



Department for
Business, Energy
& Industrial Strategy

ofgem

Making a positive difference
for energy consumers

STATUTORY SECURITY OF SUPPLY REPORT 2017





Statutory Security of Supply Report 2017

A report produced jointly by BEIS and Ofgem.

Presented to Parliament
pursuant to section 172 of the Energy Act 2004
as amended by section 80 of the Energy Act 2011

Ordered by the House of Commons to be printed 4 December 2017

HC 536



© Crown copyright 2017

This publication is licensed under the terms of the Open Government Licence v3.0 except where otherwise stated. To view this licence, visit nationalarchives.gov.uk/doc/open-government-licence/version/3.

Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.

This publication is available at www.gov.uk/government/publications

Any enquiries regarding this publication should be sent to us at energy.security@beis.gov.uk

ISBN 978-1-5286-0073-6

CCS1017187240 11/17

Printed on paper containing 75% recycled fibre content minimum

Printed in the UK by the APS Group on behalf of the Controller of Her Majesty's Stationery Office

Introduction

1. This report discharges the Government and Ofgem's respective obligations under section 172 of the Energy Act 2004 as amended by section 80 of the Energy Act 2011, including Government's obligation to report annually to Parliament on the availability of electricity and gas for meeting the reasonable demands of consumers in Great Britain (GB).
2. The technical data presented here has been produced from analysis conducted by the Department for Business, Energy & Industrial Strategy (BEIS), Ofgem and National Grid (NG). The statistics relied on in this document are for GB only where possible. However, in some cases where it is not possible to split the GB data out from the United Kingdom (UK) data, UK statistics have been used. Where this is the case, they have been referred to as UK in the accompanying text.

EU Exit

3. The Government recognises the importance to businesses and households of access to an affordable, secure and sustainable supply of energy. GB has a resilient electricity and gas system with sufficient capacity to meet demand in all but the most unlikely circumstances. Retaining a well-functioning, competitive and resilient energy system after leaving the EU is a priority.
4. The UK is seeking a deep and special future partnership with the EU on energy. A well-functioning energy market is of vital importance for the European economy and the well-being of citizens. The UK will work to ensure that our future partnership is successful at ensuring efficiency of trade.

Electricity

5. GB's electricity system has delivered secure supplies to date. While the system continues to face the challenges of decarbonisation and replacing ageing and polluting plant, the experience of past years shows that we have a plan to manage the system and provide for our domestic energy demand.
6. The Government reliability standard for security of electricity supply is expressed as a Loss of Load Expectation (LOLE) of 3 hours per year. LOLE represents the number of hours per year in which supply is expected on

average to be lower than demand under normal operation of the system. It is important to note that the LOLE metric is not a measure of the expected number of hours in which customers may be disconnected, but represents periods where the system operator may be expected to employ mitigation actions available to it¹.

7. Two new balancing services, Supplemental Balancing Reserve (SBR) and Demand Side Balancing Reserve (DSBR)² were introduced in winter 2014/15. These services provided National Grid Electricity Transmission (NGET) with additional tools to help balance the system in the rare event that there was insufficient capacity in the market to meet demand in the mid-decade period ahead of the Capacity Market (CM).
8. Together, SBR and DSBR formed the Contingency Balancing Reserve (CBR), and the system operator procured CBR services up to and including the winter of 2016/17. For winter 2016/17, NGET procured 3.5 GW of SBR. No DSBR was procured as it was determined minimal volume would be available across this period. Neither service was used in winter 2016/17.
9. The intention was that CBR would be available to the system operator until the first delivery year of the Capacity Market, which was originally scheduled to be 2018/19. With the introduction of the Supplementary Capacity Auction (“early auction”) in 2016, the start of the Capacity Market has been brought forward to winter 2017/18. Consequently, the cost recovery arrangements for CBR for 2017/18 were removed³ and no CBR has been procured for this coming winter. Following a consultation, in September 2017 Ofgem decided to remove the remaining references to SBR/DSBR from NGET’s licence.
10. National Grid’s Winter Outlook Report for 2017/18⁴ forecasts a margin of 6.2GW, equivalent to 10.3% with a LOLE of 0.01 hours/year. This margin is on an underlying demand (UD) basis, which NGET is moving to in order to align with the calculations used in the Capacity Market target capacity recommendations in its annual Electricity Capacity Report. The margin range on the transmission demand (Td) basis used in previous years is 11.5%, with an LOLE also around 0.01 hours/year.
11. This margin takes account of the 54.4GW of capacity which was successful in the early auction, as well as plant which have indicated they will stay open without a CM contract, and is expected to deliver a high level of security.
12. With the start of the Capacity Market, NGET has introduced a new tool, the Capacity Market Notice (CMN), to ensure that capacity is available when needed. The CMN was first available in 2016/17 as there was a small amount

¹ Use of LOLE is a probabilistic approach – the actual amount will vary depending on the circumstances in a particular year, e.g. how cold the winter is; the number of plants experiencing unplanned outages; the power output from wind generation at peak demand; and, all the other factors which affect the balance of electricity supply and demand.

² SBR provided generating reserve while the DSBR scheme provided the opportunity for participating large energy users and aggregators to receive payments in return for reducing their electricity use during periods of high demand.

³ [Ofgem decision to remove SBR and DSBR cost recovery arrangements for 2017-18](#)

⁴ [National Grid Winter Outlook Report 2017/18](#)

of capacity available from the first Transitional Arrangement's auction but it assumes a more significant role this year with the first full Capacity Market delivery year. The CMN is a signal to the market that the risk of a system stress event in the electricity network is higher than under normal circumstances. It is not a call to bring forward more capacity, but a notice that providers – especially those with Capacity Market agreements – should be alert to the possibility of system notices being issued and be ready to respond as required. CMNs are issued automatically - four hours ahead of a potential system stress event - when forecast margins reach a pre-determined level.

Capacity Market

13. The Government has established a Capacity Market (CM) to bring forward new investment to ensure we have enough capacity to meet peak demand at the lowest cost to consumers. The Capacity Market secures electricity capacity, mainly power plant and Demand Side Response, through competitive auctions. Targets for the auction are set to ensure there is enough capacity available to meet peak electricity demand, including a contingency for unexpected generation losses. Electricity providers bid into a Capacity Auction, declaring that if they win a capacity agreement that they will be available to provide electricity when needed. In return, they will receive a steady payment on top of the electricity that they sell. Failure to deliver on their obligations during a stress event results in financial penalties.
14. Auctions are managed by the Delivery Body (National Grid) and are held four years ahead of requirement (T-4) with a further auction one year ahead (T-1) to adjust for any change in requirements against the earlier projection.
15. In March 2016, the Government announced reforms to the Capacity Market including a commitment to buy more capacity, earlier, and to hold an early auction which would bring forward the first Capacity Market delivery year to 2017/18 rather than 2018/19. The early auction took place in January 2016 and secured 54.4GW of capacity for delivery in winter 2017/18 at a clearing price of £6.95/kW (2017 prices).
16. The first three T-4 auctions secured 49.26GW, 46.35GW and 52.4GW of capacity for delivery in winters 2018/19, 2019/20 and 2020/21 respectively. Clearing prices in the auctions were £19.40/kW (2012 prices), £18/kW (2014 prices) and £22.50/kW (2016 prices) respectively. Together with the early auction, these results will help to ensure that enough of our existing capacity will remain open at the end of the decade as well as unlocking new investment as we head into the next. The auction held in December 2016 saw around 3.4 GW of new projects clear, with 1.5GW of new gas.
17. Two Transitional Arrangements (TA) auctions have also been held. The TA auctions were designed to offer targeted support to Demand Side Response (DSR), to encourage enterprise, and increase levels of participation in the years preceding the original date of full Capacity Market delivery in 2018/19. The first TA auction saw 803MW of capacity clear at a price of £27.50. The second TA auction, which was restricted to turn-down DSR only, contracted 312MW of capacity for delivery in winter 2017/18 at a clearing price of £45.00/kW.
18. The first T-1 auction is expected to start on 30 January 2018 with a target capacity of 6GW for delivery in 2018/19. The next T-4 auction is expected to start on 6 February with a target capacity of 50.1GW for delivery in 2021/22.
19. Targets for Capacity Market auctions are for de-rated capacity, which builds-in an assumption of a certain level of non-deliverability for each capacity type due to unplanned outages based on historic averages.

20. National Grid assesses how much de-rated capacity is needed to meet the Reliability Standard (3hrs LOLE) for the year in question and makes a recommendation to the Government.
21. An independent Panel of Technical Experts (PTG) scrutinise the recommendation and Government takes final decision over how much capacity to procure in each auction on the basis of a demand curve, which is derived according to an enduring methodology.

Table 1.1 Capacity Market auctions to February 2018

Date	Type	Capacity secured / target⁵	Delivery Year
Dec 2014	T-4	49.3GW	2018/19
Dec 2015	T-4	46.4GW	2019/20
Jan 2016	TA	803MW	2016/17
Dec 2016	T-4	52.4GW	2020/21
Jan 2017	Early Auction	54.2GW	2017/18
Mar 2017	T-A	312MW	2017/18
Jan 2018	T-1	6GW	2018/19
Feb 2018	T-4	50.1GW	2021/22

⁵ Figures for future auctions are provisional targets which will be adjusted in light of prequalification results.

Electricity Balancing Significant Code Review (EBSCR)

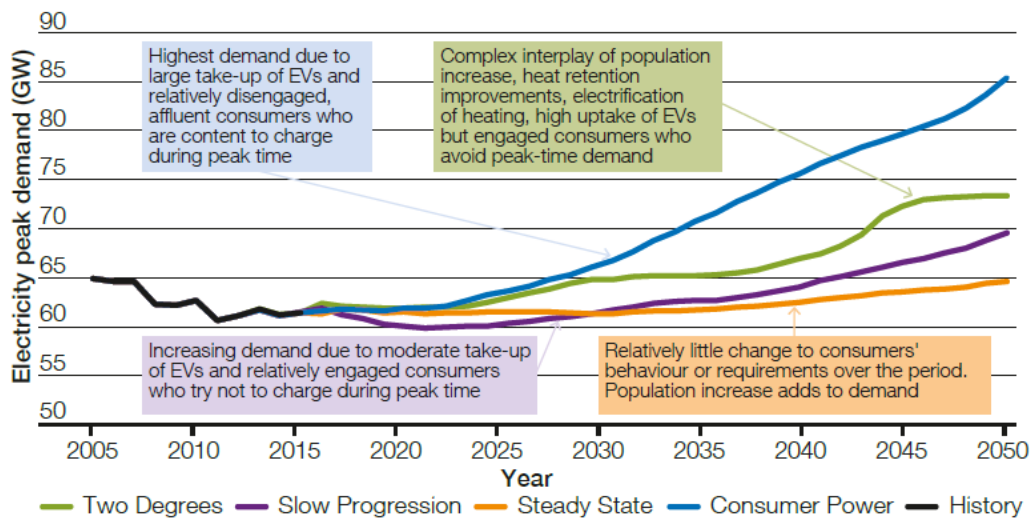
22. The first phase of Ofgem's Electricity Balancing Significant Code Review (EBSCR) reforms to cash-out arrangements came into effect for winter 2015/16. The objective of the reforms is to address issues with balancing arrangements which undermine efficiency in balancing and security of supply. The second phase of the reform will come into effect in winter 2018/19, further sharpening the cash-out price and increasing the Value of Lost Load for imbalance from £3K/MWh to £6K/MWh.
23. In conjunction with the Capacity Market introduction, EBSCR reform has the potential to strengthen the provision of security of supply by the wholesale market – for instance, by incentivising suppliers to strike demand-side reduction contracts rather than risk facing the cash-out price on their imbalances. With the introduction of the CM in 2017, EBSCR will help to ensure security of supply is delivered at least cost.⁶

⁶ The incentive will be even stronger once the basis for arriving at the cashout price (Par 50 to Par 1) comes into effect on 1 November 2018 as per the BSC

Demand

24. Chart 1.1 shows historic and forecast trends of underlying peak electricity demand from National Grid. This includes demand met by generation which is connected to the transmission network as well as embedded generation (generation that is connected directly to the distribution network). Peak electricity demand has been declining in recent years; peak demand levels were around 62GW over winter 2015/16 down from around 65GW in 2005/06.⁷
25. National Grid has published four scenarios for electricity demand as part of the ongoing UK Future Energy Scenarios (FES) project: under their Two Degrees (TD) scenario, which this year replaces the former Gone Green (GG) scenario, it will take until 2030 to see peak underlying electricity demand rise to the level it was in 2005/6; whereas in the Consumer Power (CP) scenario it reaches that level in 2027. In No Progression (NP) and Slow Progression (SP) scenarios, peak electricity demand does not exceed 2005/6 levels until 2050 and 2041 respectively.⁸

Chart 1.1 Future Development of Underlying Peak Electricity Demand



Source: National Grid Future Energy Scenarios 2017

⁷ Please note that National Grid use a different type of peak demand in their security of supply assessments which calculate LOLE and de-rated margins. Please see their [Winter Outlook](#) for more details

⁸ [National Grid Future Energy Scenarios 2017](#)

Demand Side Response (DSR)

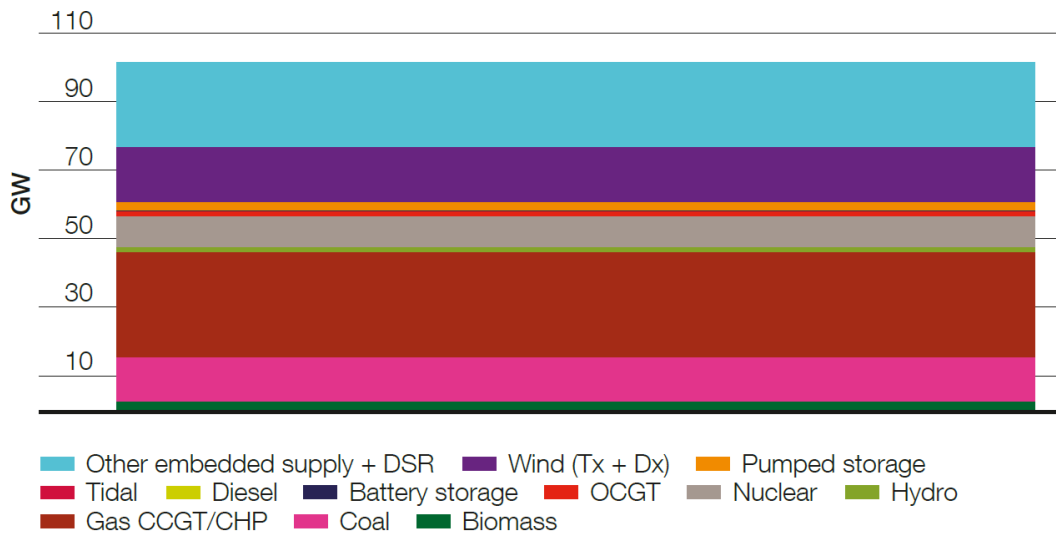
26. In the 2016 T-4 Capacity Market auction, 1.4GW of DSR (both generation derived and turn down) successfully obtained agreements, which is around 2.69% of all capacity procured for delivery in 2020/21. This was an increase of almost 1GW from the DSR volume procured in the T-4 auction in 2015. That has been further aided by the TA, which is encouraging providers to offer more capacity in the CM For 2017/18, 380MW of DSR was successful in the early auction while an additional 312 MW of turn-down DSR secured agreements in the second TA auction for 2016/17.
27. The precise volume of wider demand side response (DSR) currently utilised in GB is unknown because DSR arrangements between businesses can be organised independently of network owners. It is also not always clear what proportion of DSR is achieved by using back up generation versus turning demand down/off, however findings from the evaluation of the first TA estimate that 10-15% of delivered capacity was turn-down DSR.
28. Parliament has tightened the eligibility for the second Transitional Arrangements auction so that it focused on turn-down DSR rather than the more mature generation-derived DSR.

Supply

Present Capacity

29. National Grid's 2017 Winter Outlook Report assumes a total of approximately 76.6 GW of generation capacity to be available this winter (2017/18) for the base case and Chart 1.2 shows the breakdown⁹.

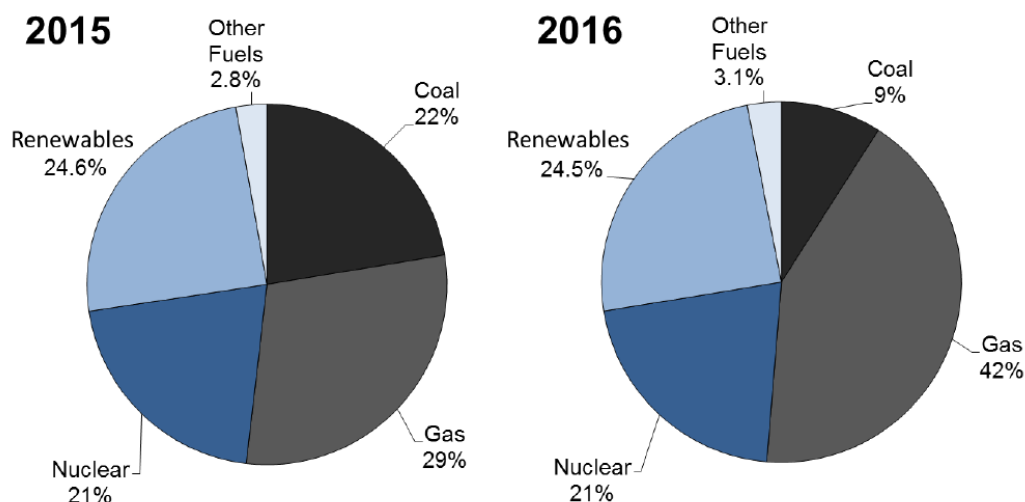
Chart 1.2 Generation Capacity by technology type (winter 2017/18)



Source: National Grid Winter Outlook Report 2017

⁹ Solar power is not relevant to security of electricity supply during winter peak.

Chart 1.3 Shares of Electricity generation, by fuel, in 2015 and 2016



Source: *DUKES 2017*

Storage

30. In GB there is around 2.7GW of pumped storage capacity. This technology can be operated flexibly, meaning it can come on and off the electricity system within seconds, and is widely used, alongside other technologies, by National Grid to balance and maintain the integrity of the electricity system.
31. New pumped storage projects are also being explored, with one pumped storage company currently seeking planning consent for 100MW, while other developers have made proposals for over 1GW of additional pumped storage capacity.
32. In addition around 500MW of batteries were successful in the 2017 T-4 auction for 21/22 with a subset of these also obtaining Enhanced Frequency Response (EFR) ancillary service contracts with National Grid.

Electricity Networks

Current network reliability

33. The networks, both transmission and distribution, remain reliable but along with the rest of the electricity system, continue to require investment to ensure they continue to facilitate the transition to a low carbon system. Ofgem's price control settlements through its RIIO (Revenue = Incentives + Innovation + Outputs) model are ensuring this investment takes place and drives further efficiency savings.
34. Onshore Transmission Owners face statutory obligations and regulatory incentives to create an operating environment designed to reduce unsupplied electricity. The historic overall reliability of supply has been high, with overall reliability for the transmission network at 99.999964%¹⁰ for financial year 2016/17.
35. Offshore Transmission Owners are incentivised to maintain availability of their offshore transmission systems. This ensures offshore generators are able to export energy with minimal disruption. For the financial year 2015/16, the average availability of offshore transmission systems was over 95.99%¹¹.
36. As part of the price control process, Ofgem set target and incentive rates for the number of customer interruptions and customer minutes lost for each Distribution Network Operator (DNO). The 'Interruptions Incentive Scheme' (IIS) incentivises DNOs to invest in and operate their networks to manage and reduce the frequency and duration of power cuts experienced by their customers, whilst maintaining focus on minimising network costs and securing optimal value for consumers.
37. The standards encourage DNOs to meet certain expected levels of service and to provide payments to end customers in the event of individual standards not being met. They cover a range of activities, including restoring supply during an unplanned interruption and providing notice periods for planned interruptions.

Future development of electricity networks

38. The 2013 to 2021 transmission price control (RIIO-T1) started on 1 April 2013. Ofgem has approved funding of up to £22.50bn for expanding, replacing and maintaining the GB transmission network for RIIO-T1.
39. In addition, the transmission owners provide quarterly updates on their major projects to the Electricity Networks Strategy Group (ENSG – a high level

¹⁰ [National Grid website Responsibility and Sustainability page](#)

¹¹ [National Electricity Transmission System Performance Report 2015-2016](#)

industry group chaired by BEIS and Ofgem)¹². The latest update shows that 5.75GW of network capacity is under construction for delivery by mid-2018, with 8.35GW delivered since February 2012.

40. As part of the first price control for the 14 regional electricity DNOs under the RIIO process Ofgem has approved overall funding of £24.60b across GB for the period 1 April 2015 to 31 March 2023. This represents a major investment in the distribution network.

Interconnection

41. GB currently has 4GW of electricity interconnector capacity with mainland Europe and the Irish electricity market. This consists of a 2GW link to France (IFA), a 500 MW link between Wales and Ireland (East-West), a 1GW interconnector with the Netherlands (BritNed), and a nominally rated 500MW link between Scotland and Northern Ireland (Moyle).¹³
42. There is a significant pipeline of projects at various stages of development – if all these projects come forward, they would bring our total interconnection capacity to nearly 18GW. Many of these projects are being brought forward under Ofgem’s cap and floor regulatory regime, which was put in place in 2014 to encourage investment in projects that will benefit consumers by providing a minimum return for project developers (the floor) whilst ensuring that consumers benefit from excess revenues accruing to developers by limiting the maximum return (the cap).
43. There are four projects under construction, which will add 4.4GW of capacity:
- i. Nemo Link – 1GW to Belgium, expected to be completed in 2019;
 - ii. NSL – 1.4GW to Norway, expected to be completed in 2021;
 - iii. ElecLink – 1GW to France (via the Channel Tunnel), expected to be completed in 2019; and
 - iv. IFA2 – 1GW to France, expected to be completed in 2020.
44. Three more projects have initial regulatory approval in GB. These would add a further 3.3GW of interconnection:
- i. FAB Link – 1.4GW to France;
 - ii. Greenlink – 0.5GW to Ireland; and
 - iii. VikingLink – 1.4GW to Denmark.
45. Ofgem is also considering applications for 6.2GW of further interconnection which could be connected by 2022:
- i. GridLink – 1.4GW to France;
 - ii. Aquind – 2GW to France;

¹² [Electricity Networks Strategy Group](#)

¹³ Moyle’s transmission entry capacity is currently limited to 90MW in Scotland, but will rise in future to 500MW by 2022/23, with export capacity at 450MW.

- iii. NeuConnect – 1.4GW to Germany; and
 - iv. NorthConnect - 1.4GW to Norway.
46. Three of these projects have applied to be regulated under the cap and floor regime, while the Aquind project is seeking an exemption.

Market Functioning

47. Energy market firms buy and sell their electricity in the wholesale market. The wholesale market allows participants to trade in a range of products that enable them to meet their obligation to supply energy whilst also enabling them to mitigate risk. The degree of access to these products relates to the liquidity of the market: low levels of market liquidity can be indicative of an uncompetitive market.
48. Poor liquidity in the wholesale market can prevent consumers from fully realising the benefits that competition can deliver in terms of downward pressure on bills, better service and greater choice. It can also obscure or weaken price signals, inhibiting long term investment decisions in new generating plant with negative consequences for security of electricity supply.
49. Ofgem and industry had concerns about the lack of liquidity of the wholesale electricity market. Ofgem's liquidity project has examined poor liquidity in the electricity wholesale market and the potential barriers that this poses to competition and entry in the market. After extensive consultation, Ofgem activated the 'Secure and Promote' licence condition on 31 March 2014, with the aim of ensuring that all parties can access the wholesale market effectively and that robust reference prices are available from the wholesale market. Ofgem has monitored the success of the licence condition and published its first annual report on 9 September 2015¹⁴ and its second annual report on 3 August 2016¹⁵.
50. Ofgem's monitoring shows some indicators of liquidity have improved since the introduction of the policy. Bid-offer spreads of mandated products have dropped (averaging below 0.5% since implementation), the churn ratio has increased slightly, but with variability year on year in individual quarters (particularly Q4 2016), and the total traded volume of electricity increased year on year by 36% to reach 1,432TWh in 2016. Independent suppliers have told us they are finding it easier to access the products they need. However, the increase in trading and churn could have been driven by increased price volatility rather than by structural change.
51. Ofgem has started a formal review of Secure and Promote, including a consultation to seek views as to whether the Secure and Promote licence

¹⁴ [Wholesale Power Market Liquidity Annual Report 2015](#)

¹⁵ [Wholesale Power Market Liquidity Annual Report 2016](#)

condition has met the original objectives of the policy¹⁶. The consultation closed in late September and the responses are being considered.

¹⁶ [2017 Secure and Promote Review: Consultation paper](#)

Gas

Introduction

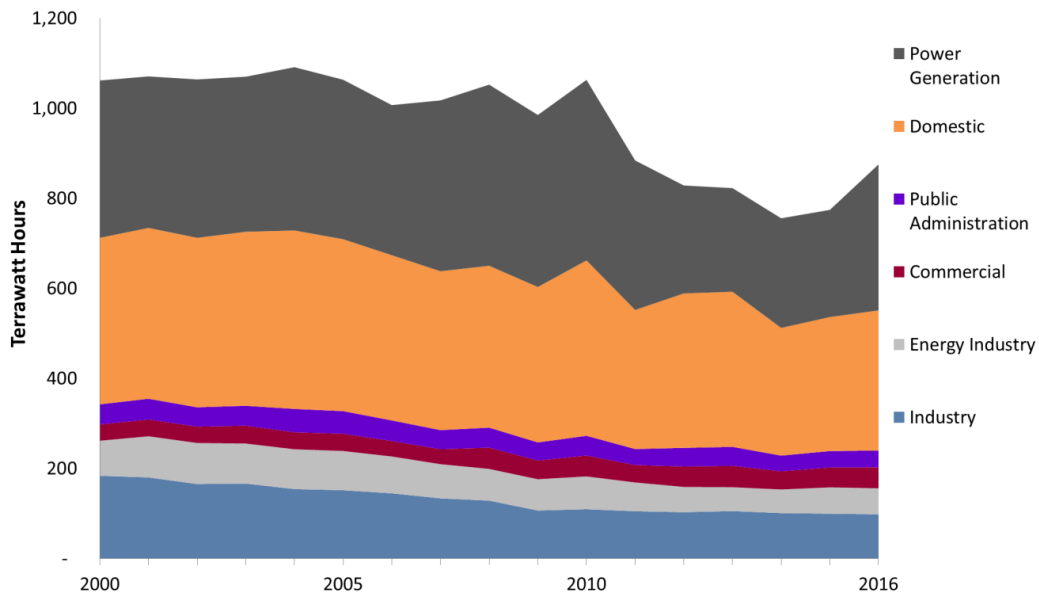
52. GB's gas system has delivered security to date and is expected to continue to function well, with a diverse range of supply sources and sufficient delivery capacity to meet demand. The UK Continental Shelf (UKCS) remains a major source of gas in the GB market, with supplies also coming from a variety of international partners via pipelines and Liquid Natural Gas (LNG) cargoes. There are a range of future supply outlooks, but all show sufficient gas available from the combination of domestic, regional and global markets.
53. Gas is a central part of the GB energy system and gas security is of importance to all parts of society and the economy, both directly (i.e. through its use as a fuel source for domestic heating and cooking, and for various industrial uses) and indirectly (i.e. because of its role in electricity generation). Past analysis by BEIS (including that undertaken for the 2017 strategic assessment of gas security of supply¹⁷) and by Ofgem has provided valuable insight into the nature of the risks to our gas security, building an evidence base that the UK gas supply infrastructure is resilient to all but the most extreme and unlikely combinations of severe infrastructure and supply shocks. Nonetheless there is always future uncertainty – for gas this includes wider energy system changes required to deliver lower carbon energy and the range of possible future sources of gas (domestic and international).

Demand

54. Chart 2.1 shows annual gas usage by sector since 2000, with overall gas consumption continuing to fall in 2014 although with a slight uptick in 2015 and 2016. Over the period, significant reductions in gas used for power generation had been notable until the reduction in coal-powered generation in 2016 that led to increased use of gas that year. Since 2014 there has been an increase in gas use by the services sector and modest increases by domestic users.

¹⁷ [Gas Security of Supply Strategic Assessment and Review](#)

Chart 2.1 Annual gas usage by sector since 2000



Source: DUKES 2017

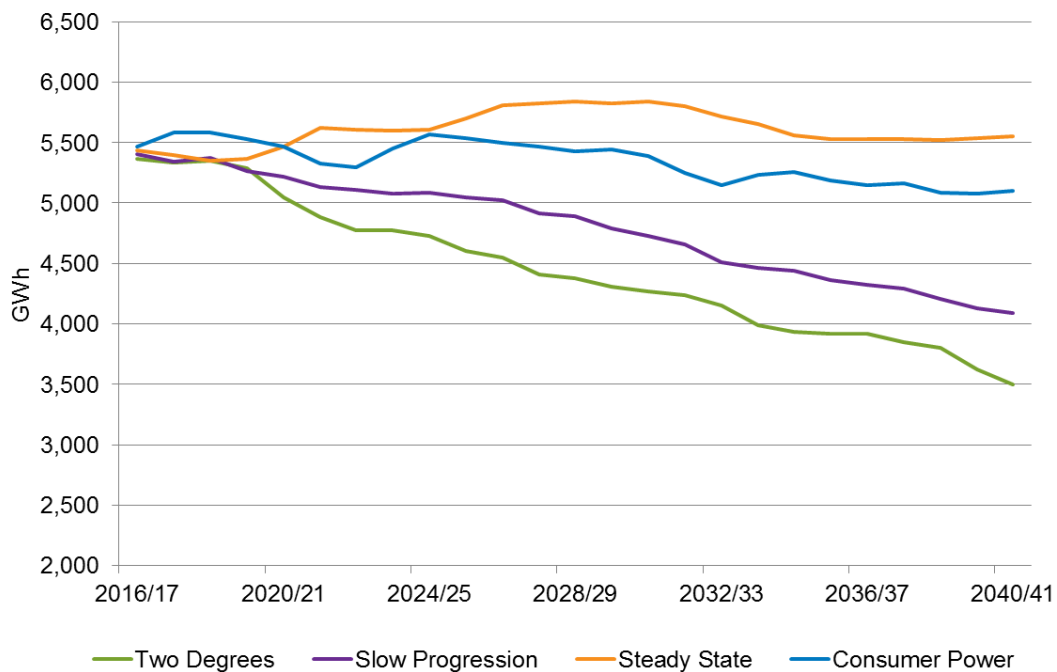
55. Gas demand in 2016 was over 12 per cent higher than in 2015. The principal cause was more gas being used for power generation - an increase of just over 40 per cent - due to a corresponding drop in coal-powered generation.
56. Demand for natural gas from the industrial sector in 2016 was broadly level with 2015. In contrast, domestic consumption was up by around 5 per cent, largely resulting from a colder winter in 2016 than in 2015.
57. In contrast to the pattern in 2016, gas demand in Q2 2017 was 7.6% lower compared to Q2 2016, the first substantial reduction since the end of 2015¹⁸. A decrease in gas use versus Q2 2016 was seen across many sectors, particularly for domestic and other final use (down 16 per cent and 12 per cent respectively). This was driven primarily by the warmer average temperatures. There was also a reduction in gas used for power generation (down 5.3 per cent).
58. As with electricity, National Grid has published four scenarios for gas demand as part of the UK FES work. These show a range of possible futures to 2050. Generally gas demand reduces over the scenario period, remaining at its highest in the Steady State scenario. In the Two Degrees and Slow Progression scenarios, the reduction in gas demand is due to the decarbonisation of both power generation and heating.
59. In addition to meeting annual demand, the gas market's ability to meet demand on a peak day is an important security of supply consideration. In general, a peak day demand is over double the average daily gas demand. Gas market participants build redundancy into their supply arrangements,

¹⁸ [Energy Trends – Gas - Section 4](#)

above the minimum amount to meet peaks, to manage the risk that other capacity may not be available.

60. The peak winter day demand for 2016/17 was 372mcm¹⁹, which was 93mcm lower than the record winter peak day demand in January 2010. For the coming winter seasonally normal peak demand is forecast to be 327mcm/d. The 1-in-20 peak demand for this coming winter is 502mcm/d with a peak deliverability of 618mcm/d²⁰.
61. Looking further forwards, National Grid scenarios also cover gas peak demand: under their Steady State scenario peak gas demand will remain broadly steady out to 2040 while under the Consumer Power it would slightly decrease. There will be more substantial declines under Slow Progression and Two Degrees.

Chart 2.2 Gas Demand for a 1-in-20 peak day



Source: *National Grid Future Energy Scenarios 2017 charts workbook (chart GD7)*²¹

Demand Side Response (DSR)

62. The conclusions of Ofgem’s Gas Significant Code Review (SCR)²² placed an obligation on National Grid to develop a centralised demand side response mechanism to encourage greater demand-side participation from industrial

¹⁹ [National Grid Winter Review and Consultation](#)

²⁰ [National Grid Winter Outlook Report 2017/18](#)

²¹ [National Grid Future Energy Scenarios 2017](#)

²² [Gas Security of Supply Significant Code Review Conclusions](#)

and commercial users. National Grid's proposed DSR methodology was approved by Ofgem and went live in October 2016.

63. This service allows large gas consumers to offer, via a centralised mechanism, to reduce the amount of gas they use during times of system stress in exchange for a payment.
64. National Grid published their first Gas DSR Annual Report in April 2017²³. Due to the secure supply picture, the gas market did not approach the circumstances required to issue a Gas Deficit Warning, and therefore the Gas Demand Side Response Service was not called upon.

Supply

65. To date, the GB gas system has reliably delivered secure supply. Security of supply reports by Ofgem and by BEIS²⁴ have concluded that the GB market is generally secure. Most recently, BEIS's strategic assessment of gas security of supply, published on 12 October 2017²⁵, noted that GB will have enough import capacity to deliver under high demand and the resilience to cope with severe shocks to the system. The UK N-1 calculation (whether peak demand could still be met if the single largest piece of infrastructure fails) exceeds the target of 100% with a score of 127% meaning that GB has 27% more infrastructure than is required to meet demand in the coldest day in 20 years even if the single largest piece of infrastructure fails. This Risk Assessment is repeated biennially, and was last undertaken in 2016.
66. National Grid's FES also examines the adequacy of supply to meet demand, with the greatest system challenge being to meet peak demand. Chart 2.3 shows that in all scenarios, maximum deliverability of gas infrastructure exceeds projected peak demand. However, the announced planned closure of the Rough storage site in June 2017 has meant that the Steady State scenario, with high demand and moderate supply, comes close to failing the N-1 test in the late 2020s and as we near 2040 (on the assumption that no new infrastructure is built).

²³ [Gas Demand Side Response \(DSR\) — Annual Report](#)

²⁴ By DECC:

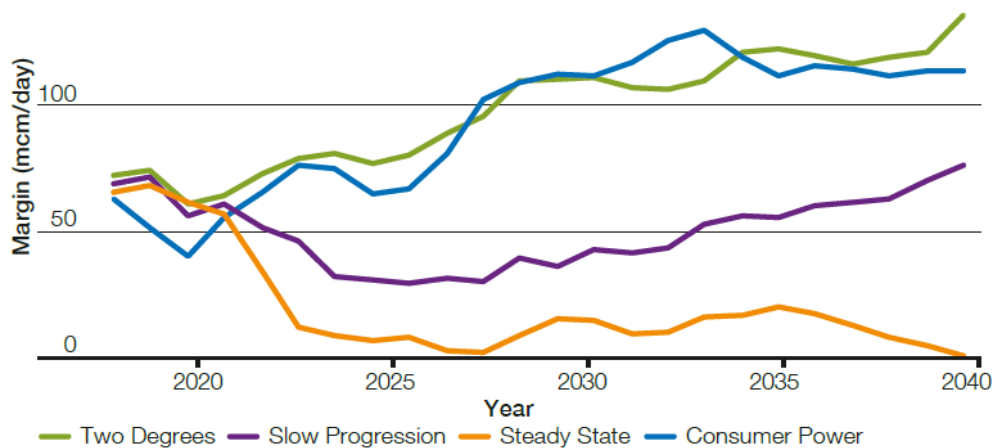
- The Impact of Gas Market Interventions on Energy Security (for DECC by Redpoint, July 2013)
- Gas Security of Supply Report (Ofgem requested by DECC, November 2012)
- GB Gas Security of Supply and Options for Improvement (for DECC by Pöyry, March 2010).

By Ofgem:

- Gas SCR (for Ofgem by Pöyry, January 2014)
- Gas Security of Supply Report: Further Measures Modelling (for Ofgem by Redpoint, November 2012)
- GB Gas Security of Supply and Future Market Arrangements (Report to the Gas Forum by Pöyry, October 2010)

²⁵ [Gas Security of Supply Strategic Assessment and Review](#)

Chart 2.3 Gas margins



Source: National Grid Future Energy Scenarios 2017

Import capacity and outlook

67. The UK has a diverse range of sources of gas supply, including domestic production, pipeline imports from Norway and mainland EU, LNG from global markets, and storage (which is not strictly speaking a 'source' of gas but is an important source of system flexibility). GB's gas supply infrastructure is capable of sustaining a 1-in-20 peak day demand as required under the Gas Transporters Licence. This is defined as the amount of infrastructure (pipes and compressors etc.) needed to transport the gas that would be required by our customers in the coldest day of winter, in the coldest winter we can expect in a 20 year period. This forecast value, at 502mcm, is higher than the record peak day demand of 465mcm experienced in winter 2010/11.
68. Currently, the UK has an import deliverability²⁶ of ~57 bcm/y from Norway, ~46 bcm/y from capacity connected to the Continent, and ~49 bcm/y from LNG import terminals.²⁷
69. Capacity is not itself a measure of utilisation. To date, GB has always secured the gas required; and BEIS, Ofgem and National Grid analysis has all concluded that it will remain well positioned to do so. National Grid's FES notes that there are a wide range of possible supply patterns but that the gas market provides enough gas from Europe and beyond to make up the difference between GB's indigenous supply and demand. A key factor in GB's ability to secure the necessary gas it is an appropriately incentivised, flexible and accessible market. This is discussed under *Market Functioning* below.

²⁶ Nameplate deliverability figures may differ from actual operational deliverability

²⁷ [Gas Ten Year Statement](#)

Storage

70. Storage itself does not produce gas, but allows gas from other sources (whether domestic or imports) to be held until times of high demand.
71. Storage takes in gas when it is low priced (usually at times of over-supply such as in the summer) and returns it to the system when prices are high (usually during peak demand). Some storage operates over short timescales (days/weeks) while other facilities exploit longer term seasonal differences. GB storage does not operate as a 'strategic reserve' of gas – providing a large volume of gas to be used in case of an emergency but otherwise not utilised. Instead, the value of storage lies in its ability to operate flexibly in response to relatively short term price signals and ultimately reduce price volatility.
72. Rough long-term storage facility represents 3.3bcm of the total GB gas storage capacity of 4.7bcm, around 70%²⁸. Last winter, Rough was unavailable for injection for technical reasons and withdrawals were reduced. There was instead more cycling of storage as shippers refilled the medium-range storage facilities to accommodate the absence of Rough. In June 2017, Centrica announced that it cannot safely return Rough long-term storage facility to injection and storage operations, and furthermore that it would be uneconomic to do so. Accordingly, Centrica announced that they plan to close the Rough storage facility, and to draw down the remaining gas held in it. Centrica subsequently announced plans to withdraw up to 0.868bcm of gas this winter, with deliverability starting at 12mcm/day from early October and falling to 6mcm/day as gas is withdrawn.
73. The economics of storage relies on the variations in gas price over time (the spreads). For long range storage such as Rough, this is summer-winter (seasonal) spreads and for short range storage it is a combination of seasonal and shorter term spreads. Volatility in the gas market has declined, which can be explained by the diversity of supply sources and capacity of infrastructure. In particular, seasonal spreads have declined significantly. While short range volatility may increase in the medium term, incentivising new short-range gas storage, the increase in gas sources throughout the year makes it unlikely that high seasonal volatility will return. The situation at Rough is not considered to undermine security of supply. Nonetheless, we will continue to monitor the value of long-term storage as the dynamics of the gas market continue to evolve.
74. Whilst the CEPA (2017) report was concluded before the announcement in June 2017 of the planned closure of the Rough gas storage site, the scenarios considered within the report examine the impact of Rough closing.
75. As such, the announcement of Rough's planned closure is not considered to have impacted the findings of the CEPA (2017) report, or of this assessment. As this assessment outlines, current and forecast levels of GB supply and

²⁸ [Gas Ten Year Statement](#)

storage infrastructure are sufficient to meet all customer demand in all but the most extreme cases.

Market Functioning

76. The UK gas market is one of the most liquid and developed markets in the world. The National Balancing Point (NBP) is by far one of Europe's largest traded gas markets, with only the Netherlands' comparable in size. In 2016, total traded volumes were approximately 1,826 bcm in the GB market. There is a diverse range of products and platforms available for those looking to trade at the NBP. This includes a wide range of forward and spot contracts with significant trading volumes throughout. Furthermore, market concentration is at healthy levels, indicating competition between participants.
77. This liquidity is evidenced by high "churn rates" at the NBP, i.e. the number of times a unit of gas is traded between extraction and consumption (one indicator of liquidity). GB continues to perform well on this indicator, with annual average churn of 22 in 2016; a number in excess of 10 is taken by industry commentators to indicate gas hub maturity. This churn rate was notably higher than gas hubs on Continental Europe with the exception of the Dutch TTF. High liquidity benefits security of supply as it provides international gas producers with effective markets where they can bring gas, and also the means by which gas consumers can indicate their willingness to buy.
78. Overall, the UK gas market has the characteristics of a developed and competitive market. This assessment was supported by the Competition and Markets Authority (CMA) Energy Market Investigation; the CMA considered the wholesale gas market in the early stages of their investigation and confirmed in their updated issues statement that they did not find any causes for concern²⁹.

Network Reliability

79. The UK gas transmission network achieved 99.975% reliability in 2016/17³⁰. An interruption is classed as a significant event on the NTS that causes a cessation of flow relating to the loss of firm or Off Peak Capacity at an NTS Exit Point where commercial tools have not been utilised. There was cessation to the flow at two supply points on the NTS on a small number of occasions. UK Gas Distribution had two incidents in the East of England network. One of these affected around 6,000 customers and was caused by third-party damage to our assets. The other affected around 2,500 customers.

²⁹ [CMA Energy Market Investigation – Updated issues statement](#)

³⁰ [National Grid Responsibility and Sustainability page](#)

80. The distribution network that carries gas directly to consumers is equally robust, with a reliability rating of 99.998%³¹.

³¹ [National Grid Annual Report and AccountS](#)

Oil

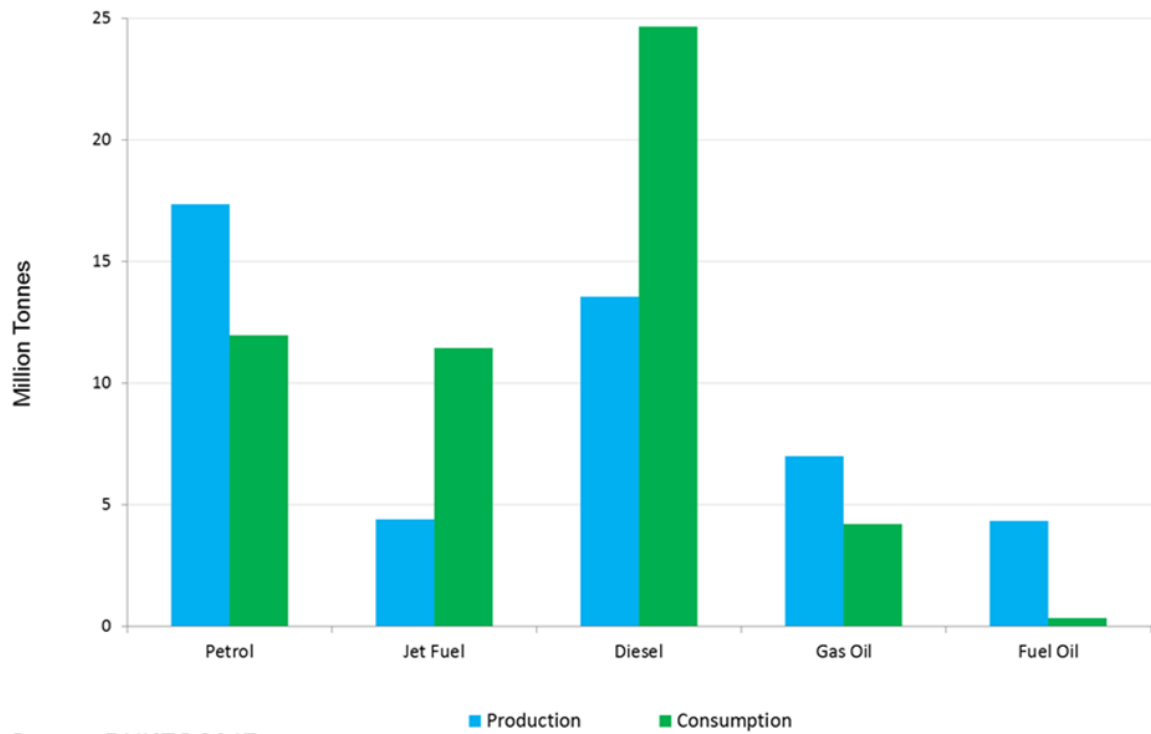
Introduction and Summary

81. This chapter sets out a summary of key facts and figures on UK oil demand and supply, production and imports. Oil currently meets around a third of primary energy demand and is the main energy source for transport, meeting virtually all of the UK's needs, including electricity generation, industrial processes, domestic heating and as feedstock for petrochemical, industrial and construction products and processes. The sector plays a key underpinning role for the whole of the UK economy as well as offering significant direct benefits socially, economically and in terms of resilience.
82. The UK's oil supply chain continues to deliver security of supply and is expected to continue to function well, with sufficient capacity to meet demand, as well as respond to supply shocks. The UK is well placed in the global oil markets (crude and product), trading extensively in all oil types and with significant import / export infrastructure on coastal locations able to source fuels from around the globe, notably from the Amsterdam-Rotterdam-Antwerp (ARA) oil hub.
83. Recent analysis by BEIS has provided valuable insight into the risks of specific point failures in our downstream oil system. The evidence shows that the UK fuels supply infrastructure is resilient to most shocks where the market is able to adapt as it has done historically. However, for the case of very short term disruptions BEIS has identified some measures that are able to increase our fuel resilience, most notably through leasing additional truck and trailers to add to the supply chain, which we have done since late-2016. BEIS, building on the new analysis intends to consult this year on further measures that may improve the sectors' resilience.

Demand

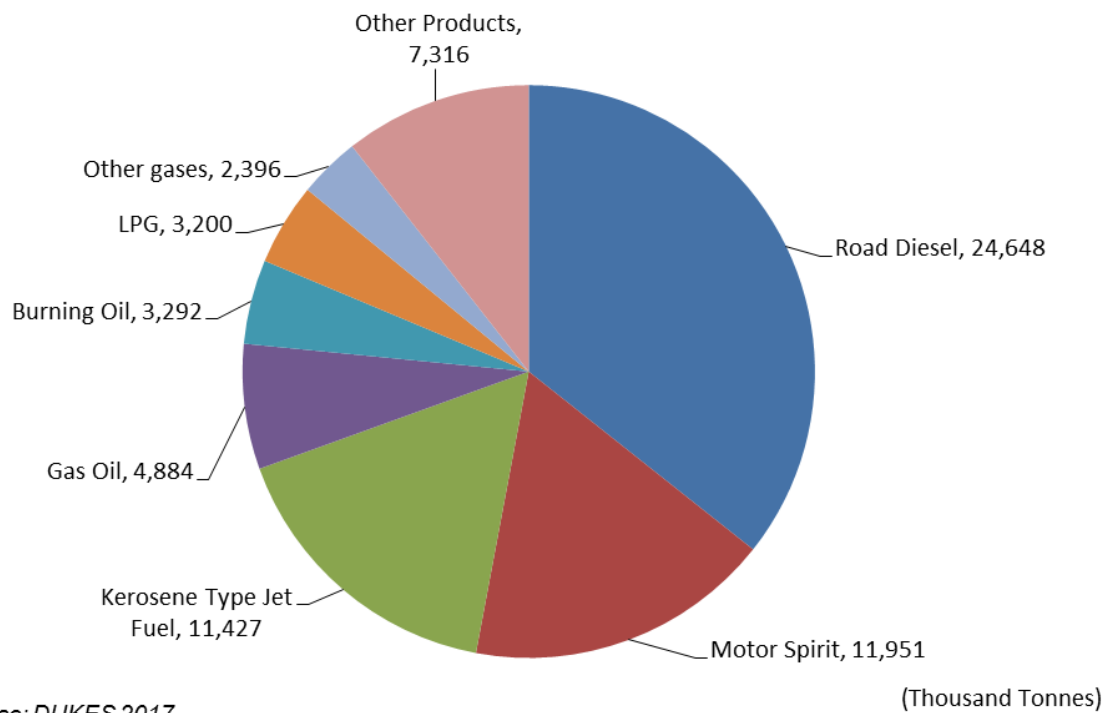
84. Following on from the increase in 2015, 2016 saw another rise in demand (although shallower) of 1.8%. These increases in demand were largely driven by demand for transport fuels. However, demand for oil products for use at petrochemical plants also increased. Demand for oil in the UK is set to decrease further in the long term in order for the UK to meet its 2050 climate change objectives and rebalance the economy towards more sustainable and secure energy supplies.

Chart 3.1: Production and consumption of key petroleum products 2016



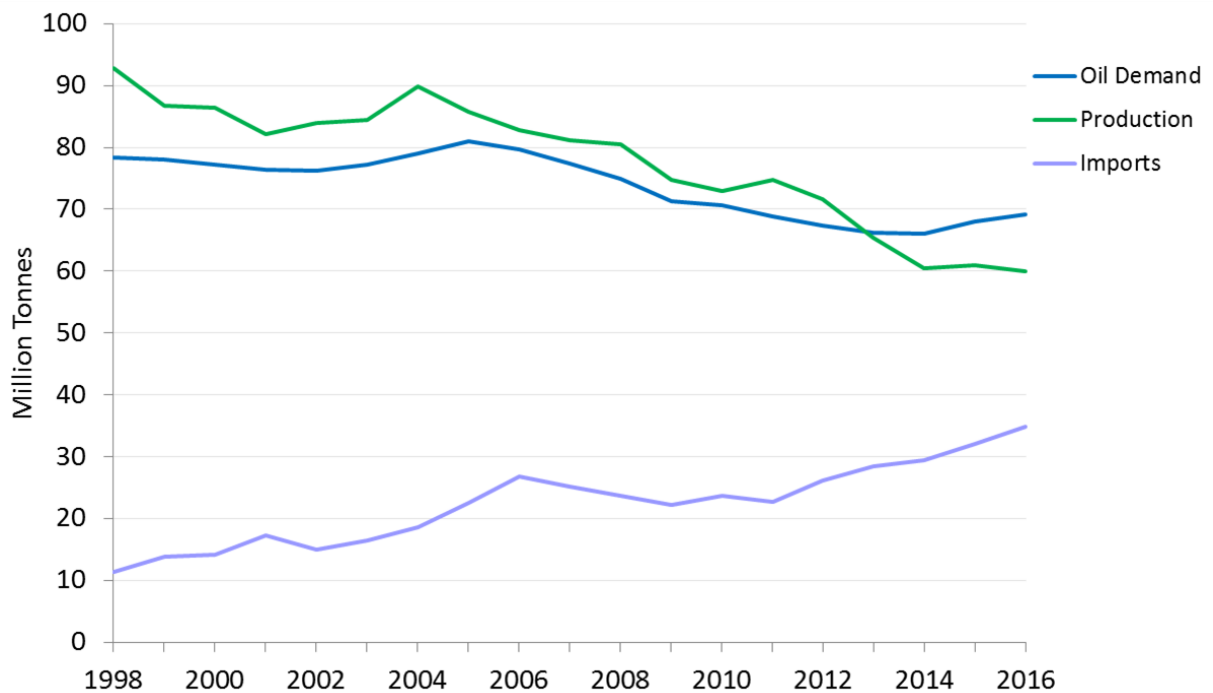
Source: DUKES 2017

Chart 3.2: UK 2016 oil demand by petroleum product type



Source: DUKES 2017

(Thousand Tonnes)

Chart 3.3: UK Petroleum product demand, production and imports

Supply

UK Oil Production

85. From its peak of 137 million tonnes at the turn of the century UKCS production has dropped nearly two-thirds to 48 million tonnes. But, in contrast with this long-term trend, production has risen two years in a row due to the opening of new fields such as Golden Eagle. Production in 2016 was 4.8% higher than 2015. The long-term future will depend on the level of investment and the success of further exploration.

86. The current estimate of remaining recoverable hydrocarbon resources from the UK's offshore resources is in the range 10 to 20 billion barrels of oil equivalent. The founding of the Oil and Gas Authority as an Executive Agency of BEIS represented a critical step in implementing the recommendations contained in Sir Ian Wood's 2014 report ("Wood Review") into maximising economic recovery from the United Kingdom's Continental Shelf ("UKCS").

Crude Oil

87. The UK both imports and exports crude oil, and the direction of this trade is dependent on the prevailing market conditions. Historically around two-thirds of the UK's crude imports have come from Norway. Although this fell to 50% in 2015, in 2016 the proportion from Norway recovered to 62%. Imports from OPEC countries fell by 6.7 million tonnes in 2016 as a result of lower total UK imports and increasing imports from Norway. The percentage of imports from OPEC countries is now 28%, with Nigeria and Algeria the most notable.

88. The UK's own production of crude oil would have been sufficient to meet roughly 80 per cent of UK refinery demand in 2016, but the increase in the diversity of sources coming into the UK reduced the impact of a disruption to any one source of supply on the UK. In 2016, 26% of UK crude oil production was used by UK refineries.

Refined product

89. UK oil refineries have continued to rationalise and optimise their operations and 2016 saw a decrease in throughput of 2 per cent on last year. The market will continue to drive changes in the supply sector and HMG recognises the benefit of ensuring that a mix of domestic refining and imports remains viable in the UK, so far as market conditions allow.

90. In 2015, UK refinery production was 29% petrol, 23% diesel and 7% aviation fuel, with the remaining 41% primarily being other light and heavy distillates. This is significantly different from the demand pattern. To balance demand, the UK trades widely and is one of the largest importers of jet fuel and road diesel in the OECD and one of the largest exporters of petrol.

91. Approximately 41% of fuel produced by UK refineries in 2016 was exported, of which 46% was petrol and 14% fuel oil.

92. Imports of diesel road fuel and jet fuel to the UK are increasing. In 2013, the UK became a net importer of petroleum products for first time since 1984. In 2016, the UK was a net importer by 10.5 million tonnes, 14 per cent up on 2015.

93. The UK has a well-developed infrastructure for the trade of both crude oil and petroleum products and sources its petroleum products from a diverse range of countries. In the main, Russia and European countries export large volumes of diesel to the UK, but the United Arab Emirates, Saudi Arabia and Kuwait are major trading partners for jet fuel.

Resilience

94. The UK remains well supplied by a combination of domestic refining and imported fuels and there were no significant disruptions to the end supply of oil products and fuels during 2016. Continued efforts by the industry and National Crime Agency coordinated through the Pipeline Security Forum have contributed to a fall in the number of illegal pipeline tapping incidents causing short-term interruptions.

Emergency oil stocks

95. The UK holds emergency stocks of oil to respond to major disruptions to the global oil market as part of its membership of the European Union and International Energy Agency. In order to meet its international obligations the UK directs oil companies that are substantial suppliers of oil products to the UK to hold stocks that can be released in an emergency. In 2016, the UK's obligation was approximately 12.5 million tonnes of crude oil equivalent, similar to levels in 2015.

CCS1017187240

978-1-5286-0073-6