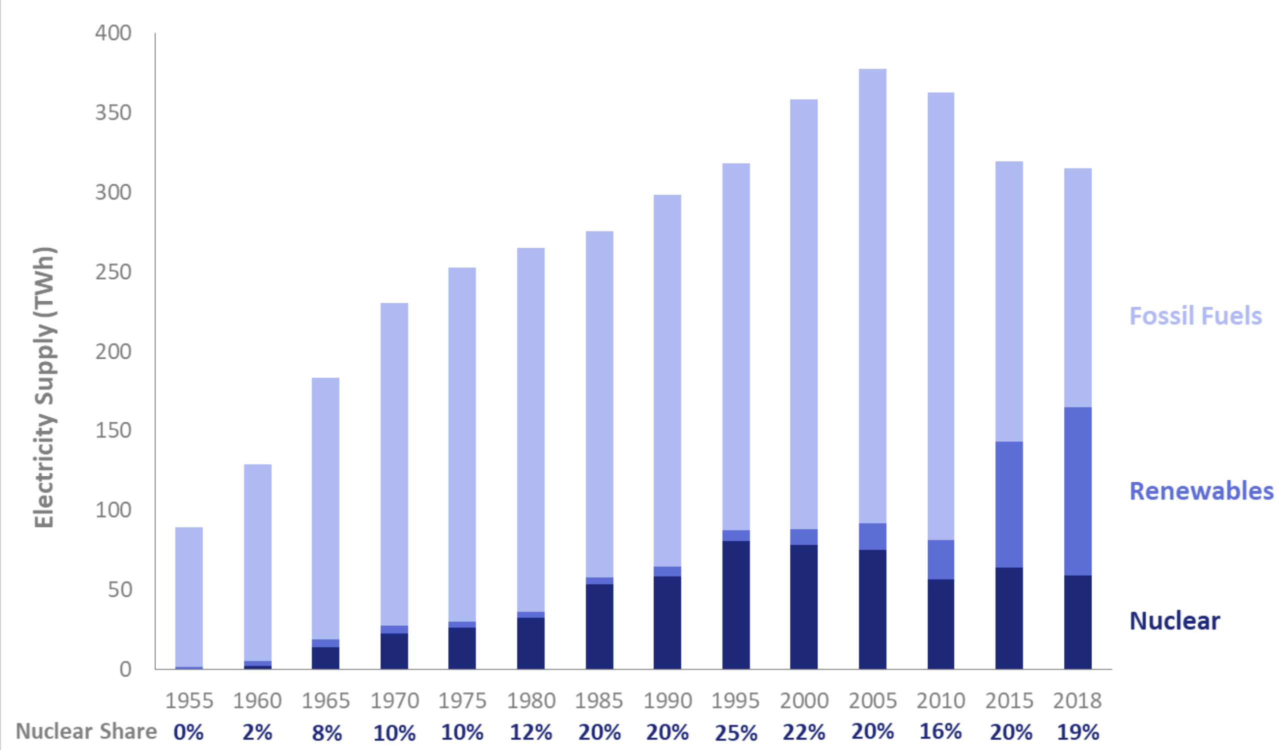


Chart 2 shows the pivotal role that nuclear has played in the UK's electricity supply mix since the 1960s, with increasing nuclear generation helping to meet rapidly rising demand in the 1980s and 90s, that would have otherwise been met by burning more high-emission fossil fuels.

In 2018, nuclear accounted for 18.7 per cent of the total electricity supplied to the grid, with fossil fuels supplying 47.7 per cent and renewables 33.6 per cent; for the first time, more than half of supply was from low carbon sources. The energy mix has changed completely since nuclear capacity peaked in 1995, when nuclear supplied 25.3 per cent and fossil fuels dominated with a share of 72.5 per cent.

Between 1983 and 1998, nuclear accounted for more than 90 per cent of the low carbon electricity supplied to the grid. However, renewables have since seen rapid growth and are now making a significant contribution to meeting demand. Consequently, nuclear power's share of low carbon supply has decreased from a peak of 93.8 per cent in 1996, to 69.3 per cent in 2010, to 35.8 per cent in 2018. Though in 2018, more than 70 per cent of renewable generation was from weather-dependent energy sources, such as wind, solar and hydro. The fluctuating generation of these technologies contrasts with nuclear, which provides a continuous reliable base-load supply that helps to ensure that demand can always be met. This difference is shown clearly by comparing the load factors (calculated as the total electricity generated as a proportion of total potential generation) of different generation types with nuclear. In 2017, the average load factor for nuclear

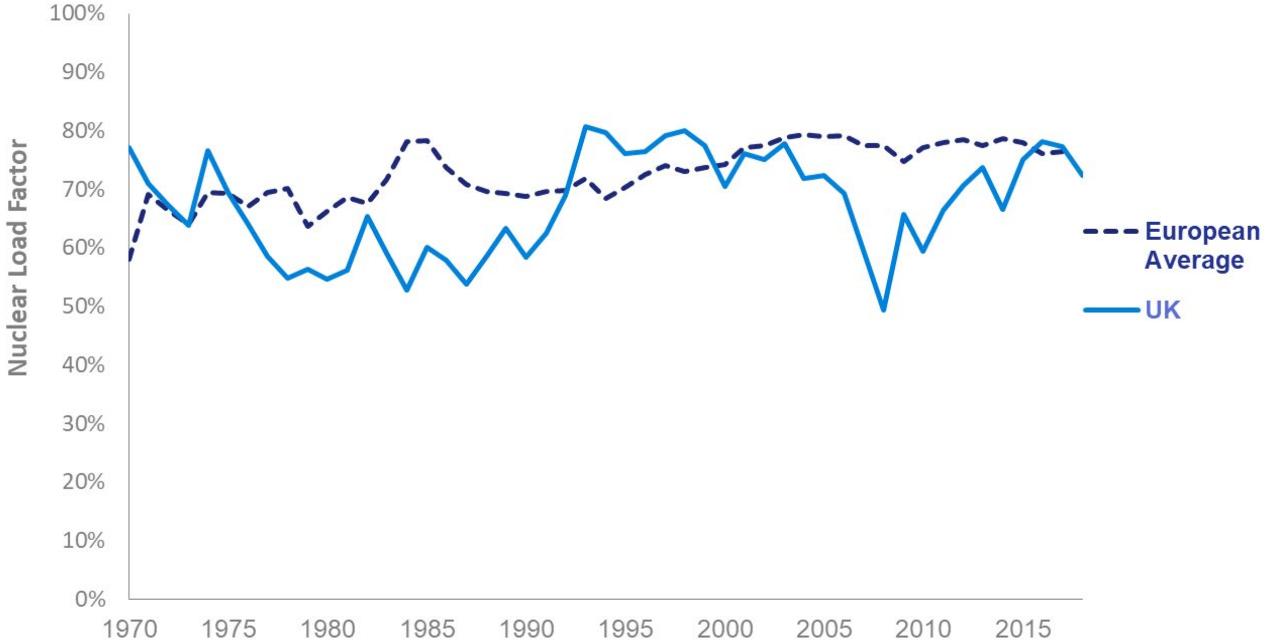
[3] Note that in this article, 'fossil fuels' also includes non-biodegradable wastes, which differs from the typical definition.
[4] Historical electricity data: 1920 to 2017, www.gov.uk/government/statistical-data-sets/historical-electricity-data
[5] Fuel used in electricity generation and electricity supplied, March 2019 (ET 5.1), www.gov.uk/government/statistics/electricity-section-5-energy-trends

was 77 per cent, compared to 45 per cent for gas-fired generation, 36 per cent for hydro, 32 per cent for wind and just 11 per cent for solar.

Nuclear load factors

Chart 3 shows the variation of the UK's annual average nuclear load factor since 1970 in comparison with the European average. Nuclear reactors provide a continuous supply of electricity when they are running, however they undergo planned outages for inspection, maintenance and re-fuelling, and occasional unplanned outages if there are problems with the plant. This is why nuclear load factors are not 100% and why they vary from year-to-year.

Chart 3: Annual nuclear load factors for the UK[6,7] and Europe[8], 1970-2018



In 2017, the UK's average nuclear load factor was 77.4 per cent, 0.9 pp above the European average. However, the UK's average load factor for 1970 to 2017 was 5.2 pp below Europe's, at 67.4 per cent, with the UK's annual load factor below Europe's in 71 per cent of the years since 1970. From 1976 to 1992, the UK's average load factor was 59.1 per cent, well below Europe's. At this point, the old Magnox reactors lifetime had been extended beyond their 20-year design life, possibly increasing the number of statutory and unplanned outages. Meanwhile, the UK constructed its fleet of AGR reactors, Europe (mainly France) constructed PWR nuclear reactors.

The UK's nuclear load factor increased in the 1990's with the closure of some of the Magnox reactors and the opening of Sizewell B. In the early 2000s, load factors decreased, as infrastructure aged and no new reactors were built. The UK's load factor fell to its lowest ever level in 2008 (49.4 per cent) due to unplanned outages. Recently, the closure of the last remaining Magnox plants led to a resurgence in the UK's nuclear load factor, pushing above the European average in 2016 and 2017. In 2018, it dropped to 72.4 per cent, down 5.0 pp from 2017, after a prolonged unplanned outage at Hunterston B limited nuclear generation for much of the year.

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[6] Plant loads, demand and efficiency, July 2018 (DUKES 5.10), www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes
[7] Historical electricity data: 1920 to 2017, www.gov.uk/government/statistical-data-sets/historical-electricity-data
[8] IAEA, Power Reactor Information System (PRIS), https://pris.iaea.org/PRIS/home.aspx

Comparison of theoretical energy consumption with actual usage

Introduction

The purpose of this analysis is to explore the difference between theoretical energy consumption (from fuel poverty statistics), and actual energy consumption (recorded in the National Energy Efficiency Data Framework) for English dwellings. We examine how this difference varies by dwelling and household characteristics, including fuel poverty status, payment type, energy efficiency rating, income and household type.

Fuel Poverty in England is currently measured using data derived from the English Housing Survey (EHS). The relationship between fuel poverty based estimates for gas and electricity consumption and actual consumption figures is therefore useful in understanding the variance and underlying patterns in fuel poverty.

The aim of this paper is to explore the relationship between fuel poverty and other characteristics, and actual energy consumption, with a view to identifying patterns of underconsumption and possible underheating. The methodology is detailed in full on page 76.

Executive summary

- The theoretical fuel expenditure derived from fuel poverty statistics (gas and electricity) is, on average, £133 higher than the actual consumption in NEED, or 9.9% in percentage terms.
- This average cost difference increases to £319 for people classed as fuel poor (19.9%) while for dwellings classed as non-fuel poor this difference is £110 (8.6%).
- FPEER[1] Band B actual consumption is on average the same as the theoretical, while for less efficient dwellings the difference between actual and theoretical consumption increases as the energy efficiency decreases.
- Dwellings with an actual consumption greater than theoretical figure have an income 21% higher on average than the rest of the sample.
- The gap between theoretical and actual energy consumption is negatively correlated with income, with households in the highest income decile using on average £27 more than the theoretical consumption, and those in the lowest income decile using on average £189 less.
- Households using prepayment meters use on average £186 less than their theoretical consumption while households using other payment types (standard credit and direct debit) use £113 less than in the theoretical, for the fuel poor on prepayment this gap rises to £340.
- The greatest difference between theoretical and actual consumption is for couples with children and lone parents with children. This trend is amplified further when looking specifically at fuel poor households.

Methodology outline

The data used in this study consisted of five years of data from 2012 to 2016 (inclusive) that was used in the production of fuel poverty statistics. The data was address matched (only for cases where full consent was given) and then joined to the NEED database to obtain the recorded consumption for electricity and gas.

The merged dataset produced included both the NEED actual consumption value, and the EHS derived, fuel poverty theoretical consumption value, for each case (household). Here, two new variables recreating the amount of money spent on energy by each household based on the NEED consumption data and on theoretical consumption data were created.

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[1] Fuel Poverty Energy efficiency rating (FPEER) is a measure of the energy efficiency of a property based on the Standard Assessment Procedure (SAP) but accounts for policies that directly affect the cost of energy.

The money spent was obtained by computing actual gas and electricity consumption from NEED, and the theoretical fuel poverty consumption values, with energy prices from Quarterly Energy Prices (QEP) [2] for the relevant year of the survey. The average cost difference between actual money spent and the theoretical money spent was then compared across different variables.

What will comparing the datasets show?

The theoretical consumption value itself is calculated using BREDEM[3], which is based on SAP (standard assessment procedures) ratings for each dwelling that give an annual unit energy cost of space and water heating for a dwelling, based on a set heating regime of 21 degrees in the main living area and 18 degrees elsewhere[4]. It therefore represents the cost needed to heat a dwelling to what is deemed to be an adequate level for living.

As such, a positive reading for the cost difference can indicate a possible under-consumption, and therefore possible 'under-heating' of a dwelling, as it is not deemed to be consuming to the level for adequate heating established under fuel poverty methodology.

To simplify definition, unless stated; 'theoretical consumption' refers to the theoretical consumption value for each dwelling derived from fuel poverty data. The 'actual consumption' is derived from the NEED administrative dataset showing reported consumption from meter readings for each dwelling. The 'cost difference' is the gap between them in monetary terms, this may also be referred to as the 'consumption gap'.

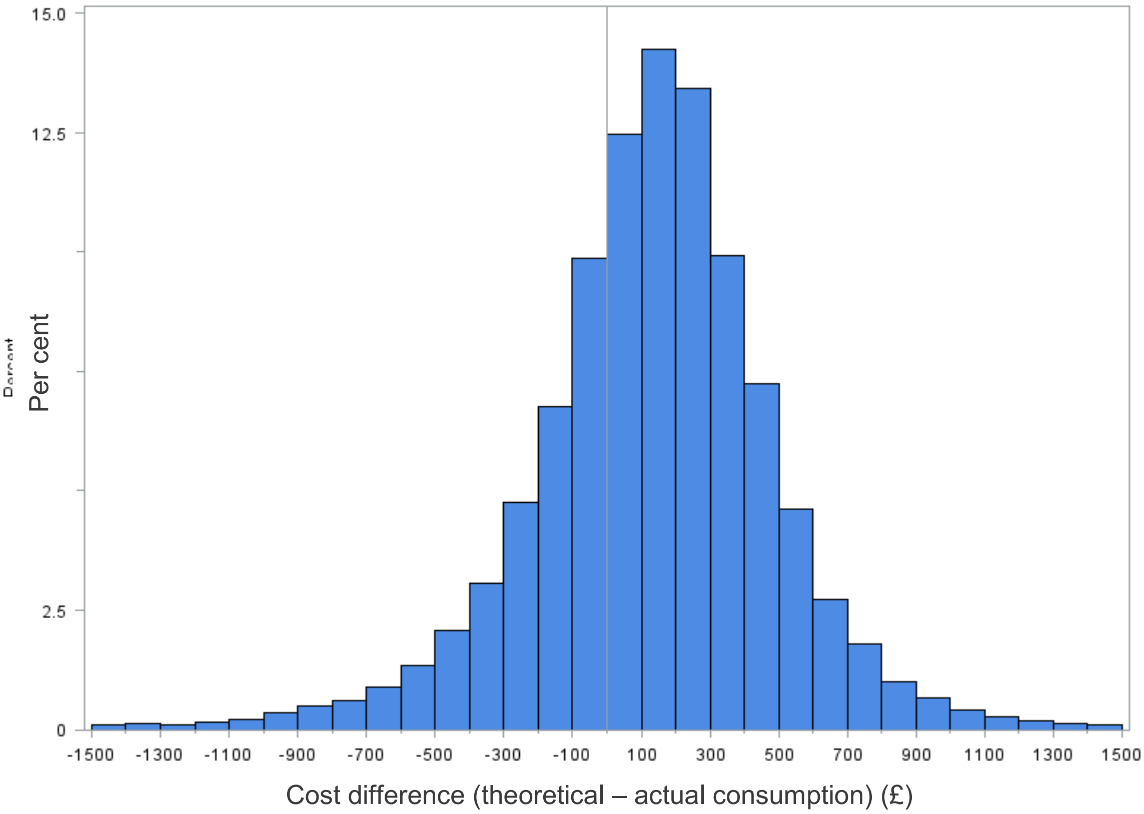
[2] The prices used were UK average prices specified for year, payments type and electricity plan (E7 vs standard tariff), all other fuel types were excluded
[3] BRE Domestic Energy Model
[4] (Page 49-50) Fuel Poverty Methodology Handbook

Analysis

Comparison between theoretical consumption and actual consumption

The distribution of the cost difference between theoretical energy consumption and actual consumption shows that the actual amount of energy used, in the majority of cases, is lower than the theoretical figure, with an average cost difference of £133.

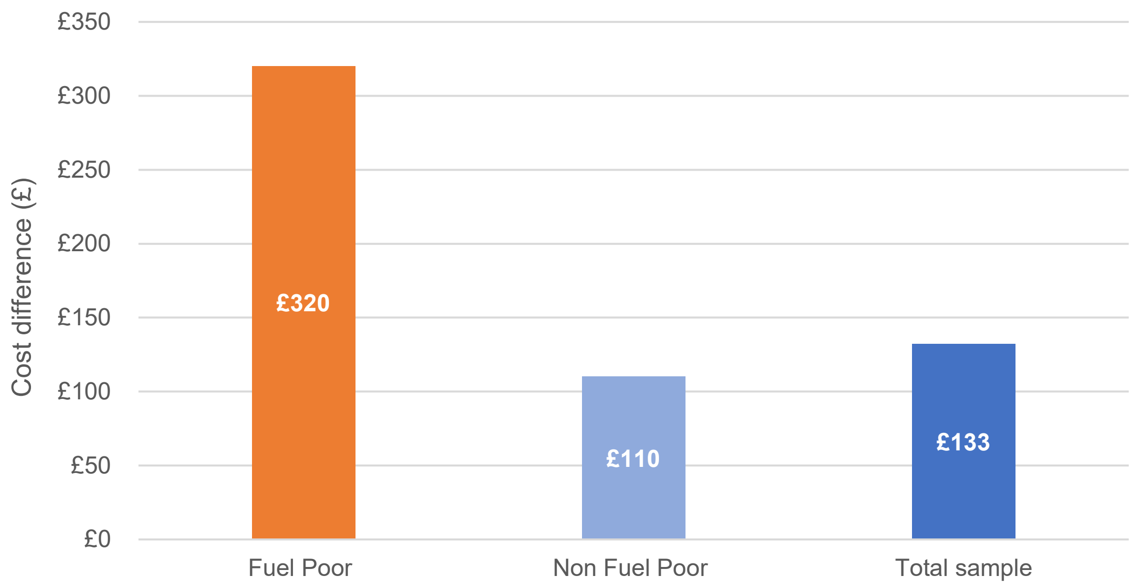
Figure 1: Histogram of the average cost difference showing that 69% of households had theoretical consumption higher than their actual consumption



We would expect an overall positive cost difference, due to the standardised nature of how the theoretical consumption figures are calculated. EHS technical guidance does accept that this is more likely to result in a slight overestimation of actual energy consumption. However, what would distinguish this difference from fixed systematic overestimation is whether this difference is constant or not across various household characteristics.

The overall pattern is true for both households classed as fuel poor and as non fuel poor. However, the average difference between actual and theoretical consumption was £110 for the non fuel poor, whereas the average cost difference for fuel poor households (11 % of all households in England[5]) was almost three times higher at £320.

Figure 2: the average difference between actual and theoretical consumption is much larger for fuel poor households



These results would suggest that there is more underconsumption among the fuel poor, in that there is a much larger difference between theoretical consumption required, and actual consumption for fuel poor households.

Fuel Poverty Energy Efficiency Rating (FPEER)

When looking at the cost difference for each FPEER[6] band it reveals that for dwellings rated in Band B (second highest energy efficiency) the actual consumption matches on average the theoretical consumption[7].

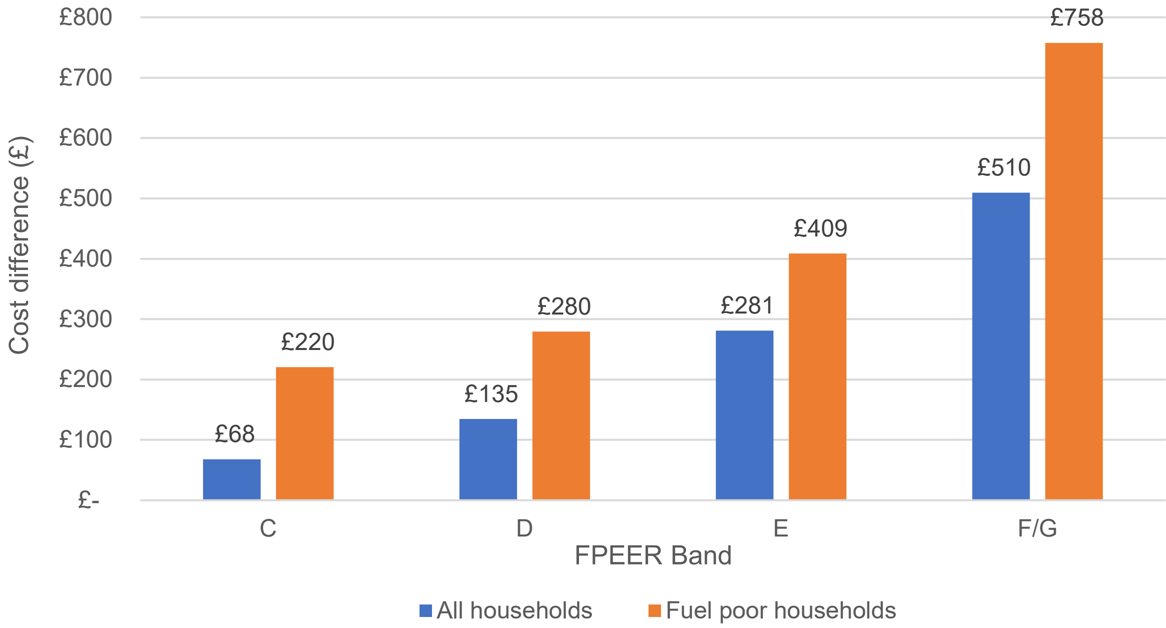
However, for dwellings with a lower FPEER rating, C and below, the actual consumption on average is lower than the theoretical value, and this gap increases as the energy efficiency class of a property decreases, as can be seen in Figure 3. Here, the cost difference is £510 for dwellings in Band F/G compared to just under £68 in Band C. The results suggest that the lower the energy efficiency rating

[5] Annual Fuel Poverty Statistics Report
[6] FPEER is a measure of the energy efficiency of a property based on the Standard Assessment Procedure (SAP) but accounts for policies that directly affect the cost of energy.
[7] Band A dwellings (highest efficiency) were analysed however there were not enough cases to be included.

of a dwelling, the larger the difference between actual and theoretical gas and electricity consumption[8].

The same trend is observed when considering only those households classified as being fuel poor, whereby the cost difference increases with decreasing energy efficiency, however the differences are markedly larger.

Figure 3: cost differences increase as FPEER band decreases[9]



An analysis of cost difference by floor area, split by houses and for flats, was also carried out alongside FPEER analysis. Whilst this showed that floor area and cost difference were broadly correlated, the relationship was not linear and by comparison it was deemed that energy efficiency had a stronger relationship to the difference between theoretical and actual consumption of a household. There was also a relatively small difference between the average cost difference of houses and flats (£131 and £138 respectively).

Income decile

As expected, in Figure 4, there is a relationship between the difference in actual and theoretical consumption and income, with this difference being the highest for lowest income group (1st income decile) at £189, and a progressive reduction as income increases, to the point that the gap becomes negative for the highest income group (10th income decile) at -£27 (i.e. people in the highest income group spend on average more than the theoretical requirement).

This trend shows a negative relationship between energy underconsumption and income and suggests that those households with less financial capability are much more likely to restrict consumption to less than suggested adequate levels. It also suggests that at the higher income end, there is a tendency to consume more than theoretically required.

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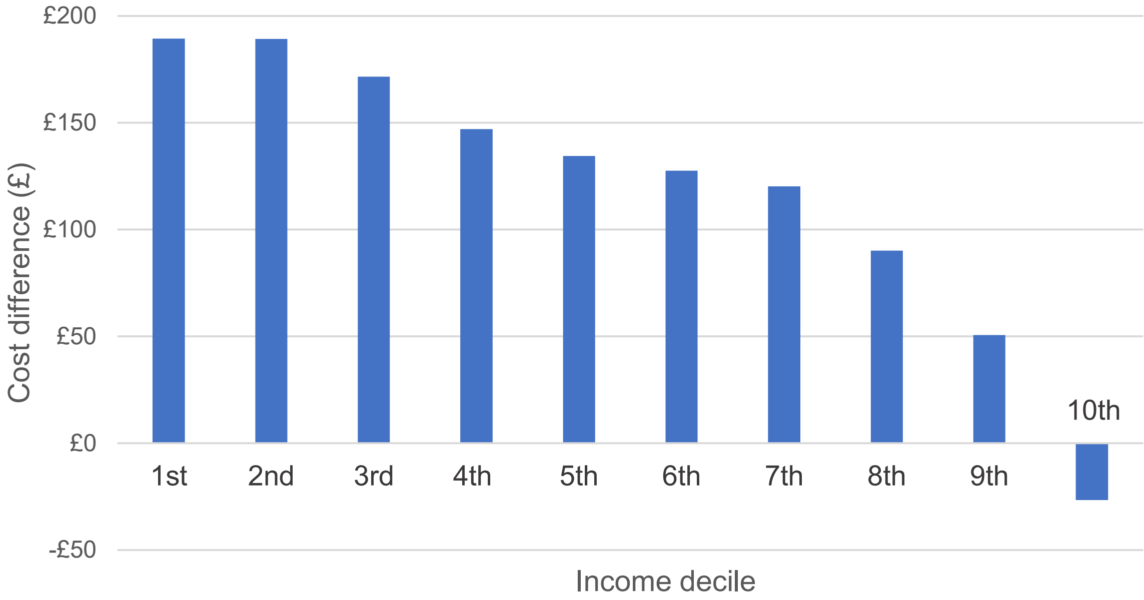
[8] The possibility that the current energy rating model overestimates the amount of energy required by less efficient dwellings must be noted.
[9] Bands A & B were excluded due to small sample sizes

Figure 4: cost differences decrease as the income decile increases



Furthermore, an analysis of the subgroup within the sample with an actual consumption that is above the theoretical consumption in NEED shows that the income for this group is 21% higher than that of the rest of the sample. Suggesting further that consumption relative to theoretical consumption standards is strongly linked to income.

Pre-payment meters

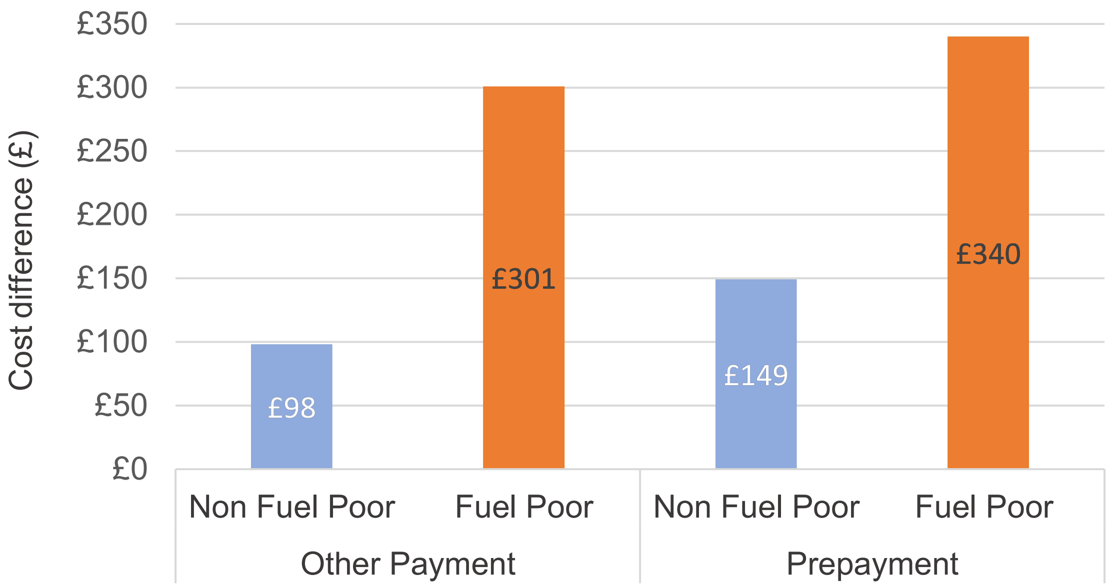
It has widely been theorised that lower income households are more likely to be users of pre-payment meters. From analysis of the fuel poverty data, it shows that of dwellings in the lowest two income deciles, 47% use pre-payment meters for electricity.

Households using a pre-payment electricity meter consume considerably less, on average, than the theoretical consumption value. In particular the gap between actual and modelled consumption is £186 for dwellings using pre-payment meters while only £113 for customers using other payment methods (standard credit or direct debit)[10].

The consumption gap for the fuel poor households is higher than for the non fuel poor. For pre-payment this gap is £149 for non fuel poor households and £340 for fuel poor, while for dwellings using other methods of payment this gap is respectively £98 for non fuel poor and £301 for fuel poor.

[10] For the prepayment variable we have used the payment method for electricity. All figures for using gas pre-payment meters, or pre-payment for both gas and electricity, are largely the same as for electricity. As such electricity pre-payment meter usage has bene taken as indicative of overall pre-payment usage.

Figure 6: the cost difference for households on prepayment is higher than for other payment methods



This variance in the difference in theoretical and actual costs, could be down to a variety of factors, however it is likely that pre-payment overlaps with those already facing low incomes and high costs, as well as pre-payment meter energy tariffs being generally higher[11]. It can also be theorised that pre-payment meters can be used as a more immediate form of under-consumption via self-disconnection, and therefore have higher rates of underconsumption in users.

Household composition

Figure 7 shows the difference between actual and theoretical consumption grouped by household type, as recorded in the EHS. The results show that the highest difference in energy consumption is for lone parents with child(ren) showing a difference of £191 and couples with dependent child(ren) at £171[12], while single people aged over 60 and couple without children (both aged 60 or over or under 60) have a much lower gap between the theoretical and actual energy use at just £73.

This shows that older households and those with no dependent children have a lower difference between actual and theoretical costs, suggesting a lower rate of underconsumption comparative to younger households with dependants. It is possible that this reflects differences in current policy such as the winter fuel allowance for older households, as well as the relative income impacts of having dependent children, particularly on single income households. Multi-person households[13] also have the second highest cost difference, however due to the variability of these household types it is hard to conclude too much from this result.

[11] These results use data from 2012 to 2016 and therefore do not take into account the pre-payment price cap introduced in April 2017.

[12] It should also be noted that the median values for lone parents and couples with dependents were markedly higher than their mean values, suggesting that more of the distribution of these households have a higher cost difference than the mean would suggest.

[13] Multi-person households 'include unrelated adults sharing, student households, multi-family households and households of one family and other unrelated adults'

Figure 7: households with children had the largest average under consumption

Figure 8: average income is negatively correlated to the average cost difference in Figure 7

Furthermore, in Figure 8, when household types are broken down by equivalised, after housing costs income, it follows that the income for each household type negatively correlates with average cost difference. Suggesting that the after housing cost income could be broadly related to the cost difference of the relative household types.

Analysis of fuel poor households showed a similar trend as for all household types, however the cost difference amounts were markedly higher, with lone parents with dependants showing a cost difference of £337. Also fuel poor couples with dependent children had the second highest cost difference after multi person households, at £339, compared to the total population, where this household type had the fourth highest cost difference. This supports the trend suggesting lower income households with dependants are potentially more likely to under consume than other households.

Conclusions

To draw conclusions on the significance of the underlying patterns in the difference between actual consumption figures and theoretical data it is important to refer to how theoretical consumption figures are calculated. Based on SAP ratings, they are a modelled theoretical cost needed to provide an adequate level of heating to a dwelling, given its energy efficiency.

As such, a systematic pattern of higher estimates in the theoretical data compared to actual consumption could point to two of several real-world scenarios for underconsumption:

a) Certain households are systematically under consuming due to costs.
b) The base line assessment for the adequate levels of energy or heating required for a dwelling are overstated.

The overall conclusion across all variables and scenarios is that in most observations, theoretical figures are higher than actual consumption. If this relationship was consistent in its correlation across all the variables outlined in this analysis, then it could be an implication that the theoretical figures are overestimating the energy needed to adequately heat a household. This, however, is not supported from the analysis of the impacts of the different variables on the difference.

The analysis suggests instead that the indicated underconsumption is greater the lower the income and energy efficiency of a household and is exacerbated when this is combined with the use of pre-payment meters. This indicates that households with the least purchasing power and more immediate autonomy over heating are under-consuming more, relative to their higher income and more efficient counterparts. A logical explanation for this is that lower income, less energy efficient and fuel poor households, have a much greater financial imperative to under-heat their respective households, and pre-payment meters offer more autonomy with which to do so.

Inversely, the highest income households are more likely to have their consumption underestimated when compared to actual consumption. Suggesting a choice to over-consume rather than save money in comparison to the adequate levels of heating outlined in the fuel poverty methodology.

Evaluations

The aim of this analysis was to draw conclusions on the potential difference between actual energy consumption and theoretical consumption, and the possible variables that explain that difference. As well as to analyse what this might mean for fuel poverty policy and analysis.

The EHS technical guidance does refer to the possibility that it may overestimate energy cost, stating that due to the need for standardised assumptions to compare energy performance the methodology is '*more likely to result in an overall overestimation than underestimation of actual energy consumption'* [14].

However, given the skew towards a higher difference, and therefore overestimation in the most vulnerable groups (low income, high cost) whom traditionally need to be targeted by fuel poverty initiatives, this variance can be seen to be indicative of the nature of interaction between households and underconsumption.

Here the study indicates, that rather than paying costs of heating – either made higher by lower energy efficient homes, or relatively higher by a lower income or competing child costs, many households may be choosing to under consume relative to the standards laid out on page 2, rather than pay to consume adequately. This is a trend pronounced mainly the lower the income, fuel poverty status and higher the energy inefficiency of a household.

[14] English Housing Survey 2016 to 2017: Technical Report

Fuel poverty statistics are measured using a low income high cost methodology, which will flag up where vulnerable groups may be faced with high costs. However, policy decisions should take into consideration that these figures do not necessarily indicate that vulnerable and fuel poor households are *actually paying* those costs or consuming the indicated level of energy from the fuel poverty data. Instead, fuel poor groups are much less likely than more well-off groups to be consuming at those levels. Particularly younger households with dependants. This should be factored in to the scope and size of targeted fuel policy initiatives such as fuel allowances and the Warm Home Discount.

Appendix and methodology notes

Further to the methodological summary, a more detailed breakdown of the methodology is as follows.

The starting sample included six single year datasets totalling 47,738 cases, excluding households that did not give permission for their data to be used (approximately 5%). NEED does not record consumption other than gas and electricity, therefore all properties in the EHS using other methods of heating (oil, coal, biogas, community schemes or other) were excluded, as well as cases that appeared twice, to create a final database with 22,178 rows.

After combining the two datasets, two new variables recreating the actual amount of money spent on energy by each household based on the NEED consumption data and the theoretical gas and electric consumption data (both originally in Kwh) were created. The total money spent (in £) for each was obtained by computing actual gas and electricity consumption from NEED, with energy prices coming from tables 2.3.4 and 2.2.4 from the Quarterly Energy Prices (QEP)[15] for the relevant year of the survey. The prices used were UK average prices specified for year, payments type and electricity plan (E7 vs standard tariff), all other fuel types were excluded. This process was then repeated for the theoretical consumption variable.

The new monetary variable based on NEED consumption was then subtracted from the new theoretical consumption variable to produce the cost difference between theoretical and actual consumption.

This difference has a positive reading if the actual consumption was lower than the theoretical consumption, while a negative reading means that actual consumption was higher than the theoretical consumption.

These results have also been filtered to exclude those dwellings where the difference between modelled and actual consumption was greater than £1,500, as being in the top 1% of observations, they are thought to be extreme observations.

Further points

Gas consumption in NEED is weather corrected using a complex procedure that uses a geography matrix, which can result in a small change in the gas consumption figure. A preliminary analysis of the time series showed that results across the years were consistent and with limited effect coming from the weather correction.

A further point to note is that this study compares total energy consumption for a whole year and is including energy used for heating water, lighting and appliances throughout the year.

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[15] The QEP publication and tables can be found at the following link: www.gov.uk/government/collections/quarterly-energy-prices#2018

Sub-national consumption tables: 2016 & 2017

Introduction

BEIS publish sub-national gas and electricity consumption figures using electricity and gas consumption data for all meters in Great Britain. BEIS have already published data on gas and electricity consumption in 2017 at Local Authority and at Lower and Middle Super Output Areas level (December 2018). These tables are available at:
www.gov.uk/government/collections/sub-national-electricity-consumption-data (electricity) and
www.gov.uk/government/collections/sub-national-gas-consumption-data (gas).

Domestic gas and electricity consumption data at postcode level was previously published for 2015 (March 2017) and 2013 (March 2015). These tables are available at:
www.gov.uk/government/collections/sub-national-electricity-consumption-data#postcode-level-data (electricity) and
www.gov.uk/government/collections/sub-national-gas-consumption-data#postcode-level-data (gas).

This document sets out the sub-national consumption tables published under Energy Trends in March 2019. This adds to the datasets already released by providing data for 2016 and 2017 for:

- Postcode level domestic gas consumption
- Postcode level domestic electricity consumption for both standard and economy 7 meters
- Sub-national (LA, MSOA, LSOA, postcode) level domestic electricity consumption for prepayment meters

For all the postcode level tables, the data have been aggregated to partial postcode level where the meter count drops below 6 as this is considered disclosive. All postcode tables cover meters in England, Scotland and Wales.

The postcode level data contains a different overall meter count and consumption from data published at Local Authority, MSOA and LSOA level as any 'unallocated' meters are removed. The number of postcodes contained in this table is less than the number of postcodes in Great Britain. This is because:

- Some meters and consumption cannot be allocated to a postcode due to insufficient or incomplete postcode information.
- Further differences occur when the number of operating prepayment meters in a postcode are disclosive and have been aggregated into the partial postcode (e.g., AB1) or removed from the data where the partial category is also disclosive.

Overview of tables

Postcode level domestic gas consumption for 2016 and 2017

The meter count and total, mean and median consumption of domestic gas meters at the postcode level. These tables use the same method for classifying meters as domestic or otherwise as other sub-national tables: all meters consuming under 73,200 kWh annually are classed as domestic. The tables are available at:
www.gov.uk/government/collections/sub-national-gas-consumption-data#postcode-level-data.

Postcode level standard meter domestic electricity consumption for 2016 and 2017

The meter count and total, mean and median consumption of standard domestic electricity meters at the postcode level. Note that this does not include economy 7 meters. The data for each year is broken into separate .csv files so that no table exceeds 1 million rows for users of certain versions of Microsoft Excel. These tables use the same method for classifying meters as other sub-national tables, where the meter profile and annual consumption below 100,000 kWh are used to determine whether a meter is domestic or otherwise. The tables are available at: www.gov.uk/government/collections/sub-national-electricity-consumption-data#postcode-level-data.

Postcode level economy 7 meter domestic electricity consumption for 2016 and 2017

The meter count and total, mean and median consumption of economy 7 meters at the postcode level. This uses the same logic to classify meters as used in the December 2018 sub-national publication where the profile of the meter is used to determine whether a meter is an economy 7 meter. The tables are available at: www.gov.uk/government/collections/sub-national-electricity-consumption-data#postcode-level-data.

Prepayment meter domestic electricity consumption for 2017

Tables estimating the number of prepayment meters at local authority, Middle Layer Super Output Area (MSOA), Lower Layer Super Output Area (LSOA) and postcode levels. Included are the meter count and total, mean and median consumption. This is the first time BEIS has released sub-national statistics on prepayment meters and a methodology and guidance note is included within this article at Annex A. The tables are available at: www.gov.uk/government/collections/sub-national-electricity-consumption-data

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Annex A: Prepayment electric meter methodology and guidance note

This methodology and guidance note provides detail on how BEIS identify electricity consumption from prepayment meters.

BEIS use a Meter Point Administration Number (MPAN) to link electric meter information from three sources:

- **Meter data – Subnational electric meter point data**. Data is collected from electricity meters as part of BEIS annual subnational electric consumption publication. This data source is used to collect meter profile information to classify a meter as non-domestic and to identify key meter tariffs.
- **ECOES – Electricity Central Online Enquiry Service.** Data is published as a monthly report to assist suppliers in the customer transfer process. ECOES is used to identify the type of meter and allows for the identification of smart meters operating in prepayment mode. This is data is collected by ECOES from the Supplier Meter Registration Service.
- **MEX – NHH Meter Exchange Data**. Data is collected by Elexon and is based on Meter Technical Details (MTD) sent over the Data Transfer Network (DTN). This data source is used to identify the type of meter and is records all changes of physical meters.

BEIS have used a combination of sources as one source does not capture the number of prepayment meters estimated by BEIS' survey of electricity suppliers. For smart meters the ECOES Meter Time-switch Code (MTC) variable is used to identify smart meters operating as prepayment.

Steps in method to identify prepayment meters:

1. Identify prepayment meters from MEX where the variable meter_type is equal to 'K','T' or 'S' (where 'K' refers to 'Key', 'T' refers to 'Token' and 'S' refers to 'Smartcard prepayment').
2. Identify prepayment meters in ECOES where the variable meter_type is equal to 'K','T' or 'S' (where 'K' refers to 'Key', 'T' refers to 'Token' and 'S' refers to 'Smartcard prepayment').
3. Meter data is used to identify a key meter tariff where a Standard Settlement Code (SSC) is equal to '58' or '243' (where '58' and '243' refers to 'Key meter pseudo tariff').
4. An MPAN is classified as prepayment where it is identified in steps 1 to 3.
5. Remove meters with a non-domestic meter profile using BEIS where profile is not equal to '1' or '2'.
6. Meter data is used to remove meters consuming less than 100kWh or more than 100,000 kWh per annum.

Smart meters operating as prepayment meters

The number of smart meters operating in prepayment mode was calculated estimated based on a snapshot of data taken on the 30th of January 2018. A feature of smart meters is they can be updated over the airwaves to change from prepayment mode to standard mode and vice versa. These changes are not detectable with the available data sources, and a meter could change multiple times in a given year. Smart meters which are identified as prepayment meters have therefore been excluded from the published tables, as this additional uncertainty means that the final figures are insufficiently reliable for publication.

Recent and forthcoming publications of interest to users of energy statistics

Greenhouse Gas Emissions final 2017 statistics

This publication provides final estimates of UK greenhouse gas emissions going back to 1990. Estimates are presented by source in February of each year and are updated in March of each year to include estimates by end-user and fuel type. Final 2017 UK greenhouse gas emissions statistics were published on 5 February 2019 at:
www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics

Household Energy Efficiency statistics

This series presents statistics on the Energy Company Obligation (ECO), Green Deal and homes insulated. The headline release presents monthly updates of ECO measures and quarterly updates of in-depth ECO statistics, carbon savings and the Green Deal schemes. The latest release was published on 21 March 2019 at:
www.gov.uk/government/collections/household-energy-efficiency-national-statistics

Greenhouse Gas Emissions provisional 2018 statistics

This publication provides the latest annual provisional estimates of UK greenhouse gas emissions based on provisional inland energy consumption statistics as published in Energy Trends. A quarterly emissions time series is also included within this publication. Provisional 2018 UK greenhouse gas emissions statistics were published on 28 March 2019 at:
www.gov.uk/government/collections/provisional-uk-greenhouse-gas-emissions-national-statistics

Smart Meters quarterly statistics

This publication provides estimates of the number of Smart Meters installed and operating in homes and businesses in Great Britain. The latest release, covering estimates of the number of Smart Meters deployed up to the end of December 2018, was published on 28 March 2019 at: www.gov.uk/government/collections/smart-meters-statistics

Local authority carbon dioxide emissions

This annual publication provides estimates of local authority carbon dioxide emissions in the United Kingdom. Data for 2017 will be released on 27 June 2019 at:
www.gov.uk/government/collections/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics

Sub-national road transport consumption

This annual publication provides estimates of road transport fuel consumption in the United Kingdom, by vehicle and fuel type. Data for 2017 will be released on 27 June 2019 at:
www.gov.uk/government/collections/road-transport-consumption-at-regional-and-local-level

List of special feature articles published in Energy Trends between March 2018 and December 2018

Subject	**Title**
Energy	
March 2018	Experimental statistics on heat networks
Combined Heat and Power (CHP)	
September 2018	Combined Heat and Power in Scotland, Wales, Northern Ireland and the regions of England in 2017
Electricity	
September 2018	Competition in UK electricity markets
December 2018	Electricity generation and supply figures for Scotland, Wales, Northern Ireland and England, 2014 to 2017
Energy prices	
March 2018	Domestic energy bills in 2017: The impact of variable consumption
December 2018	International energy price comparisons
Feed-in Tariffs	
December 2018	Feed-in Tariff load factor analysis
Fuel Poverty	
December 2018	Do households move in and out of fuel poverty?
Gas	
September 2018	Competition in gas supply
Petroleum (oil and oil products)	
September 2018	Diversity of supply for oil and oil products in OECD countries in 2017
Renewables	
March 2018	The contribution of reversible air to air heat pumps towards the Renewable Energy Directive
June 2018	Renewable energy in 2017
September 2018	Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2017 Aggregated energy balances showing proportion of renewables in supply and demand

PDF versions of the special feature articles appearing in Energy Trends since 2015 can be accessed on the BEIS section of the GOV.UK website at:
www.gov.uk/government/collections/energy-trends-articles

Articles published before 2015 can be accessed via the National Archives version of the BEIS website at:
https://webarchive.nationalarchives.gov.uk/20180716123801/https://www.gov.uk/government/collections/energy-trends-articles

Explanatory notes

General

More detailed notes on the methodology used to compile the figures and data sources are available on the BEIS section of the GOV.UK website.

Notes to tables

- Figures for the latest periods and the corresponding averages (or totals) are provisional and are liable to subsequent revision.
- The figures have not been adjusted for temperature or seasonal factors except where noted.
- Due to rounding the sum of the constituent items may not equal the totals.
- Percentage changes relate to the corresponding period a year ago. They are calculated from unrounded figures but are shown only as (+) or (-) when the percentage change is very large.
- Quarterly figures relate to calendar quarters.
- All figures relate to the United Kingdom unless otherwise indicated.

- Further information on Oil and Gas is available from The Oil & Gas Authority at: www.ogauthority.co.uk/

Abbreviations

ATF	Aviation turbine fuel
CCGT	Combined cycle gas turbine
DERV	Diesel engined road vehicle
LNG	Liquefied natural gas
MSF	Manufactured solid fuels
NGLs	Natural gas liquids
UKCS	United Kingdom continental shelf

Symbols used in the tables

..	not available
-	nil or not separately available
p	provisional
r	revised; where a column or row shows 'r' at the beginning, most, but not necessarily all, of the data have been revised.
e	estimated; totals of which the figures form a constituent part are therefore partly estimated

Conversion factors

1 tonne of crude oil =	7.55 barrels
1 tonne =	1,000 kilograms
1 gallon (UK) =	4.54609 litres
1 kilowatt (kW) =	1,000 watts
1 megawatt (MW) =	1,000 kilowatts
1 gigawatt (GW) =	1,000 megawatts
1 terawatt (TW) =	1,000 gigawatts

All conversion of fuels from original units to units of energy is carried out on the basis of the gross calorific value of the fuel. More detailed information on conversion factors and calorific values is given in Annex A of the Digest of United Kingdom Energy Statistics.

Conversion matrices

To convert from the units on the left hand side to the units across the top multiply by the values in the table.

To:	Thousand toe	Terajoules	GWh	Million therms
From	**Multiply by**			
Thousand toe	1	41.868	11.630	0.39683
Terajoules (TJ)	0.023885	1	0.27778	0.0094778
Gigawatt hours (GWh)	0.085985	3.6000	1	0.034121
Million therms	2.5200	105.51	29.307	1

To:	Tonnes of oil equivalent	Gigajoules	kWh	Therms
From	**Multiply by**			
Tonnes of oil equivalent	1	41.868	11,630	396.83
Gigajoules (GJ)	0.023885	1	277.78	9.4778
Kilowatt hours (kWh)	0.000085985	0.003600	1	0.034121
Therms	0.0025200	0.105510	29.307	1

Note that all factors are quoted to 5 significant figures

Sectoral breakdowns

The categories for final consumption by user are defined by the Standard Industrial Classification 2007, as follows:

Fuel producers	05-07, 09, 19, 24.46, 35
Final consumers	
Iron and steel	24 (excluding 24.4, 24.53 and 24.54)
Other industry	08, 10-18, 20-23, 24.4 (excluding 24.46), 24.53, 24.54, 25-33, 36-39, 41-43
Transport	49-51
Other final users	
Agriculture	01-03
Commercial	45-47, 52-53, 55-56, 58-66, 68-75, 77-82
Public administration	84-88
Other services	90-99
Domestic	Not covered by SIC 2007