DEPARTMENT OF ENERGY & CLIMATE CHANGE

Statutory Security of Supply Report

A report produced jointly by DECC and Ofgem

November 2010

ofgem

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A report produced jointly by DECC and Ofgem

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section 172 of the Energy Act 2004

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Contents

1. Introduction

1.1 About this report

1.1.1 This report has been prepared to discharge the Government's and Ofgem's obligation under section 172 of the Energy Act 2004[1] to report annually to Parliament on the availability of electricity and gas for meeting the reasonable demands of consumers in Great Britain; and the Government's obligation under certain EU Directives[2] to monitor gas and electricity security of supply issues and publish reports.

1.1.2 This is a technical report focusing on gas and electricity. Other fuels (coal, nuclear fuel, renewables) are also mentioned in the electricity chapter in the context of electricity generation. This report provides forward-looking energy market information relating to security of supply, including identification of risks and drivers.

1.1.3 Although security of supply of oil is not included as part of the statutory requirement, this report includes a section on oil security of supply for general information.

1.1.4 This report represents an evolution of the Energy Markets Outlook, of which the third report was published in December 2009. The technical data is presented in the settled format of the Energy Markets Outlook, and has been provided jointly by DECC, Ofgem and National Grid. Government will set out policy considerations relating to security of supply in detail in the Annual Energy Statement. The first Annual Energy Statement was published in July 2010.

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[1] Available from http://www.statutelaw.gov.uk/Home.aspx

[2] Directive 2003/55/EC of 26 June 2003 concerning common rules for the internal market in natural gas, augmented by Article 5 of Directive 2004/67/EC of 26 April 2004 concerning measures to safeguard security of natural gas supply; Directive 2003/54/EC of 26 June 2003 concerning common rules for the internal market in electricity, augmented by Article 7 of Directive 2005/89/EC of 18 January 2006 concerning measures to safeguard security of electricity supply and infrastructure investment.

1.2 Any comments?

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2. Executive Summary

2.1.1 This report provides the information to meet the statutory security of supply reporting requirement set out in Section 172 of the Energy Act 2004. This requirement was previously met by the Energy Markets Outlook. This report provides a technical assessment of the outlook for the supply of electricity, gas and oil up to 2025, drawing on analysis by Government, National Grid, Ofgem and others.

2.2 Security of supply outlook – Electricity

2.2.1 National Grid's central case projection for peak electricity demand is for this to remain relatively stable at around 60GW, although there is a range of sensitivities around this central case. These sensitivities relate to: fuel prices, energy conservation, household numbers, power generation capacity and output, CHP capacity, embedded generation and exports.

2.2.2 Generation capacity in the UK currently stands at 85.3 GW. However, the coming decade will see many changes in the Electricity Markets, in particular, the closure of a number of coal and oil fired plant that are considered too polluting by modern standards, and nuclear plant that are scheduled to come to the end of their working lives. The Large Combustion Plants Directive will lead to closure of around 12 GW of coal and oil-fired fleet by 2016 at the latest. The Industrial Emissions Directive could also lead to further closures by 2023. In addition, according to current timetables, up to 7.4 GW of existing nuclear generating capacity is reaching the end of its operational life and will have closed by 2020.

2.2.3 However, 9 GW of new plant that will connect to the National Grid is already being built, and a further 10.8 GW that will connect to the National Grid has planning permission. Of this new capacity with planning permission, 6.7 GW is gas-fired generation[1].

2.2.4 In terms of Renewables, including capacity connecting to local networks as well as to the National Grid, latest statistics from August 2010 show that 4.6 GW of renewable projects are under construction in the UK. A further 6.7 GW of projects have planning permission and are awaiting construction and over 14.2 GW more are going through the planning process. This new capacity will replace the capacity due to close with cleaner technologies and will contribute to securing our supplies while at the same time helping to reduce our greenhouse gas emissions.

[1] As at October 2010

2.3 Security of supply outlook – Gas

2.3.1 The outlook for security of gas supply is broadly benign in the near term. This does not mean that it is risk-free; there are risks, both in the short term, and towards the second half of the decade, when some uncertainties remain. UK annual gas demand is projected to trend downwards slightly in DECC UEP40 and National Grid's central case. There are however sensitivities around this leading to a wider potential range of outcomes, depending on factors such as relative fuel prices of gas and coal, the amount of gas fired generation in the electricity generation mix, and economic growth. Projections for peak demand show this remaining at current levels (500 mcm/d) in the Central case or trending downwards to around 450 mcm/d in the Gone Green 2009 scenario over the period 2010 to 2025.

2.3.2 While production from the UKCS is projected to continue to decline, GB has an increasingly large and diverse range of import sources on which to draw.

2.3.3 New import and storage capacity is identified at various stages of development and delivery. Should this come forward, the UK would continue to be well-served. In practice, it is noted, however, that projects might slip, and not all of this capacity might come forward.

2.4 Security of supply outlook – Oil

2.4.1 Oil products play an important role in the UK economy, providing around 33% of the primary energy used. We currently rely on oil for almost all of the UK's motorised transport needs. Transport accounted for almost 85% of energy consumption of oil products in the UK in 2009, amounting to 49.6 million tonnes of oil.

2.4.2 Over time, technology changes, including electric vehicles and the generation of more heat from renewables, together with Government energy efficiency policies such as seeking to encourage greater use of public transport, will reduce demand for oil in the long term. Significant reductions are not anticipated for the next 10-15 years.

2.4.3 Oil production in the UK peaked in 1999 and is now declining. Oil imports are forecast to increase through the 2025 timeframe. DECC continues to work with its international partners to improve the effectiveness of oil markets and encourage the necessary investment in both increasing oil supplies and reducing oil demand.

2.5 Conclusion

2.5.1 This Security of Supply Report is intended to inform and facilitate decision making by energy market participants and stakeholders. We welcome views and comments on the document to that end.

3. Electricity

3.1 Introduction

3.1.1 This chapter sets out future supply and demand forecasts for electricity, and provides a discussion of risks and drivers.

3.1.2 Electricity security of supply is, at a high level, determined by: the ability to produce or import power, future demand levels and the network infrastructure needed to deliver electricity to where it is used. A particular issue for electricity is that it is expensive and difficult to store, so supply and demand must be closely matched on a moment to moment basis.

3.1.3 Forecasts for both the demand for electricity and the level and nature of capacity that will be available to produce it are subject to a range of sensitivities when looking forward over the next decade.

3.1.4 Where analysis in this chapter draws on data provided by National Grid it refers to electricity supply and demand in Great Britain. The electricity market in Northern Ireland is part of the Single Electricity Market, which is discussed in box 3.1 at the end of this chapter.

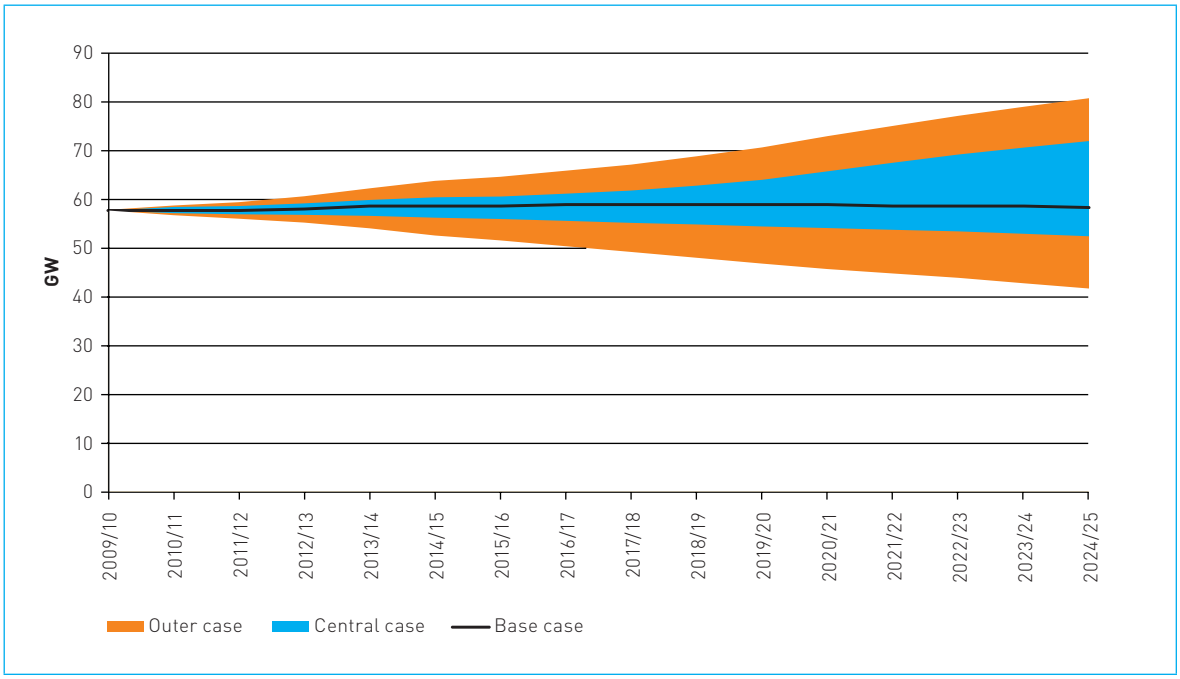
3.2 Electricity demand

3.2.1 Electricity security of supply depends on the amount of generation capacity available to produce sufficient electricity to meet demand at any point in time. Hence, the most significant indicator in assessing electricity security is the peak – the highest instantaneous level of demand in any given year.

3.2.2 Chart 3.1 shows projections of future peak electricity demand. The base case projection for peak electricity demand is for this to remain relatively stable at around 60GW. For the purposes of this document the base case for electricity demand is consistent with the 'Slow Progression' scenario developed by National Grid. More detail on this scenario and others produced by National Grid can be found in the Development of Investment scenarios[1] document.

[1] National Grid Development of Investment Scenarios document: http://www.nationalgrid.com/uk/Gas/OperationalInfo/TBE/

Chart 3.1: Future development of peak demand on the national transmission system



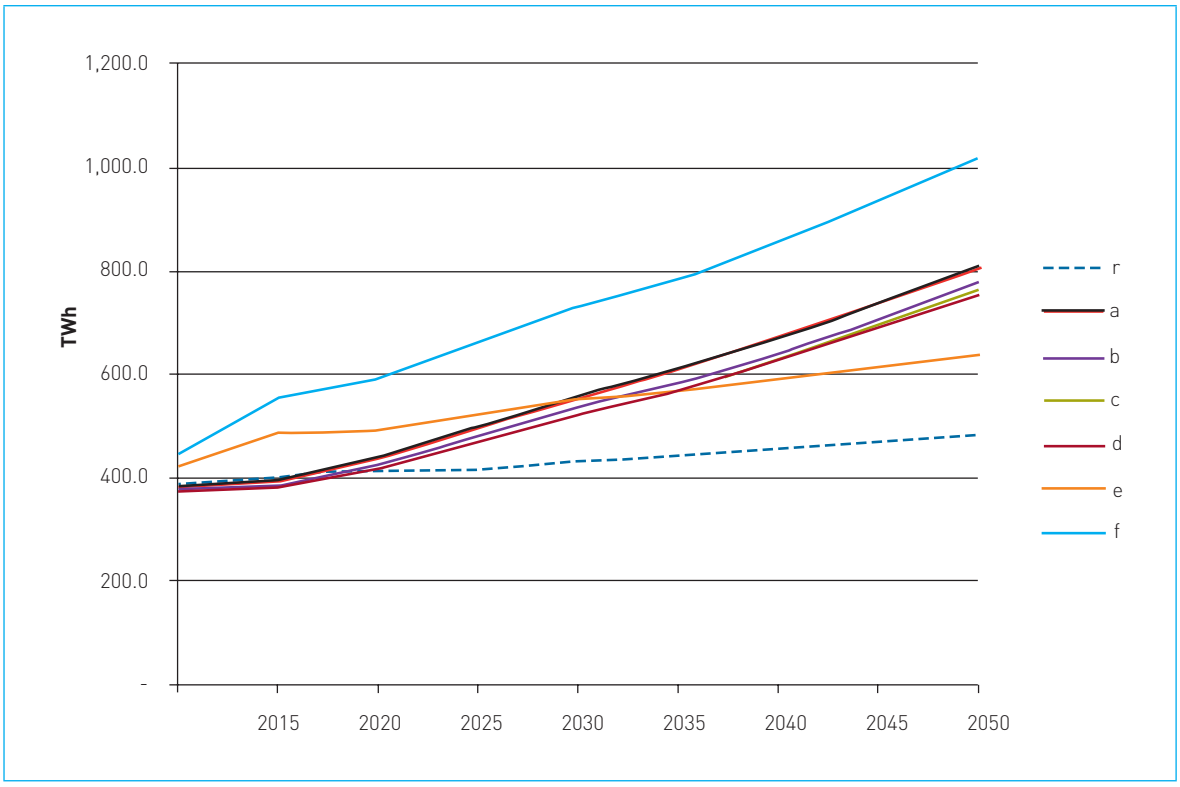
Source: National Grid

3.2.3 In addition to the base case, the chart also shows an outer fan (illustrating a simple summation of all sensitivities) and an inner fan illustrating combinations of sensitivities more likely to occur together. For example, the highest levels of demand shown in Chart 3.1 are likely to be reached only if the relevant factors (such as the rate of economic growth, or the take-up of electric vehicles) were all stimulating demand growth and no factors were acting to reduce demand. In practice it is unlikely that they would all combine to push electricity demand in one direction. A narrower central range of more probable demand levels has therefore been highlighted on the chart. However, even within this range, there are still significant variations. The demand associated with the National Grid 'Gone Green' scenario developed as a plausible scenario to meet the 2020 EU environmental targets falls within the central band and is similar to the base case demand.

3.2.4 A number of sensitivities have been developed around the base case to illustrate a range of potential demand scenarios for the future. Sensitivities modelled here include: fuel prices, energy conservation, household numbers, power generation capacity and output, combined heat and power (CHP) capacity, embedded generation and exports.

3.2.5 DECC has also carried out modelling of possible scenarios for future electricity demand in the context of its 2050 Pathways work. Chart 3.1a below illustrates six scenarios for achieving carbon reduction targets by 2050. This shows total electricity demand rather than capacity required to meet peak demand. However, if the ratio between peak demand and annual total electricity demand is assumed to continue broadly as at present, then all but one of the 2050 reference pathways illustrated fall within National Grid's current outer case projections for 2025[2]. It may be noted that the projection which lies above this range (scenario "f") assumes little behavioral change.

Chart 3.1a Possible scenarios for future electricity demand based on DECC modelling for 2050 Pathways



Source: DECC

3.2.6 In the case of both the National Grid and the DECC scenarios, it may be noted that the range of potential demand increases in the future, particularly post 2020, with uncertainty surrounding the impact of new technologies such as smart metering, electric vehicles and heat pumps.

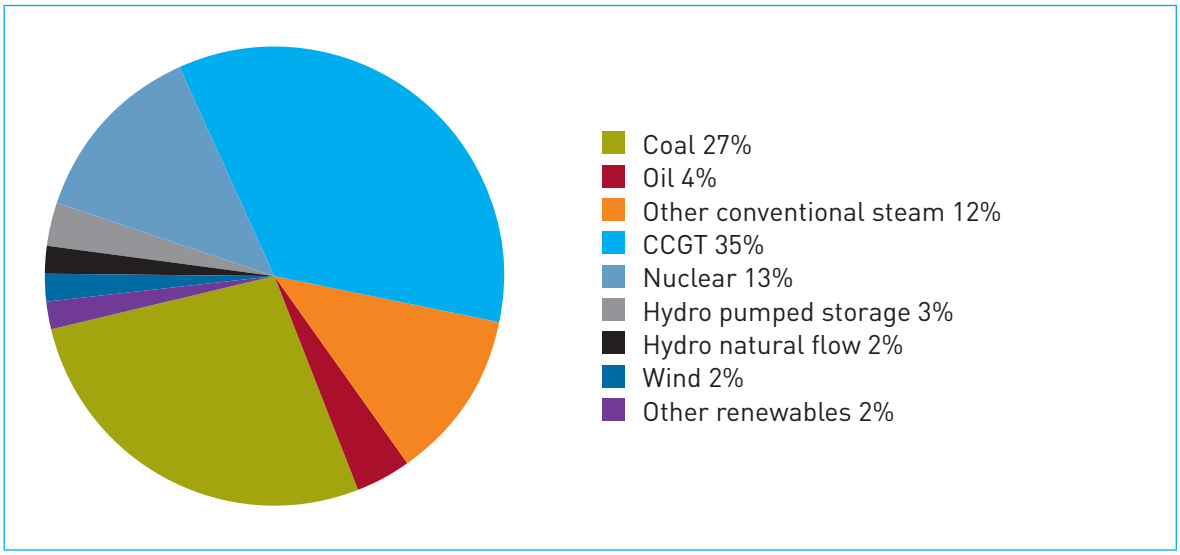
[2] DECC 2050 Pathways Analysis: http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/2050/2050.aspx

3.3 Electricity supply

Present capacity

3.3.1 As at the end of 2009, the UK as a whole had a total of 85.3 gigawatts (GW) of electricity generating capacity of various kinds (source: DUKES). In addition, Great Britain had the capacity to import and export the equivalent of 2.5GW from and to France and Ireland.

Chart 3.2: Electricity generating capacity in the United Kingdom, by technology[3], in 2009

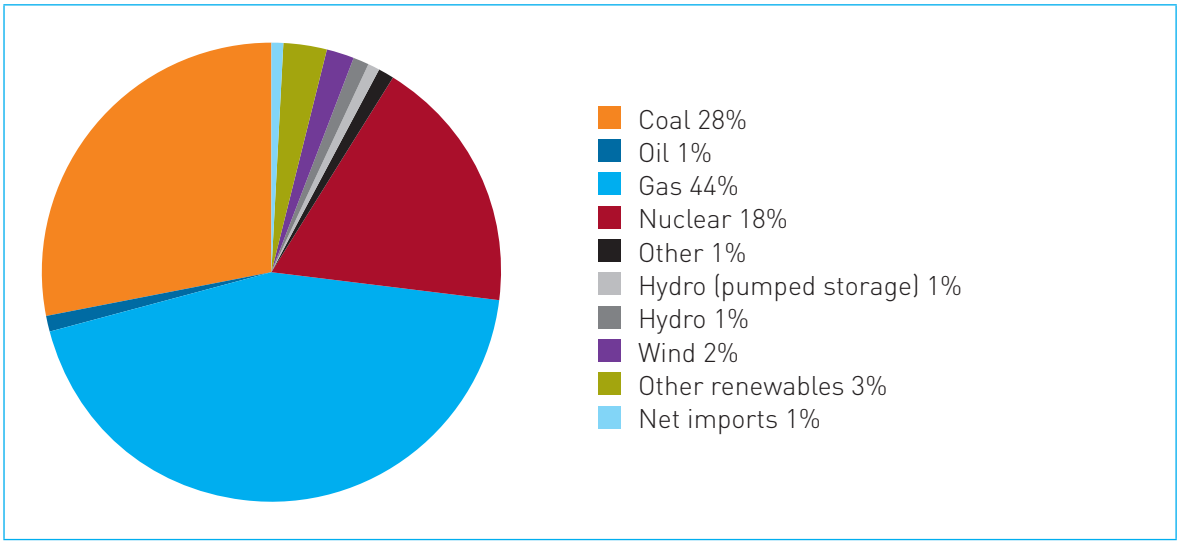


Source: DECC, Digest of UK Energy Statistics 2010, Table 5.7

3.3.2 This represents an increase in capacity from 83.5 GW at the end of 2008. The balance between technologies is broadly similar, with a 1% increase in Combined Cycle Gas Turbines (CCGTs), and a 1% reduction in both coal and oil as a proportion of the total generation capacity mix.

[3] "Other conventional steam" includes mixed or dual fired thermal capacity and gas fired stations that are Open Cycle Gas Turbines, or have some CCGT capacity but mainly operate as conventional thermal stations.

Chart 3.3: UK electricity supply in 2009 (total: 379TWh)



Source: DECC, Digest of UK Energy Statistics 2010, Table 5.7

3.3.3 The respective shares of generating technologies in electricity production are different from shares in capacity, since some plant generates more or less continuously (e.g. nuclear), some only at times of extremely high prices and/or demand (e.g. oil) and some depending on the availability of the power source (e.g. wind). Of the 379 TWH of electricity supplied in 2009 (down from 401 TWH in 2008), the breakdown by technology type was as shown in Chart 3.3. Significant changes from the same data for 2008 include a change in the proportion from coal generation (down from 34% to 28%) and a reduction in that from oil (down from 2% to 1%). The proportion from nuclear increased (from 16% to 18%) and the proportion from gas fired generation remained the same at 44%.

Plant closures

3.3.4 A substantial proportion of the UK's electricity generating capacity is expected to close over the next few years. Electricity generation capacity has a finite lifetime, and faces increasingly strict environmental regulation. Both these factors will lead to closures of some existing plant over the next decade. The Large Combustion Plants Directive (LCPD) will lead to closure of around 12 GW of coal and oil-fired fleet by 2016 at the latest[4]. The Industrial Emissions Directive (IED) could also lead to further closures by 2023. In addition, and according to current timetables, up to 7.4 GW of existing nuclear generating capacity is reaching the end of its operational life and will have closed by 2020.[5]

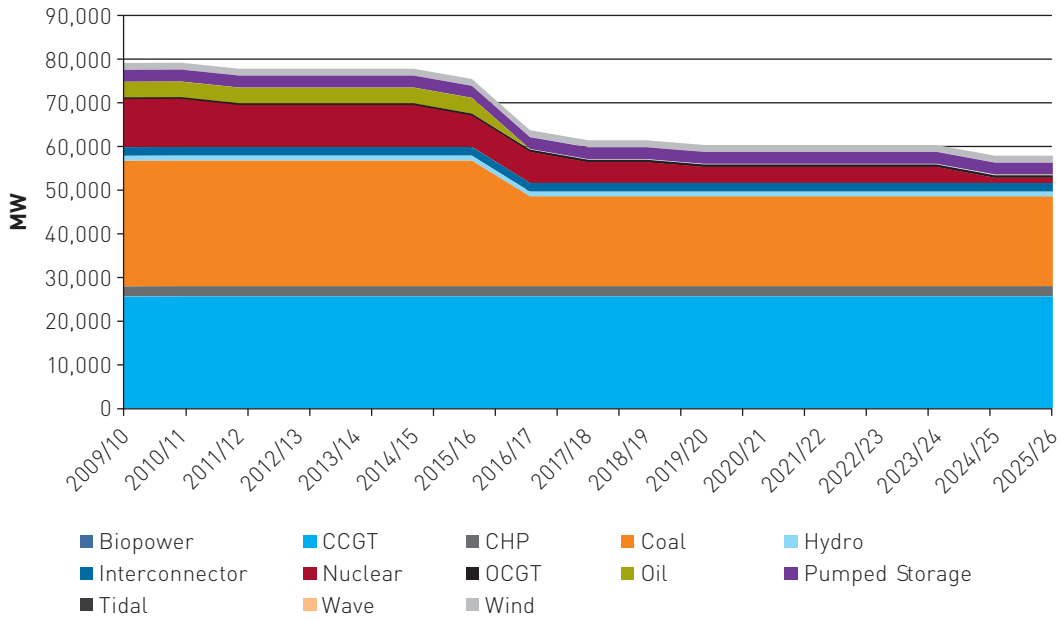
[4] Environment Agency: http://www.environment-agency.gov.uk/business/sectors/32613.aspx and http://www.scottishpowercsrannualreview.com/acidification.php

[5] DECC Legacy nuclear issues: http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/nuclear/issues/power_stations/power_stations.aspx

3.3.5 Chart 3.4 below shows the development of existing GB generating capacity, based on existing grid-connected capacity and an assessment of likely closures. The GB market is not the only one affected by closures; some 600MW of gas-fired capacity at the Ballylumford plant in Northern Ireland will also have to close by the end of 2015.

3.3.6 It should be noted that Chart 3.4 does not make allowances for plant closing and/ or opting out under the terms of the Industrial Emissions Directive, which could lead to closure of certain coal plant by 2023. The Industrial Emissions Directive is discussed in more detail below.

Chart 3.4: Development of existing GB generating capacity



Source: National Grid/DECC

Reasons for expected closures

1: Large Combustion Plants Directive and Industrial Emissions Directive

3.3.7 The proposed next phase of environmental constraints may have a significant effect on the future generation outlook. The proposed Industrial Emissions Directive (IED) consolidates seven environmental directives, including the Integrated Pollution Prevention and Control (IPPC) Directive and the Large Combustion Plant Directive (LCPD), into a single directive. The IED will introduce tougher emission limit values for SOx and NOx (oxides of sulphur and nitrogen) across a range of installations including combustion plants.

3.3.8 After a series of trilateral negotiations between the European Commission, the European Parliament and Member States, the European Parliament (EP) signed off the latest version of the European Commission's draft IED text on 7th July 2010. The last remaining step in the clearance process is ratification by the EU Council of Ministers (i.e. representatives from all 27 Member States), which should be received later this year.

3.3.9 Under the terms of the proposed IED, combustion plants can 'opt out' of the Directive providing they:

- Close by 1 Jan 2016;
- Opt out and continue running under previous (LCPD) emission limits (which will mean plants can operate for only 17,500 hours between 1 Jan 2016 and 31 Dec 2023);
- Opt in under Transitional National Plan (TNP) (which will impose a decreasing cap on emissions on all plants operating under a country's TNP until 2020); or
- Opt in and comply fully from 1 Jan 2016 (which will mean fitting selective catalytic reduction for some plants).

3.3.10 One of the key elements of the IED is that it affects any gas plant commissioned before 2002, which is most of the UK CCGT fleet. This means that up to 40GW of existing coal and gas plant could be affected. That said, a number of plants are likely to retrofit abatement equipment to reduce their emissions and comply with the new Directive. Some of the existing plant may also already comply with the new legislation and may not have to take any action.

2: Lifetime of nuclear plant

3.3.11 According to current timetables, up to 7.4GW of existing nuclear generation capacity will have closed by 2020; this is shown in the table below. All but one of the UK's existing nuclear power stations (Sizewell B) are scheduled to close by 2023.

Station	Installed capacity (GW)	Current expected closure date
Wylfa	1.0	2012
Oldbury	0.4	2011[6]
Hartlepool	1.2	2014
Heysham 1	1.2	2014
Hinkley Point B	1.3	2016
Hunterston B	1.2	2016
Dungeness B	1.1	2018

3.3.12 The operating lives of nuclear power plants can be extended, but only with the approval of the Health and Safety Executive's Nuclear Installations Inspectorate (NII). The decision whether to seek to extend the scheduled closure date is a commercial decision for the operators. These decisions will take into account such factors as plant safety and operating costs, as well as supply, demand and price expectations in the electricity market as a whole.

New build: quantity

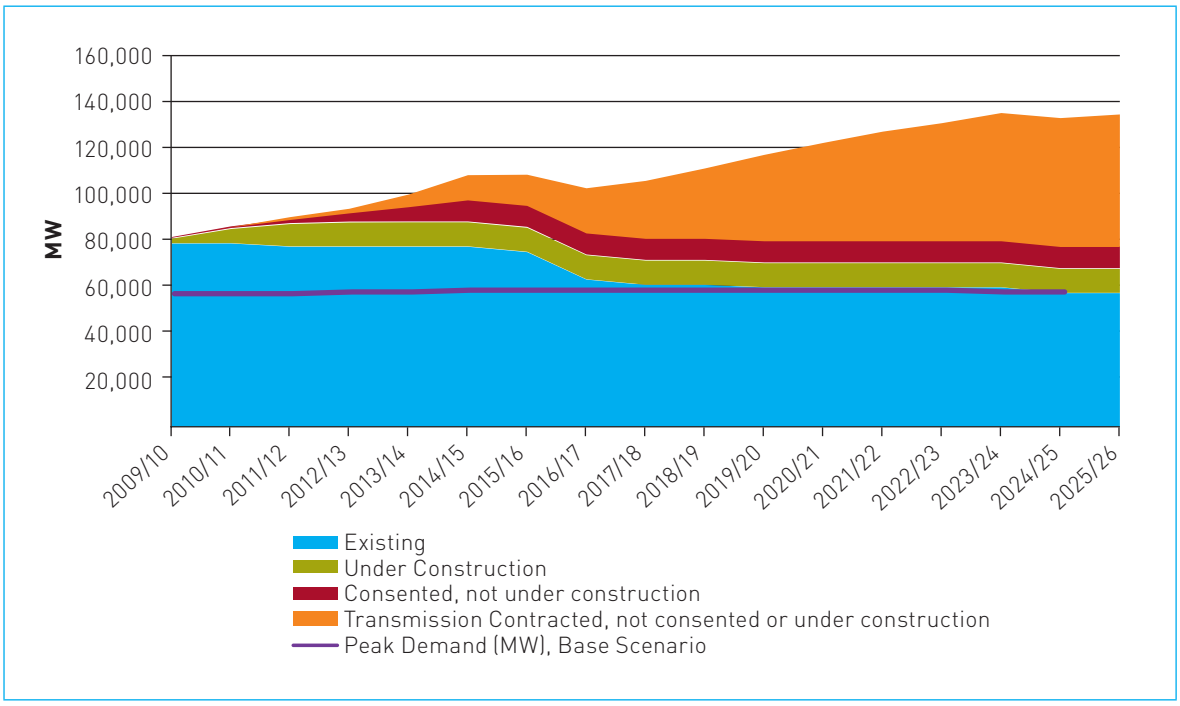
3.3.13 As shown in National Grid's Seven Year Statement, there is 10.8GW of electricity generating capacity with consent to build, of which 6.7GW is conventional capacity (gas). A further 9.0GW is under construction[7]. New capacity which is now at various stages of the planning, consent and construction process is presented in the following chart. The dates shown are from National Grid's Seven Year Statement[8]. The further into the future we look, the fewer firm commitments have been made.

[6] Oldbury has received an extension to mid 2011

[7] As at October 2010

[8] National Grid Seven Year Statement: http://www.nationalgrid.com/uk/Electricity/SYS

Chart 3.5: Existing and anticipated GB electricity generating capacity (non-derated)



Source: DECC/National Grid Seven Year Statement

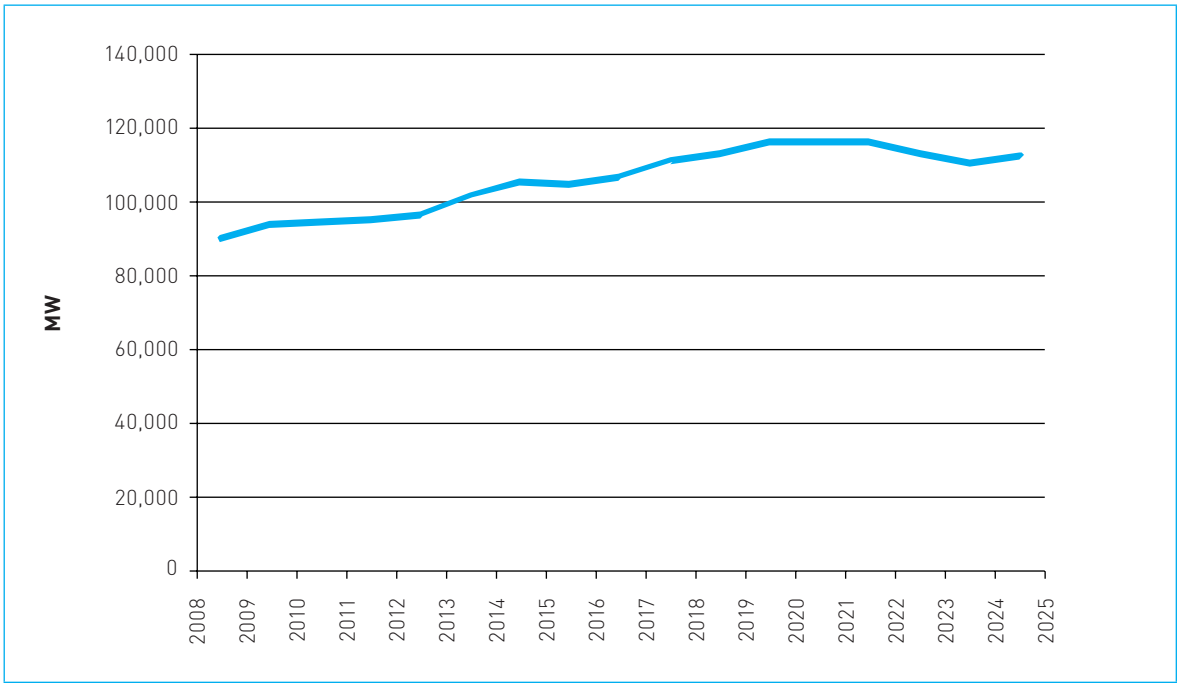
3.3.14 Chart 3.5 shows existing and anticipated GB electricity generating capacity on a non-derated basis. In terms of plant closures, this takes account of closures under the Large Combustion Plants Directive, but does not allow for potential closures arising from the Industrial Emissions Directive. In terms of new build coming forward, assumptions are based on National Grid data. In practice, the type and total amount of new build could turn out to be higher or lower, particularly over the longer term. Generators' investment decisions fundamentally depend on expected future profitability, which is largely informed by investors' views of such factors as: likely future developments in the supply-demand balance, Government and regulatory policy, relative movements in fossil fuel and CO_2 prices, and the capital cost of new plant.

3.3.15 It may be noted that capacity identified as "Transmission Contracted, not consented or under construction" entails only limited commitment on the part of investors involved, particularly looking farther ahead.

3.3.16 An alternative source of capacity projections is provided by the Updated Energy and Emissions Projections (UEP)[9] which DECC published in June 2010. The UEP modelled four different scenarios, which amongst other outputs can be used to illustrate the likely impact of different fossil fuel and carbon prices on the need for new electricity generating capacity by 2025. All scenarios assume that electricity demand in 2025 will be approximately the same levels as today. While these UEP scenarios are therefore consistent with the National Grid range of forecast demand, it is quite possible that any of these scenarios may underestimate the increased use of electricity by 2025 as the UK moves to decarbonsise. Whilst UEP shows the amount of capacity needed to meet the estimated demand, National Grid data considers the capacity that investors have expressed an interest in developing, which may not necessarily be taken forward[10].

3.3.17 Chart 3.6 illustrates the forecast growth in generating capacity over the period to 2025 under the high scenario. The total capacity projections for all scenarios in 2025 are set out in Table 3.2. The projections do not reflect a desired or preferred outcome for Government in relation to the need for additional generating capacity or the types of electricity generation required.

Chart 3.6: Projected total capacity under the High scenario, 2010 to 2025



[9] DECC UEP: http://www.decc.gov.uk/en/content/cms/statistics/projections/projections.aspx These updated projections do not take into consideration the policies announced in 'The Coalition: our Programme for Government', which include a floor price for carbon. New policies will be incorporated once the impact can be modelled.

[10] It should also be noted that National Grid forecasts are for demand on the Transmission System. Taking account of growth in embedded generation would tend to increase overall demand levels.

Table 3.2: Summary of UEP projections of total electricity capacity by 2025

	Low fossil fuels and carbon prices (GW)	Central fossil fuels and carbon prices (GW)	High fossil fuels and carbon prices (GW)	High high fossil fuels and carbon prices (GW)
Projected total electricity capacity required by 2025	103	107	113	113

3.3.18 In the longer term, DECC's 2050 pathways[11] analysis shows that total decarbonisation will require increased use of electricity in domestic and industrial heating and transport. This is expected to outweigh increases in energy efficiency, potentially leading to a doubling of electricity demand by 2050.

New build: Planning

3.3.19 On 29 June Government announced that it will abolish the Infrastructure Planning Commission (IPC) and replace it with a new Major Infrastructure Planning Unit (MIPU) as part of the Planning Inspectorate. It also announced that it would re-consult on the draft energy National Policy Statement (NPS) in the autumn. This is due to changes which have been made to the Appraisal of Sustainability for the Overarching Energy NPS.

3.3.20 NPSs will still be the primary consideration for decisions on planning applications for major energy infrastructure under the Planning Act 2008.

Gas- and Coal-fired Generation

3.3.21 12.2GW of gas-fired generation is at various stages in the planning and development process (source: National Grid). At present, there is no new coal plant with planning consent.

New build: Nuclear

3.3.22 The nuclear industry has announced plans to build up to 16 GW[12] of new nuclear capacity in the UK.

3.3.23 In spring 2009, the Nuclear Decommissioning Authority (NDA) ran a successful auction to sell land adjacent to its nuclear sites at Wylfa, Oldbury and Bradwell. In October 2009 the NDA completed the sale of land adjacent to its existing site at Sellafield[13] for potential new nuclear build.

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[11] DECC 2050 Pathways Analysis: http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/2050/2050.aspx

[12] Revised Draft Overarching National Policy Statement for Energy (EN-1), DECC, October 2010 https://www.energynpsconsultation.decc.gov.uk/docs/RevisedDraftOverarchingNationalPolicyStatementforEnergy%28EN-1%29.pdf

[13] Nuclear Decommissioning Authority: http://www.nda.gov.uk/news/sellafield-land-sale-agreed.cfm

New build: Renewables

3.3.24 Latest statistics[14] from August 2010 show that 4.6 GW of renewable projects are under construction. A further 6.7 GW of projects have planning permission and are awaiting construction and over 14.2 GW more are going through the planning process. These are mainly projects for wind generation at various stages of development including under construction, that would connect to local networks and/or would not be covered by the consents process in England and Wales. These figures therefore differ from the National Grid figures due to these methological differences in data collection.[15] It may also be noted that since these figures were published, two large projects under construction have become operational.

Embedded or Distributed Generation

3.3.25 As well as large power generation that connects to the high-voltage transmission network, there are smaller generation plants connected to the distribution networks. Generation plant can also be located at consumer premises, either on an industrial/commercial site or micro-generation in homes.

3.3.26 For the purposes of investors in large scale generation, this embedded or distributed generation may be treated as a reduction in demand for large scale generation. This sector is expected to grow as the future energy network is made smarter and as local energy generation and storage increases (both heating and transport are likely to become a larger part of the overall electricity system in coming decades). This anticipated future growth of embedded or distributed generation is therefore a factor in forming a view about future demand for large scale electricity generation, and thus in investors' decisions, as well as the design of the electricity market (on which DECC will shortly be consulting).

3.4 Electricity Networks

Current network reliability

3.4.1 The three transmission network operators in Great Britain face regulatory incentives and statutory obligations that, among other things, create an operating environment designed to minimise energy unsupplied. Historically, the record of the electricity transmission network in Great Britain has been impressive. For instance, for 2008/09, the National Grid transmission network in England and Wales experienced a loss of unsupplied energy of only 335.5MWh[16]. This equates to a transmission reliability of approximately

[14] DECC RESTATS database – https://restats.decc.gov.uk/app/reporting/decc/datasheet, N.B. since these figures were published two large scale wind projects – Crystal Rig Wind Farm and Thanet Offshore Wind Farm – have moved from 'under construction' to 'operational'.

[15] National Grid data show there are approximately 2.4 GW of renewable projects with a grid connection are currently under construction with a further 4 GW with planning consent and grid connection agreement.' Source: National Grid's Seven Year Statement.

[16] "Report to the Gas & Electricity Markets Authority: GB Transmission System Performance Report 2008- 2009", National Grid. Available at http://www.nationalgrid.com/NR/rdonlyres/2DC98143-EECA-4864-AA64-1B9597C01444/37464/GBTransmissionSystemPerformanceReport_0809_Final.pdf

99.99974%, measured in terms of the index of unsupplied energy to energy actually delivered.

3.4.2 The operators of electricity distribution networks in Great Britain also face incentives to reduce the number and duration of interruptions to supply over their network. Since these "quality of service" incentives were introduced, an average distribution service customer would have experienced only four interruptions in total over the five years from 2001-2 to 2005–6. The average duration of such interruptions is about 90 minutes.

3.4.3 The size and location of our network infrastructure are important in minimising any transmission constraints, both now and in the future with a lower carbon generation mix. We consider future build of network capacity below.

Future development of electricity networks

3.4.4 There is a significant programme of investment underway in GB electricity networks. Ofgem, through the 2007-12 Transmission Price Control and the previous Distribution Price Control (2005-10), agreed around £9bn of investment. The latest Distribution Price Control (2010-15) will allow up to £7.2bn on investment in the distribution network. The investment programme includes funding for replacement and maintenance of network assets, in order to ensure continued network reliability, as well as for network expansion in order to connect new generation projects, including those remote from the main inter-connected transmission system.

3.4.5 The Government and Ofgem have been involved in the industry process to examine possibilities for developing the transmission network further to support the connection of new generation developments, including up to 35GW of renewable generation and potential new nuclear power stations. The Electricity Networks Strategy Group (ENSG), chaired by DECC and Ofgem, published a report in March 2009, that set out the transmission companies' view of the potential extra transmission investments needed to connect the significant changes in the generation mix to 2020, including growth in both onshore and offshore wind generation. This estimated that upgrading the onshore grid could require up to £4.7bn of extra investment over the next decade. Using the findings of the report the Transmission Owners (TOs) have been identifying and submitting proposals for specific investments to Ofgem. Following an allowance of £12.5m for pre-construction activities in April 2009, in April 2010 Ofgem made further necessary licence changes to approve a first tranche of £318m of funding on projects planned to commence construction before 1 April 2011. When making its decision on the first tranche of investment, Ofgem committed to consider further requests for the remaining investments (which in April 2010 had a potential value of £764m) as more information came to light and is now in the process of considering these updated requests.

3.4.6 Offshore wind generation has a key part to play in meeting our energy and climate change targets. The Government and Ofgem have therefore been working to put in place a new offshore transmission regulatory regime to connect an industry ambition of developing up to 50GW of offshore wind generation in UK waters, in the most cost effective, as well as timely and co-ordinated manner. This regime will provide opportunities for new entrants to the market as Offshore Transmission Owners (OFTOs) to design, finance, build and own offshore transmission assets. Ofgem started the first tenders for transitional (already constructed) assets in Summer 2009 and following full implementation of the transitional regime in July 2010 (Go-Live) it announced the preferred bidders of that round. Ofgem will run a further transitional tender round later this year. Government and Ofgem ran a further consultation on the enduring transmission regime between end August and end September 2010 that included a generator-build option. The responses are being analysed prior to the results being announced later in the Autumn. National Grid published the Offshore Development Information Statement[17] in September 2010. This document aims to help facilitate the development, in offshore waters, of an efficient, co-ordinated and economical system of electricity transmission.

Interconnection

3.4.7 In terms of interconnection, the UK currently has a 2 GW link to France, and a 450 MW link between Northern Ireland and Scotland[18].

3.4.8 Increased interconnection may provide important security of supply benefits, such as access to additional power supplies which could help manage supply fluctuations. On the other hand, with greater interconnection, there can be circumstances where tighter markets and higher prices outside the UK could result in electricity being exported, thereby tightening the market in the UK. However, it would be expected that UK prices would rise at times of market tightness, and depending on the supply/demand balance with interconnected markets, this would encourage electricity flows to reverse. Interconnection also introduces an additional variable when balancing the system, and an additional uncertainty to be managed, although the ability to access other markets could help system balancing. There is evidence from the US and Europe that extensive interconnection across System Operator boundaries can lead to difficulties in predicting power flows, particularly when faults occur and circuits trip. However, this can be managed through close cooperation and information exchange between System Operators and is less of a problem with DC interconnection, as power flows can be controlled.

[17] National Grid Offshore Development Information Statement: http://www.nationalgrid.com/uk/Electricity/ODIS/

[18] Ofgem: http://www.ofgem.gov.uk/Europe/Documents1/Interconnector%20policy%20consultation.pdf

3.4.9 There are plans to develop an East-West Interconnector linking the UK and Irish electricity grids. National Grid, in a joint venture with Dutch Transmission System Operator (TSO) TenneT, is building an interconnector between the UK and the Netherlands which is expected to be completed by late 2010. In addition, National Grid has two planned further links, with Belgium and reinforcement of the UK-France link. Also the Irish investment company Imera has two planned links, between Ireland and GB and between GB and France.

3.4.10 However, even if all these links are built, the UK's level of interconnection would still be less than 10% of installed generation.

Grid Access

3.4.11 If the UK is to meet its climate change and renewable energy targets and ensure security of supply, large amounts of renewable and other low carbon generation need to be able to connect in the next decade. Historically, grid access arrangements have delayed or prevented the connection of new renewable and other generation needed to help meet climate change targets and ensure energy security. In some cases, new generators were being offered grid connection dates as late as 2025. Timely and effective enduring reform was therefore recognised as essential.

3.4.12 As part of the Annual Energy Statement, the Government announced on 27 July 2010 a new enduring regime for grid access, enabling new generation to connect to the network quickly, removing a key barrier to new generation. Under this 'Connect and Manage' regime, new generation can apply for an accelerated connection based on the time taken to complete their 'enabling works', with wider network reinforcement carried out after they have been connected. It was implemented on 11 August 2010, and provides greater certainty for all new generators about the rules for access to the grid over the long term.

3.5 Conclusions

3.5.1 National Grid's central case projection for peak electricity demand is for this to remain relatively stable at around 60GW, although there is a range of sensitivities around this central case. These sensitivities relate to: fuel prices, energy conservation, household numbers, power generation capacity and output, CHP capacity, embedded generation and exports.

3.5.2 Peak generation capacity in the UK currently stands at 85.3GW. However, the coming decade will see many changes in the electricity markets, in particular, the closure of a number of coal and oil fired plant, that are considered too polluting by modern standards, and nuclear plant that are scheduled to come to the end of their working lives. The Large Combustion Plants Directive will lead to closure of around 12GW of coal and oil-fired fleet by 2016 at the latest. The Industrial Emissions Directive could also lead to further closures by 2023. In addition, according to current timetables, up to 7.4GW of existing nuclear generating capacity is reaching the end of its operational life and will have closed by 2020.

3.5.3 However, 9 GW of new plant that will connect to the National Grid is already being built, and a further 10.8 GW that will connect to the National Grid has planning permission. Of this new capacity with planning permission, 6.7 GW is gas-fired generation[19].

3.5.4 In terms of Renewables, including capacity connecting to local networks as well as to the National Grid, latest statistics from August 2010 show that 4.6 GW of renewable projects are under construction in the UK. A further 6.7 GW of projects have planning permission and are awaiting construction and over 14.2 GW more are going through the planning process. This new capacity will replace the capacity due to close with cleaner technologies and will contribute to securing our supplies, while at the same time helping to reduce our green house gas emissions.

Box 3.1 The Single Electricity Market

The Single Electricity Market has been in operation in Ireland since November 2007. It is a first in Europe covering two Member States and coupling two transmission systems operated by two system operators and collectively known as the all island system. The two systems are coupled by a single north south tie line which is due for substantial reinforcement in 2012. The SEM is coupled to the GB market by the Moyle 'interconnector' which is, interestingly, not an interconnector for EU purposes as it joins two regions of the same Member State. Substantial further interconnection to GB and France is planned.

The origins of the SEM date back to November 2004 when Northern Ireland's Department of Enterprise, Trade and Investment (DETI) and the Republic of Ireland's Department of Communications Marine and Natural Resources (DCMNR) together with the Northern Ireland Authority for Utility Regulation (NIAUR) and the Commission for Energy Regulation (CER) published a Development Framework for an All Island Energy Market, setting out the dates by which they expect to achieve these unified markets.

CER and NIAUR initiated the first phase of the project as set out in the Framework Document – the establishment of an all-island wholesale electricity market, known as the Single Electricity Market (SEM). The SEM high-level design was completed in June 2005 and on the back of this the CER and NIAUR (jointly known as the Regulatory Authorities) set to work on the implementation of a suite of arrangements necessary for SEM Go Live by 1 November 2007. The Single Electricity Market (SEM) which commenced, as planned, on 1 November 2007 created a single market for the trading of wholesale electricity in Northern Ireland and the Republic of Ireland.

[19] As at October 2010

The SEM is a centralised or gross mandatory pool market with electricity being bought and sold through the pool under a transparent market clearing mechanism (save for generators which have a maximum export capacity of less than 10MW for whom direct participation is voluntary). Generators receive the System Marginal Price (SMP) for their scheduled dispatch quantities, capacity payments for their actual availability (based on fixed amounts determined annually), and constraint payments for differences between the market schedule and actual dispatch due to system constraints. Suppliers purchasing energy from the pool pay the SMP for each trading period, capacity costs. The rules of the market are set out in the SEM Trading and Settlement Code.

The SEM is a unique inter-jurisdictional market that comes under the governance of both CER and NIAUR. In view of this, robust joint regulatory and governance arrangements were required to be set up. Accordingly the SEM Committee was established by legislation in Republic of Ireland and Northern Ireland (section 8A of the Electricity Regulation Act 1999 as inserted by section 4 of the Electricity Regulation (Amendment) Act 2007, and Article 6 (1) of the Electricity (Single Wholesale Market) (Northern Ireland) Order 2007 respectively).

At the end of the first year of the market, there were 45 participants registered in the SEM, 13 of whom have joined since the start of the market. These participants had a registered market capacity of 9,856MW. The market operator, SEMO, processes energy payments of approximately €3bn annually, with a further €600m being paid in capacity payments.

One of the main issues facing the SEM at present is the expected high levels of wind generation on the island with a government target of 40% by 2020 for Ireland and a similar target expected to be announced shortly for Northern Ireland. The Regulatory Authorities (RAs) are currently reviewing the market arrangements to ensure that they are robust to these levels of intermittent generation, that investment in an appropriate mix of plant for the island's future energy needs is promoted and to facilitate the achievement of the targets.

4. Gas

4.1 Introduction

4.1.1 This chapter provides a range of projections and assesses the key risks and drivers which have a bearing on gas security of supply over the coming years.

4.1.2 The level of future gas demand in the UK will depend on a number of factors, including economic growth, global gas demand, renewable penetration and fuel prices, which are hard to project accurately. In addition to meeting demand in GB, supplies are also needed to meet demand for gross exports to Ireland (Northern Ireland and the Republic). Gas is also exported from GB to the Continent through the IUK Interconnector, particularly in the summer months when seasonal swing in demand means UK prices tend to be lower and storage stocks are being filled. In the near future, non physical exports[1] to the Netherlands will also be possible via the Balgzand–Bacton line (BBL) which is currently an import-only supply source.

4.1.3 There are a number of potential sources of supply of gas to meet UK gas demand. These include:

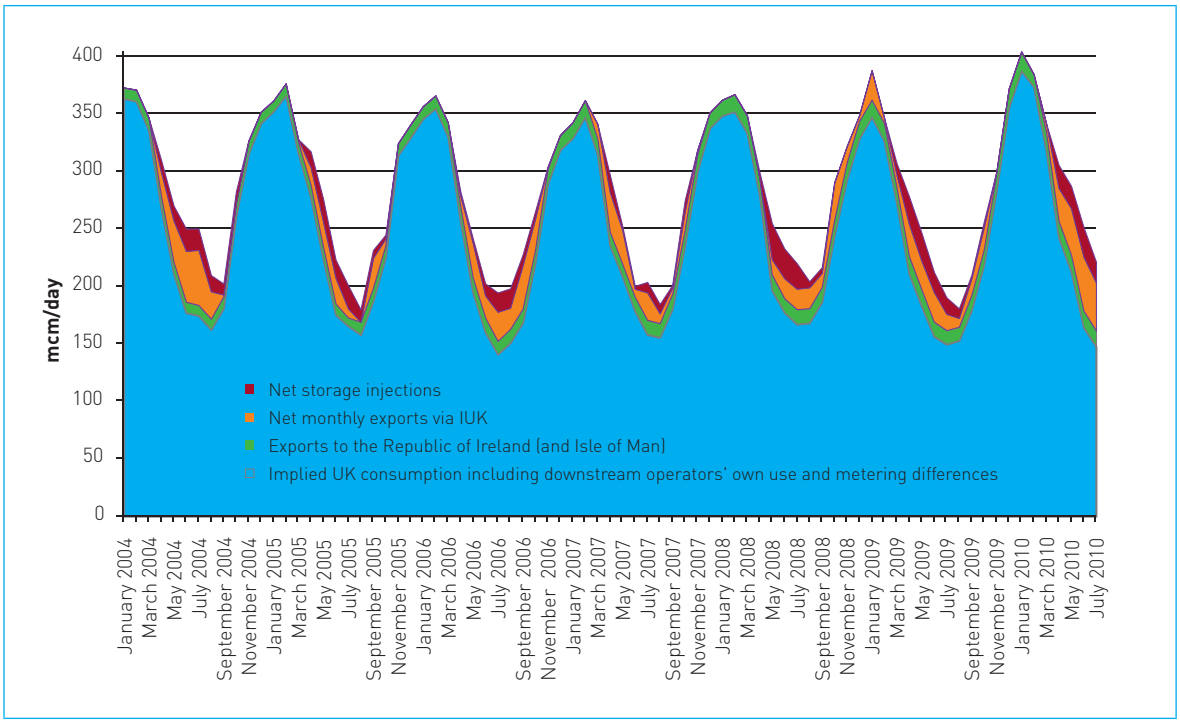
- Production from the UK Continental Shelf – which peaked in 2000 and is expected to continue to decline;
- Imports by pipeline from Norway (including via Langeled to Easington and via Vesterled and the Tampen and Gjoa Links through FLAGS to St Fergus);
- Imports of liquefied natural gas (LNG) by tanker (to date to the Isle of Grain, the two terminals at Milford Haven and a small volume through Teesside GasPort);
- Imports from the Continent through the IUK interconnector with Belgium and the Balgzand–Bacton Line (BBL) pipeline from The Netherlands; and
- Gas storage facilities also provide a role in matching supplies from these sources and demand, particularly seasonal and peak demand.

[1] This would allow shippers to purchase interruptible contracts in order to send 'virtual exports' to the Netherlands; in practice this allows the actual amount of gas imported from the Netherlands to fall below the amount implied by forward flow nominations.

4.2 Demand

4.2.1 Demand for gas varies day-by-day although it tends to be much lower in summer than in winter, despite gross exports and injections into storage, as shown in Chart 4.1. This seasonality is driven by household and business demand for gas for space heating, which is driven largely by temperature levels. For this reason, wholesale prices for gas also tend to show a seasonal pattern. Demand for industrial purposes and electricity generation tends to be much less seasonal and tends to be driven more by the price of gas relative to the prices of other fuels and the price of electricity.

Chart 4.1 UK Monthly Gas Demand



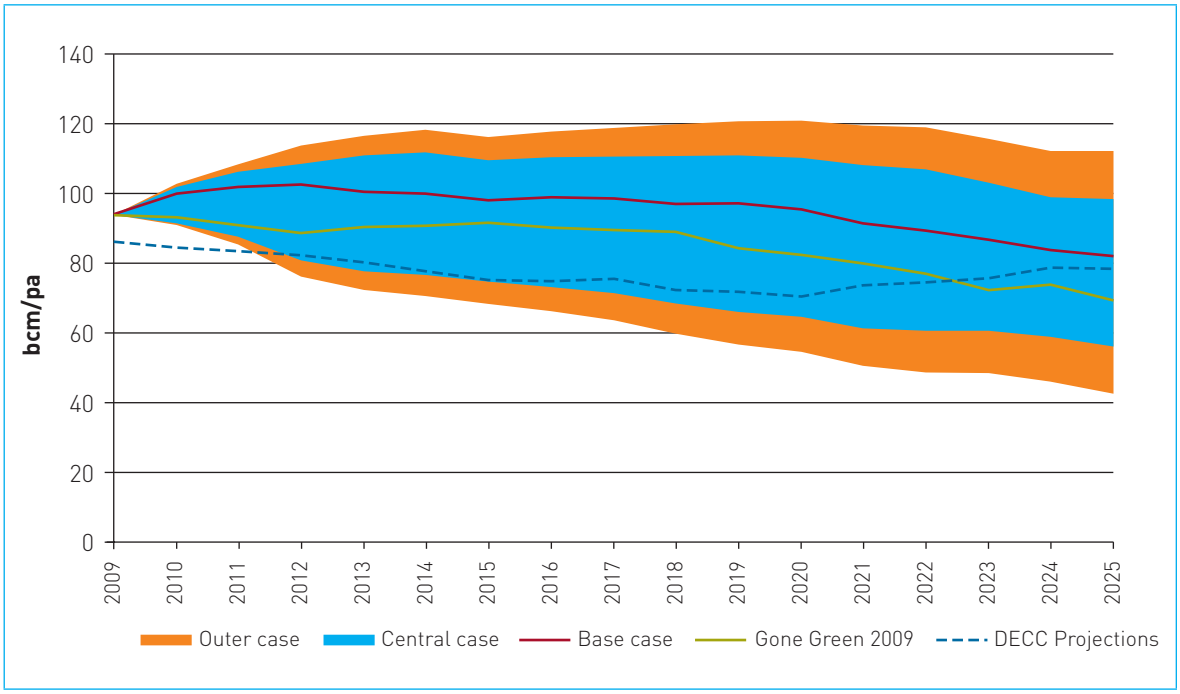
Source: DECC Energy Statistics (September 2010)

Annual Demand

4.2.2 Charts 4.2 shows a range of projections for annual gas demand. A number of sensitivities to the central forecast of gas demand have been assessed. These include strong and weak economic growth, high and low fuel prices, high and low household numbers, high and low cases for power generation capacity and operation and exports. This shows that a range of outcomes are possible, depending on the assumptions. For the purposes of this document the base case for gas demand is consistent with the 'Slow Progression' scenario developed by National Grid. More detail on this scenario and others produced by National Grid can be found in the Development of Investment scenarios document.[2] The Gone Green scenario shown on the chart has been developed as a plausible scenario to meet the 2020 EU environmental targets.

[2] http://www.nationalgrid.com/uk/Gas/OperationalInfo/TBE

Chart 4.2 UK Annual Gas Demand Range



Source: National Grid and DECC UEP40 (dotted line)

4.2.3 UK annual gas demand is projected by National Grid to trend downwards from around 100 bcm per year currently to around 80 – 95 bcm in 2020 in the central case. There are however sensitivities around this leading to a wider potential range of outcomes, depending on factors such as relative fuel prices of gas and coal, the amount of gas fired generation in the electricity generation mix, and economic growth.

4.2.4 The outer case assumes that all factors are acting independently and pushing demand in one direction. In practice these variables are not mutually exclusive. For example, it is possible that weaker fuel prices and weaker economic growth could coincide, cancelling each other out to a certain degree (as far as the impact on demand is concerned). The central case takes this into account.

4.2.5 In the annual gas demand analysis, National Grid's central band is noticeably wider than in previous years. The key driver behind this is the uncertainty in the power generation sector. There are two main aspects to this sensitivity. The first is the amount of gas-fired generation capacity that is connected in the future. This will be driven by underlying electricity demand, environmental legislation, government policy and the role of other fuel types such as nuclear and wind generation. The second aspect is driven by relative fuel prices. The relationship between gas, coal and carbon prices will determine the fuel mix going forward and whether gas or coal-fired generation is used as baseload generation. As the base case assumes that gas is the baseload fuel for the majority of the year, this results in there being a much greater potential downside to the base case gas demand than upside.

4.2.6 More detail behind National Grid's 2010 gas supply and demand forecasts has been published in the Development of Investment Scenarios[3] document.

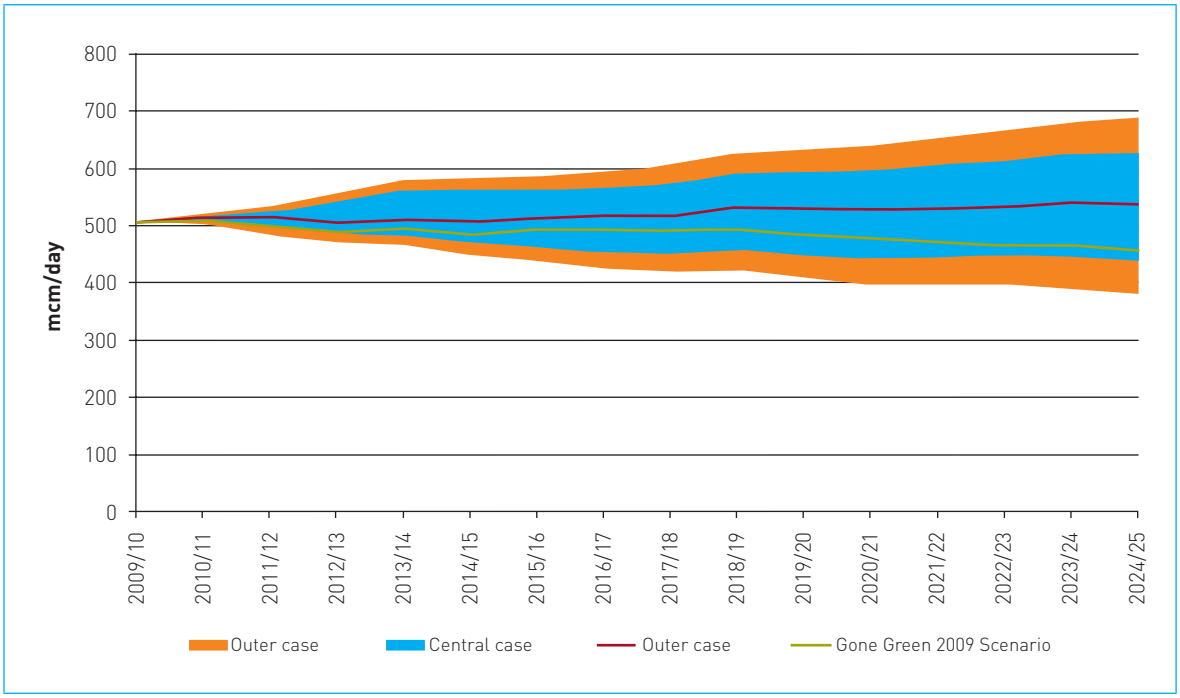
4.2.7 It should be noted that the demand projections provided by National Grid are, in general, higher than the DECC projections because these include exports to Northern Ireland and exports to the Continent via the IUK interconnector.

Peak Demand

4.2.8 The ability to meet demand, whether on a particular day or over a more prolonged period such as a severe winter, is particularly important in a security of supply context. This is equally true for demands during average weather conditions. Chart 4.3 shows a range of potential peak gas demands using the same sensitivity analysis as for annual demand.

4.2.9 There could be changes to the pattern of demand which raises new challenges. Increasing amounts of wind generation, which is variable and relatively unpredictable could increase the volatility of gas demand as gas-fired generators are likely to play a key role in balancing the electricity market. The gas market will need to respond to this challenge in the coming years by becoming increasingly flexible.

Chart 4.3 GB Peak Demand Sensitivity Analysis



Source: National Grid

[3] National Grid Development of Investment Scenarios document: http://www.nationalgrid.com/uk/Gas/OperationalInfo/TBE

4.2.10 National Grid's central projections for peak demand show this remaining at current levels (500 mcm/d) or trending downwards to around 450 mcm/d over the period 2010 to 2020. There is however a range of sensitivities around this central case. These are illustrated as an inner and an outer range.

4.2.11 The inner and outer range are constructed on the same basis as in Chart 4.2, with the outer range a summation of factors acting in concert, and the inner range taking into account the dynamic interaction between different factors leading to some cancelling out the effects of others. The inner range is less pronounced than in the annual demand assessment. Although power generation again has the biggest influence on demand, the uncertainty is lessened due to the impact of different levels of capacity rather than the combined effect of capacity and plant operation. This also results in a more symmetric range of demands around the base case.

Demand-side Response

4.2.12 At times of market tightness, mechanisms on the demand-side are also used to ensure demand and supply balance. Most demand-side flexibility is provided from the power generation sector, which can switch between a range of technologies – at present, primarily coal, oil and gas. Some large users of gas can also be flexible in their gas use. During a period of high prices these customers may, where technically feasible, choose to switch to alternative fuel or to scale back or cease production. These options can be realised by ceasing to purchase gas for companies on voluntary contracts or by selling gas back to the market for companies on firm gas supply contracts.

4.2.13 A key element for sending signals to bring about efficient demand-side response (or greater supply) at times of tightness is the GB's liquid wholesale gas market, which helps to ensure that prices reflect market tightness. Customers (and producers) exposed to these price signals will therefore have incentives to respond. Non-daily metered customers (such as households and small businesses) are not exposed to fluctuations in wholesale gas prices and therefore do not reduce demand when wholesale prices are high. In future, smart-metering could play a role in ensuring security of supply in a cost-effective way by signalling the true costs of consuming gas at times of market tightness.

4.3 Supply

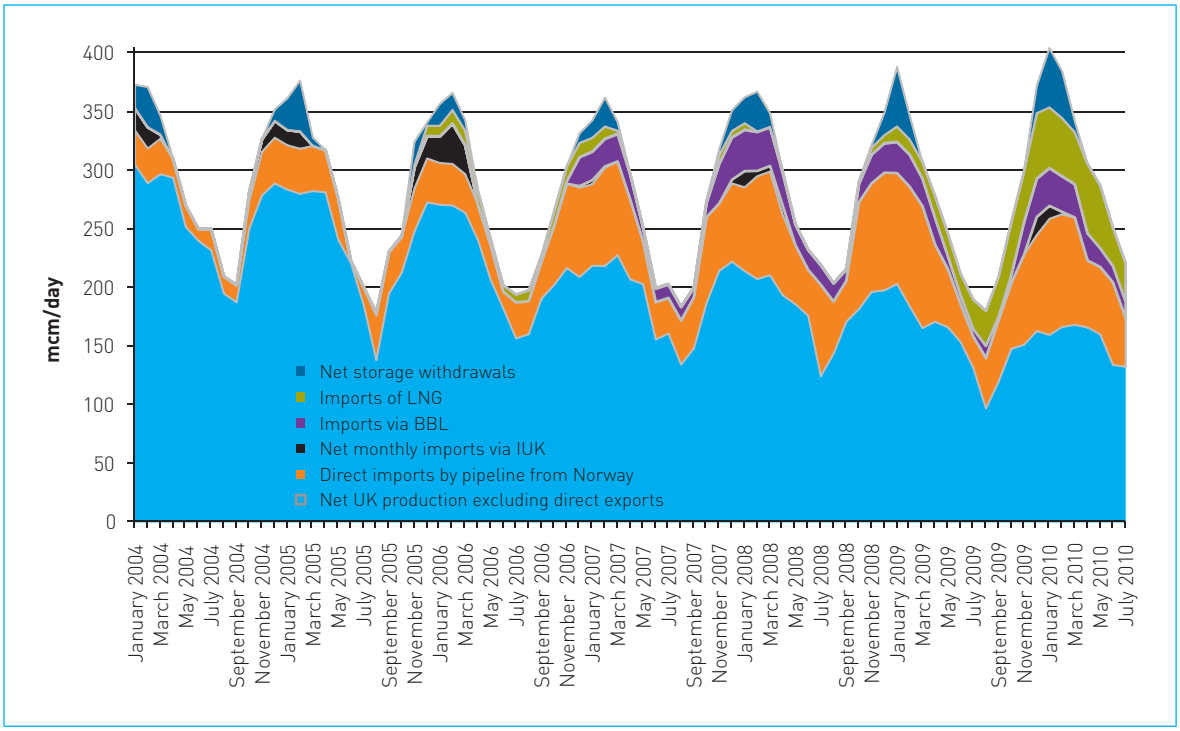
4.3.1 The production of gas from the UK Continental Shelf (UKCS) peaked in 2000 and since then has been steadily declining. UKCS gas is projected to make up less than 50% of UK supplies[4] in 2010 or 2011. Chart 4.4 illustrates the monthly variation in the principal sources of UK gas supply. The seasonal flexibility in supply from UK production, so-called 'swing supply' has also reduced. This partly reflects a greater share of production from associated

[4] Based on all supplies entering the UK, this includes supplies that are subsequently exported to Ireland or Belgium.

gas fields and less from dry gas fields[5], partly because producers are reluctant to switch off fields and partly also because a smaller proportion of production is sold under long-term buyer-nomination contracts.

4.3.2 Demand has increasingly been met by imports. Norwegian, LNG and Continental gas have become increasingly important sources of supply, not only at peak times but throughout the year. Additionally, as UKCS production has declined and the UK has become integrated with the global gas market, gas from storage is important not only at times of peak demand but also throughout the year.

Chart 4.4 UK Monthly Gas Supply



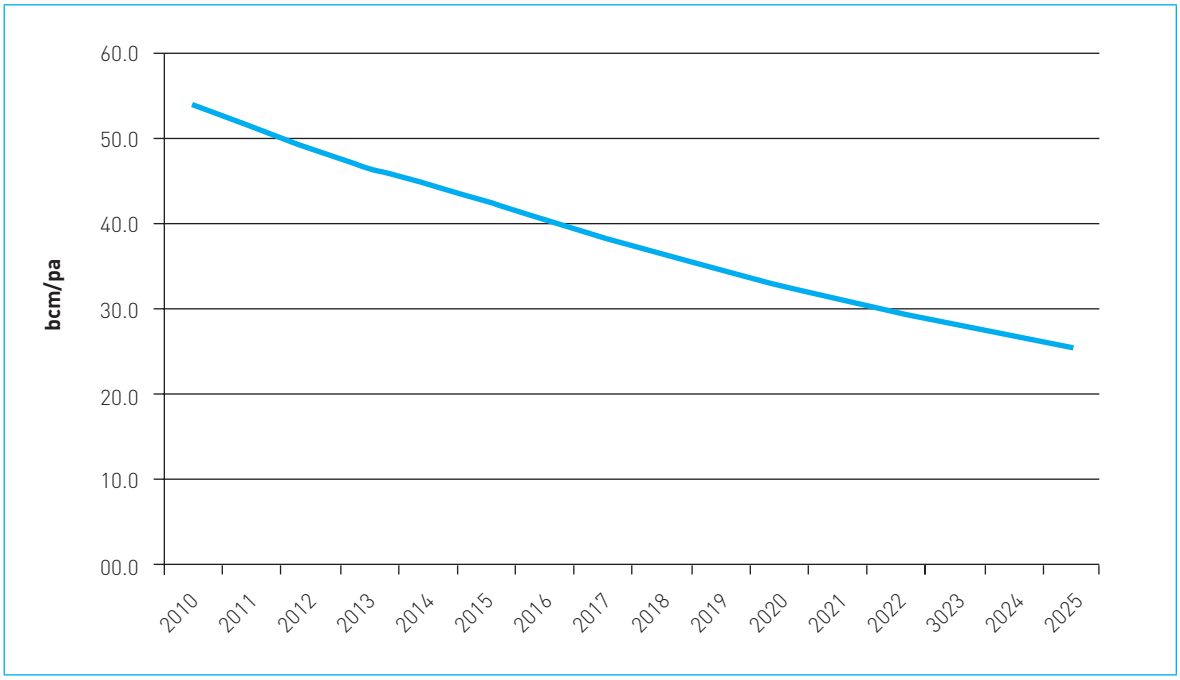
Source: DECC Energy Statistics (September 2010).

UK Production

4.3.3 Production of gas from the UKCS is expected to continue to decline. As with projections of demand, projections of UK gas production are inherently uncertain and should be treated as indicative rather than definitive. DECC's latest projections are shown in Chart 4.5.

[5] Associated gas fields hold both oil and gas, and gas is produced as a joint product with oil. Since oil is the higher value product, production tends to be governed by conditions in the oil market. Dry gas fields contain only natural gas and so their production is influenced but not determined by short term supply and demand conditions in the gas market.

Chart 4.5 DECC production projections



Source: DECC Production Projections[6]

4.3.4 Plans are in place to bring gas from West of Shetland region from around 2014. There are also currently small scale plans for gas production from unconventional sources including biogas and coal-bed methane. Potentially even shale gas could be produced in the UK[7]. However, significant volumes of unconventional gas are unlikely to be available in the UK before the end of the decade.

Imports

4.3.5 Since 2004 the UK has been a net-importer of gas. Import reliance, although neither new to the UK nor uncommon around the world, can bring additional risks of disruption to supply sources. This section considers the UK's projected demand for net imports, import capacity and potential sources for imports and risks associated with the deliverability of imports.

Import Capacity

4.3.6 The UK has a large and growing import capacity which will contribute to security of supply by enabling gas imports to be received from a diverse range of sources. This combination of diversity and capacity could also help to deliver competitive prices since it should be possible to import significant volumes of gas from whichever is the cheapest source. However, while sufficient capacity is a requirement for promoting security of supply, it is also essential that there is sufficient availability of gas (i.e. gas molecules flowing).

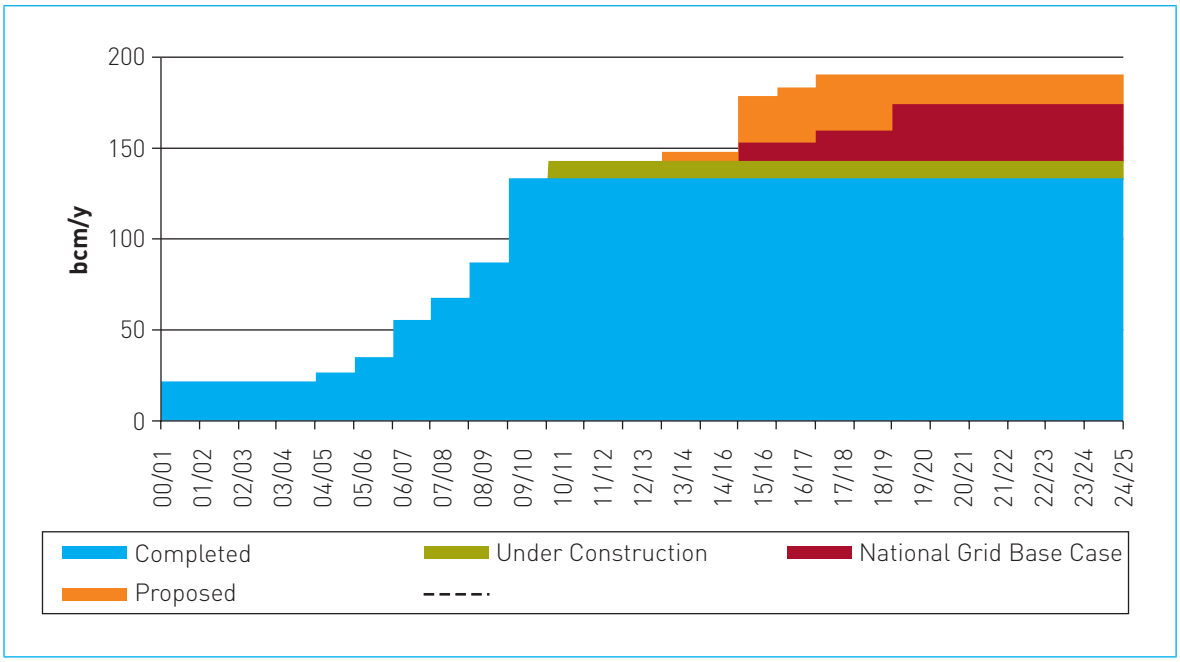
[6] https://www.og.decc.gov.uk/information/bb_updates/chapters/Section 4_17.htm

[7] There is uncertainty around how much of this gas will make it to market, or when.

4.3.7 Compared to annual demands of ~100bcm/y: the UK currently has UKCS production of ~50bcm/y and import capacity totalling ~134bcm/y. This breaks down into ~48 bcm/y from Norwegian pipelines, ~45bcm/y from LNG importation facilities and ~42bcm from capacity connecting the UK to the Continent.

4.3.8 More (10 bcm) import infrastructure is due to be delivered this year through expansion of the BBL pipeline and increased import capacity at Grain LNG. A further 32bcm of import projects has been proposed (though the extent to which all those plans will come to fruition is uncertain). Chart 4.6 shows current and potential import capacity. Note annual capacity is not a measure of utilisation.

Chart 4.6 Possible Evolution of UK Gas Import Deliverability

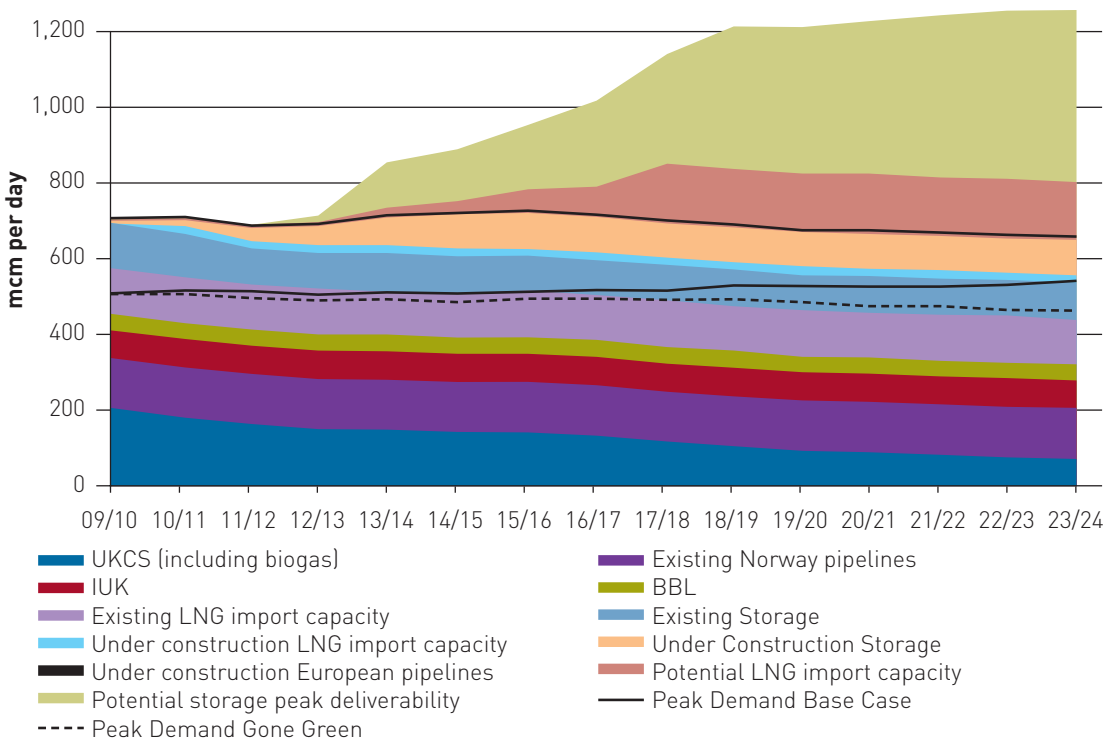


Source: National Grid (September 2010).

4.3.9 Chart 4.7 shows peak winter gas demand projections (as set out in Chart 4.3) overlaid on supply capacity (physical import pipeline capacities, peak storage deliverability and capacity of the UKCS to supply). Import capacity is shown in terms of 100% availability. This level of availability would not be expected in practice, for example due to availability of supply, planned maintenance and repair as well as unexpected outages. It suggests that in nominal terms, even without planned projects, there is sufficient import and storage capacity existing (and under construction) to meet all of National Grid's theoretical peak day demand scenarios to the end of the next decade.

4.3.10 Having sufficient capacity to meet single day demand peaks is not enough in itself. A "buffer" of spare capacity on the system is required to reflect non used capacity, physical outages or increased needs in the event of a prolonged cold period.

Chart 4.7 GB Peak Daily Winter Gas Demand and Supply Capacity (nominal) including possible projects



Source: "Transporting Britain's Energy" consultation process, Project Developers

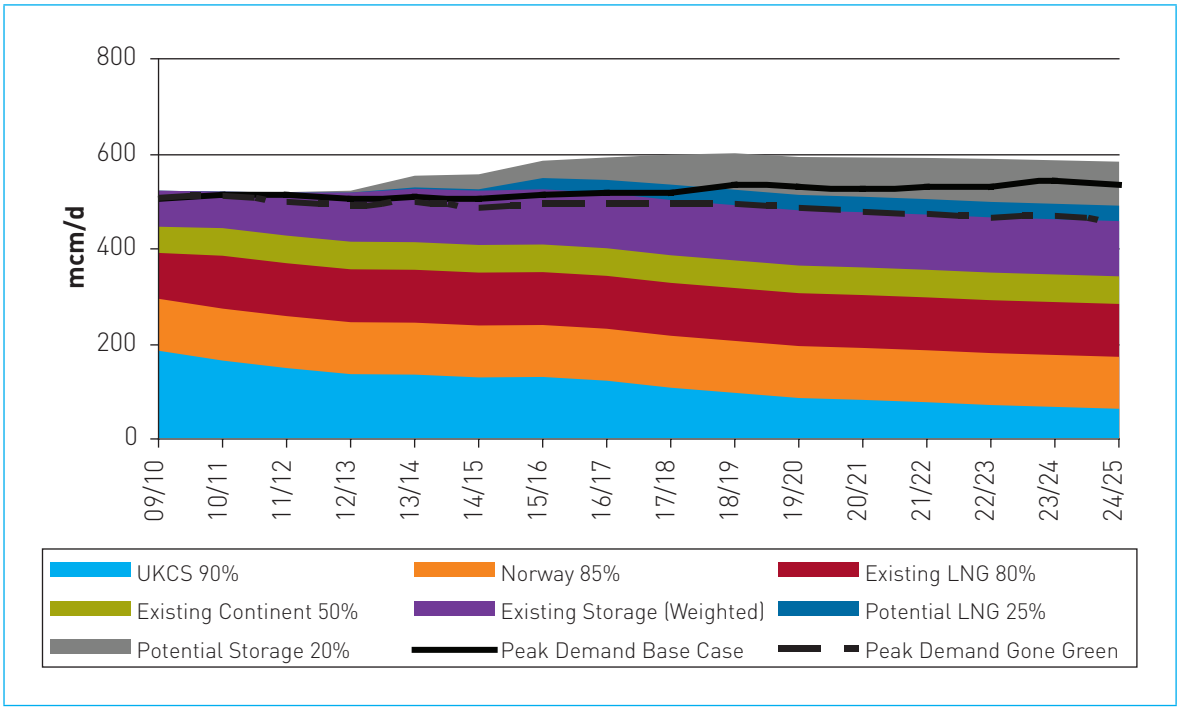
4.3.11 While sufficient capacity is a requirement for ensuring security of capacity, it is also essential that there is sufficient availability of gas. Chart 4.8 shows the build up of UK supply capacity though it has been adjusted ('de-rated') to reflect typical winter operational characteristics of import infrastructure. For this analysis, the following factors have been applied: UKCS at 90%, Norwegian import pipelines at 85%, LNG operating at 80% and Continental supplies at 50%. To reflect development uncertainty, potential LNG import projects are included at 25% and potential storage projects are included at 20%. This chart suggests that existing derated peak supply capacity may fall below peak supply in some scenarios.

4.3.12 De-rating supply capacity can be useful in so far as the de-rating factors reflect the expected flow rates at a time of peak demand. However, caution needs to be exercised in using derated data where the derating factors reflect factors unrelated to the infrastructure itself – for example, if the factors reflect issues at other points in the supply chain which might limit the amount of gas available[8]. In this case therefore, if estimated derated capacity falls short of peak demand it does not necessarily indicate that more import (or storage) capacity is needed. Capacity utilisation could be higher or lower than indicated or rise or fall over time. All other things being

[8] For example, the availability of gas in Europe for export through the IUK or the availability of LNG into import terminals.

equal, we would expect more gas to be available when GB wholesale prices increase – as we would expect at a time of peak demand.

Chart 4.8 GB Peak Daily Winter Gas Demand and Supply Capacity (derated) including possible projects



Source: National Grid September 2010

Norway

4.3.13 The UK's first pipeline from Norway was commissioned in 1977 and Norway has historically been a reliable, stable and secure supplier of gas to the UK as well to Europe as a whole. At times, due to contractual arrangements, Norway has prioritised supplies to the Continent at the expense of the UK. Today, Norway has the capacity to export approximately 48bcm a year to UK (and ~90bcm a year to Continental Europe). Imports to the UK totalled ~26bcm in 2008 and ~24bcm in 2009. Infrastructure built this decade includes: The 25 bcm Langeled pipeline commissioned in 2006, the Tampen link commissioned in 2007 and the Gjoa link to be commissioned in 2010. Flows through these links are limited by the 10 bcm capacity of the UK FLAGS pipeline. Norwegian production is projected to level off over the next few years before commencing a decline, consequently there are no current plans for additional Norwegian export infrastructure to the UK or the Continent.

The Continent

4.3.14 The UK gained its first interconnection to Continental Europe in 1998. Today, import capacity through the Interconnector is around 27 bcm per year and 15 bcm per year through the BBL. Continental imports to the UK totalled 9bcm in 2008 and 7bcm in 2009.

4.3.15 On the one hand, as part of the European gas market the UK gains some measure of security of supply because it can access a wider pool of gas. On the other hand, the UK is exposed to European security of supply problems. Although, the UK imports little or no gas directly from Russia, the EU as a whole is currently highly dependent on Russian gas which accounts for around 40% of all EU imports.

4.3.16 Whilst improving, wholesale markets in Europe at present tend to be relatively illiquid and less transparent. Risks to imports from Europe may include, lack of access to pipeline infrastructure and storage or low market liquidity or competitiveness outside UK borders.

4.3.17 In January 2010, a combination of supply and demand-side factors meant that National Grid issued four within-day Gas Balancing Alerts (GBAs) between 4 and11 January. GBAs are a way of indicating to the market that additional supplies and/or demand-side response are required, in order to avoid a shortfall. Wholesale gas prices rose around the time of the GBAs providing the incentive for additional supplies to come forward and for gas demand to respond to the increasing gas price. Industrial consumers with shorter term contracts reacted more than those with longer contracts. This indicates that the market perceived the tightness to be short lived. The within-day price of UK gas only needed to rise modestly to attract gas through the IUK interconnector because the global gas market was well supplied and European gas stocks were high. Once the last of the GBAs was lifted (on 11 January), prices quickly returned to their pre-GBA levels. It may be noted that household consumers are shielded from the short term movements in wholesale price.[9]

4.3.18 European gas security of supply is best ensured by an open and integrated EU market so that customers and shippers in the UK, and across Europe, have access to a wide range of gas supplies at prices which reflect market fundamentals.

4.3.19 The Third Package of EU internal market legislation, which entered into force on the 3rd of September 2009, is a major step forward. But more needs to be done. Firstly, the package must be implemented in full and in time by all member states. Secondly, more detailed technical rules will be needed to underpin the greater integration of EU energy markets and this will be achieved through the European network codes as provided for in the Third Package. Binding rules on gas market transparency have already been adopted and the EU regulators and system operators are developing further rules on mechanisms to allocate capacity on gas pipelines, manage pipeline congestion and introduce market-based cross-border balancing.

[9] The same set of demand and supply factors could lead to different outcomes in future winters; the outcome will depend upon a range of factors such as the availability of piped-gas or LNG and the fullness level of storage.

4.3.20 There are also measures and obligations on Member States, Competent Authorities and Natural Gas Undertakings in the new EU Regulation on Security of Gas Supply (see box 4.1) which will improve transparency and market functioning. This Regulation, expected to enter into force in December 2010, is, in part, a response to the January 2009 Ukraine/Russia gas dispute when the EU lost around 30% of its gas imports for two weeks. Based on well-functioning market principles, it will facilitate better emergency preparedness and more effective response mechanisms in the event of supply disruptions, ensure supplies to protected customers even in severe weather conditions and lead to greater regional co-operation with more effective and bidirectional cross-border pipeline interconnection. The measures in the Regulation should help improve EU (and therefore in UK) energy security.

Box 4.1: EU Regulation on Security of Gas Supply

The Commission published the text of a proposed Regulation[9] (to replace the existing 2004 Security of Gas Supply Directive) on 17 July 2009. The proposed Regulation has undergone significant changes during a negotiation process that has involved Member States, the Commission and the European Parliament. The Regulation is expected to be adopted and enter into force end November/early December 2010. The Regulation will include the following measures/obligations:

- Competent Authority to be designated by each Member State and is responsible for ensuring the implementation of the measures in the Regulation though tasks can be delegated;
- Competent Authority to ensure gas supplies to protected customers (minimum households) for at least 30 days in conditions of exceptionally high gas demand likely to occur statistically once in twenty years (1 in 20 years) and for at least 30 days in the event of disruption of the single largest gas infrastructure; supplies also to be ensured for a 7 day peak period of gas demand in 1 in 20 years;
- Preventative Plan (with Risk Assessment) and Emergency Plan (consistent with the early warning, alert and emergency levels set out in the Regulation) to be drawn up and Competent Authorities to consult on those Plans at the appropriate regional level prior to their adoption; joint Plans also possible with other Member States; Plans to be adopted, published and notified to the Commission within two years of entry into force of the Regulation (Risk Assessment initially carried out within twelve months of entry into force);
- 'N-1' rule which requires Member States to ensure that, within four years, in the event of a disruption of the single largest gas supply infrastructure, there is sufficient remaining infrastructure capacity to satisfy total gas demand during a day of exceptionally high gas demand in 1 in 20 years;

[10] Proposal for a Regulation concerning measures to safeguard security of gas supply: http://ec.europa.eu/energy/strategies/2009/doc/2009_ser2_regulation_greffe16072009.pdf

- All interconnectors to have physical bi-directional flow capability within three years with strict criteria where exemptions are sought; Commission intervention possible where Member States disagree on decisions on bi-directional flow;

- Commission may require changes to Preventative Plans where they impact negatively on another Member State and otherwise request changes to Preventive and Emergency Plans;

- Commission shall verify whether a declaration of a national emergency is justified according to the definition in the Regulation, is consistent with the national plan and does not place an undue burden on natural gas undertakings; it may request actions to be modified in an Emergency;

- Commission has powers to call a Union or Regional Emergency in certain circumstances and co-ordinate Member State action with third countries in that event Member States are required not to take measures which would restrict cross-border gas flows unduly at any time, not to take measures that are likely to endanger seriously the gas supply situation in another Member State and to maintain cross-border access to gas infrastructure as far as technically and safely possible;

- The existing Gas Co-ordination Group will be reconstituted to facilitate the co-ordination of measures concerning security of gas supply and as a forum for discussion on inter alia best practices and possible guidelines, national, regional and Union scenarios and testing levels of preparedness; the Group will be chaired by the Commission and will be composed in particular of Member States, Competent Authorities, European Regulators (ACER), European Transmission System Operators (ENTSO-G), industry and consumer representation;

- Information requirements are set out including notification of third country agreements to the Commission, aggregated contract information over a year with third countries, daily reporting of gas data in the event of emergencies with post emergency assessment, measures taken or planned to be taken in the event of a Union or Regional Emergency and publication of Public Service Obligations in respect of gas security of supply; and

- Commission is required to carry out continuous monitoring of, and reporting on, security of gas supply measures, assess overall consistency of Preventive Plans and Emergency Plans and draw conclusions as to possible means to enhance security of supply at Union level.

Imports from the rest of the world

4.3.21 In recent years the UK's LNG regasification capacity has increased significantly, with terminals at Milford Haven and the Isle of Grain, and the Teesside GasPort facility. Imports of LNG to the UK were ~1bcm in 2008 and ~10bcm in 2009, the increase mainly being facilitated by increases in import capability and global LNG production.

4.3.22 Though most LNG is sold (notably in the Far East) through long term contracts, more broadly the LNG market is slowly moving towards globalisation due to a number of factors:

- although the LNG market is relatively small – providing only 7.3% of all (world) gas consumed – the LNG market is important in terms of gas traded, accounting for 24.8% of this market[11]. This is expected to continue growing rapidly;
- world regasification capacity is now around twice as large as world liquefaction capacity. Having surplus regasification capacity allows for a large degree of flexibility in where LNG cargoes can be shipped to. This facilitates price arbitrage on the part of producers such that LNG can be delivered to where the price is highest;
- an increasing proportion of LNG is not contractually committed to one specific destination;
- advances in liquefaction, regasification and LNG shipping technology have pushed down costs and increased trading between basins. Average shipping distances have increased from around 5,700km in 2000 to around 7,100 in 2008[12]; and
- high current and forecast US unconventional gas production (tight gas, shales and coal-bed methane) has made LNG supplies available that would otherwise have gone to North America. As a result of technology advances, developing markets such as China have also started significant exploration efforts for this resource which could free up future LNG production for other destinations such as Europe and the UK.

4.3.23 These developments are encouraging – since they foster the growth of a deep and liquid global market for LNG. Such a market would mean that the UK would need to compete on price with a larger range of other markets to attract gas although it would also mean an increase in the number of potential suppliers competing to supply LNG to the UK too. The impact on LNG prices that the UK would face is not clear, but on balance a global gas market is welcome since it will be easier to attract large volumes of gas that the UK may need in the event of a supply disruption or surge in demand.

[11] IEA Natural Gas Market Review 2008, from tables on page 27.

[12] IEA Natural Gas Market Review 2009, OECD/IEA 2009, page 98.

4.3.24 Risks remain to the development of a global gas market. These risks are both economic and political in nature. For instance:

- global investment in the LNG (and upstream) supply chain will need to keep pace with future world demand despite the recent global recession; and
- the increasing concentration of reserves could allow suppliers to exercise market power either individually or if this facilitates the creation of a cartel.

4.3.25 However, it may be noted that in the near term, the availability of LNG to the UK is likely to be high. This is due to:

- the recent economic downturn which has depressed demand for LNG globally;
- increased amounts of LNG on spot markets as customers exercise the downward flexibility on bi-lateral contracts; and
- the large falls in the demand for LNG in the United States due to the recent boom in unconventional gas there, removing a large competing source of demand in the Atlantic basin.

4.3.26 It should be noted that even with a much deeper and more liquid LNG market, the responsiveness of LNG supplies will always be limited by how quickly it can be shipped to the UK. The market may need to find ways to cope with any delays between when the gas is needed and when LNG cargoes can arrive – perhaps by developing more gas storage – to prevent any increased reliance on LNG from translating into greater market volatility. Rising material costs, a shortage of skilled labour and increased uncertainty, particularly around long term sales also threaten the development of future LNG liquefaction facilities.

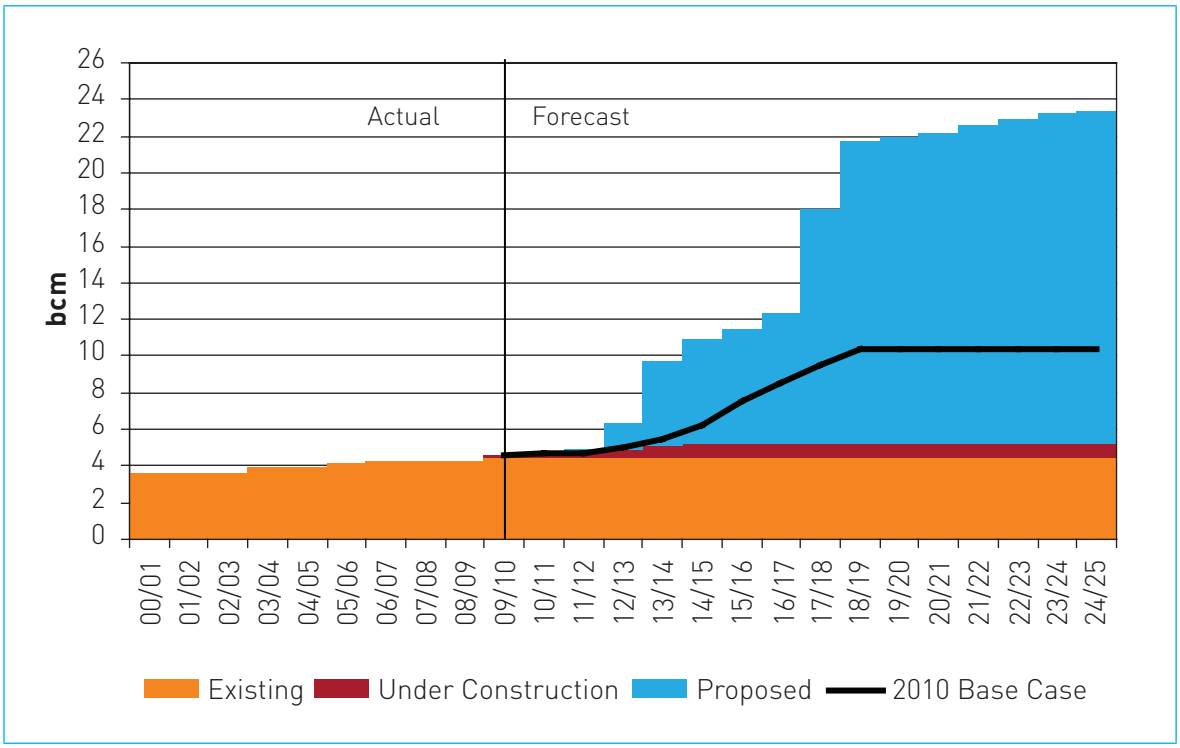
Storage

4.3.27 Storage is one means of managing seasonal demand fluctuations – historically gas has tended to be put into storage in the summer months when gas is cheap and abundant and taken out in the winter months when the demand for gas is highest and prices higher. Storage is also one option for dealing with short-term demand fluctuations or supply disruptions, which the UK may be further exposed to as it becomes increasingly import independent. Storage will also become increasingly important as the power contribution from wind increases, whereby gas fired CCGTs are expected to provide cover for wind intermittency. The flexibility of storage sites – expressed crucially in terms of the withdrawal (and injection) rate – will be key in helping to meet short-term demand fluctuations.

4.3.28 Storage capacity is often described in terms of a number of days' worth of supply but this is not a particularly satisfactory or meaningful measure since stored gas is not used on its own to meet demand. Instead, gas from storage is used to supplement supply from other sources to a greater or lesser extent depending on overall demand and the availability of other supplies. For example, the UK's largest gas storage facility, Rough, is capable of delivering over 10% of typical UK winter daily demand and could do so continuously for about eleven weeks if it started from full; other facilities can collectively deliver more per day, but would run out of gas much more quickly if they were to run at their maximum rate.

4.3.29 At present there are currently some 9 commercial gas storage projects currently in existence in GB. Three new facilities[13] are also under construction, as well as the Aldbrough facility in Yorkshire which began commercial operations in 2009/10 and is currently undergoing expansion. There are another 15 proposed storage facilities. Chart 4.8 below show storage space in terms of existing facilities, those under construction and those proposed.

Chart 4.8 GB Gas Storage Capacity



Source: National Grid (TBE information as of September 2010)

[13] The three gas storage facilities currently under construction are: Holford in Cheshire, due 2011/12; Hilltop Farm in Cheshire, due 2011/12 and Stublach in Cheshire, due 2013/14.

4.3.30 For their Base Case, National Grid assume that not all of the storage proposals will proceed as planned and that many of those that are developed may slip in terms of their delivery dates. Under this scenario the UK is expected to be able to store about 11% of its expected annual demand by 2020/2021.

4.3.31 As more gas storage is developed so gas deliverability will increase too. If all current storage proposals were to go ahead then the maximum storage deliverability would increase from almost 120 mcm/day to above 600 mcm/day, far in excess of forecast peak day demand. Under National Grid's Base Case, by 2021 the UK is expected to have the nominal capacity to meet 50% of its expected peak daily demand from stored supply.

Outlook for Supply

4.3.32 In the UK, gas suppliers have a responsibility to ensure that their customers' demands are met. As well as the reputational and commercial risks involved in not being able to offer gas supply at competitive prices, gas suppliers face financial penalties, which can be very severe, if they fail to balance their inputs into the National Transmission System with their customers' offtakes on a daily basis. The suppliers have an incentive to help ensure that they minimise these risks. Options include diversity of sources and supply routes, contractual arrangements or vertical integration with producers and/or importers, holding gas in storage and reliance on the daily market as well as the construction of new import and supply facilities. Ofgem issued an open letter in August 2010[14] seeking stakeholders' views on a number of potential Significant Code Reviews (SCR), including gas security of supply. Ofgem is minded to launch a gas security of supply SCR in January 2011, which would be confirmed through a launch statement.

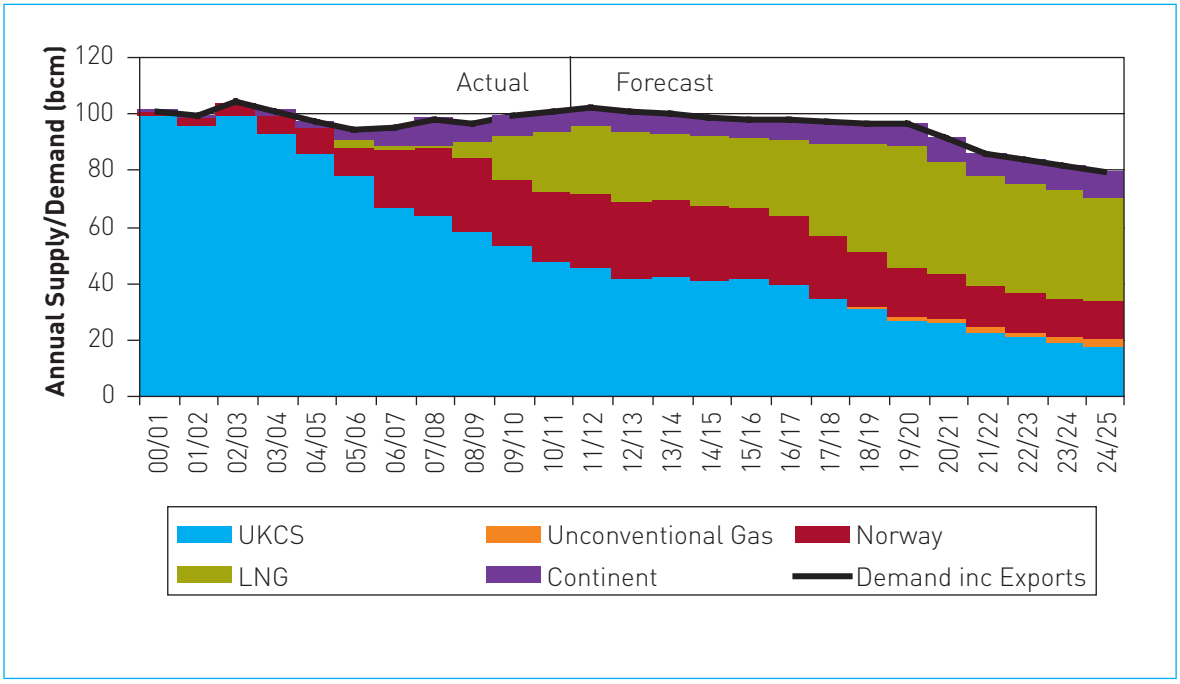
4.3.33 The ability to meet gas demand, whether on a particular day or over a more prolonged period such as a severe winter, as well as average demand levels is particularly important in a security of supply context. Each of the sources of supply – UK production, imports from Europe or LNG, and storage – will deliver a greater or lesser proportion of demand at any time depending on several factors which vary daily or seasonally and with varying levels of predictability or manageability, such as price, production conditions and contractual arrangements.

4.3.34 The extent to which flows from each of the different sources and supply routes (including the UKCS) would respond to price signals resulting from changes in the supply–demand balance within the UK market is subject to considerable uncertainty deriving from a range of factors including, for example; commercial, technical, weather-related, geopolitical, seismological, and industrial-relations led factors.

[14] Open letter consultation: Potential Significan Code Reviews. 12 August 2010.

4.3.35 There is therefore a wide range of possible supply sources that could be used to meet the UK's gas demand out to the medium term. Chart 4.9 shows how GB annual demand could be met in National Grid's 'business-as-usual' demand scenario and assuming National Grid's profile of UKCS production; supply is met with pipeline gas from Europe and a rapidly growing amount of LNG[15]. It should be noted however, that this chart considers gas flows on an annual basis and not a seasonal or peak basis. DECC's central projection is that the UK will require significantly less imports in future than implied by this graph due to slightly higher UKCS production and lower demands due to meeting the UK's 2020 energy targets.

Chart 4.9 National Grid Base Case Annual Supply–Demand Match



Source: National Grid (TBE information as of September 2010).

[15] Project Project Discovery annual gas supply sources for each scenario are at page 32 of Ofgem's Discovery consultation document.

4.4 Resilience to Shocks

Box 4.2: The Pöyry Reports

Earlier in the year DECC published work commissioned from Pöyry Energy Consulting which made an assessment of the risks to Great Britain's gas supplies and the consequent impacts over the medium-term. The work also looked closely at the risks arising from the European and international LNG market.

The studies show that the following market developments have helped to support an increasingly resilient GB market:

- the UK's abundant and diverse capacity, particularly the recent rapid growth in import infrastructure. This has counter-balanced the fall in UKCS supplies and moved the GB from a period of tight capacity margins towards a situation of excess capacity.
- the growth of a large and flexible LNG market and consequently the possibility of LNG arbitraging prices in different markets (e.g. between the UK and the US) which has allowed the UK effectively to access gas storage overseas; and
- the continued availability of gas from Europe as the European market liberalises.

The studies also show that the following could help to support security of supply in future:

- delivering on the UK's current renewable and energy efficiency targets;
- continued liberalisation of European markets; and
- the delivery of key infrastructure projects such as Nordstream.

The studies by Poyry Consulting did identify some realistic combinations of unusual demand, supply shocks and oil prices, which could have a high impact on some GB gas consumers. The likelihood of such scenarios occurring and the probability of there being insufficient gas to meet demand was judged to be low. However the nature of the high potential impact of such events has provided the underpinning for measures that would enable Ofgem to sharpen incentives on shippers and supplies to maintain secure supplies including during a gas shortage emergency.

It should be noted that any model has limitations and uncertainties over outcomes increase the further into the future the analysis looks. In particular, adoption of different methodologies and underlying assumptions will lead to different degrees of assurance in terms of security of supply. This would be seen for example in Ofgem's Project Discovery and National Grid's derated version of capacity as reported in this document.

4.5 Network reliability

4.5.1 The GB gas transmission network achieved 100% reliability in 2009/10. System reliability is assessed as no supply losses to firm supply points. During winter 2009/10 It was necessary to interrupt one customer supplied directly from the NTS on a single occasion. This interruption was limited to the interruptible flows. 2009/10 saw a maximum gas demand of 465mcm/d, an increase from the previous year's maximum demand of 443 mcm/d.

4.5.2 National Grid's Gas Transmission network reliability was 99.9999% for Distribution Networks. Information relating to forward planning for the gas transmission networks is set out in detail in National Grid's Ten Year Statement.[16]

4.6 Conclusion

4.6.1 The outlook for security of gas supply is broadly benign in the near term. This does not mean that it is risk-free; there are risks, both in the short term, and towards the second half of the decade, when some uncertainties remain. UK annual gas demand is projected to trend downwards slightly in DECC UEP40 and National Grid's central case. There are, however, sensitivities around this leading to a wider potential range of outcomes, depending on factors such as relative fuel prices of gas and coal, the amount of gas fired generation in the electricity generation mix, and economic growth. Projections for peak demand show this remaining at current levels (500 mcm/d) in the Central case or trending downwards to around 450 mcm/d in the Gone Green 2009 scenario over the period 2010 to 2025.

4.6.2 While production from the UKCS is projected to continue to decline, GB has an increasingly large and diverse range of import sources on which to draw. New import and storage capacity is identified at various stages of development and delivery. Should this come forward, the UK would continue to be well-served. In practice, it is noted however that projects might slip, and some of this a capacity might not come forward.

16 National Grid Ten Year Statement: http://www.nationalgrid.com/uk/Gas/TYS/

5. Oil

5.1 Introduction

5.1.1 This chapter presents a brief summary of key facts on UK oil production and supply. It also briefly reviews the actions DECC is taking to monitor oil markets and ensure continued energy security.

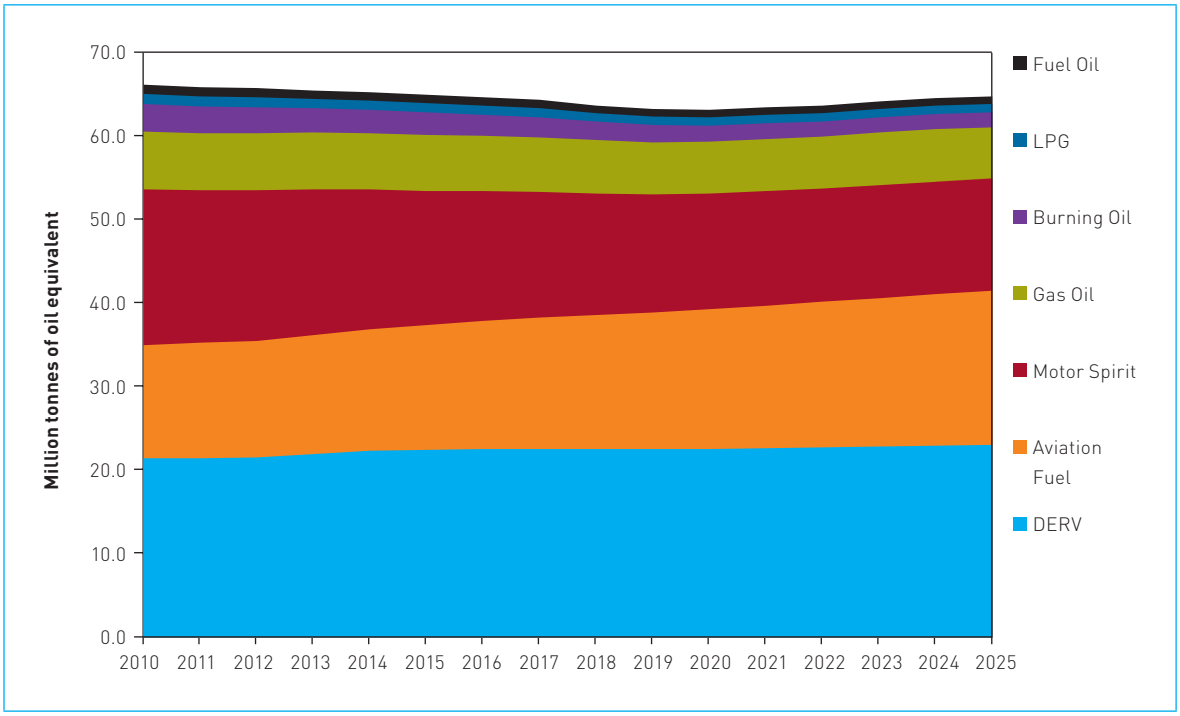
5.2 UK Oil Demand

5.2.1 Oil products play an important role in the UK economy, providing around 33% of the primary energy used. We currently rely on oil for almost all of our motorised transport needs. Transport accounted for around 75% of final consumption of oil products in the UK in 2009, amounting to 49.6 million tonnes of oil. In the longer term we need to reduce our dependence on oil by improving vehicle efficiency and using new alternative fuelled vehicles. However, demand is projected to increase in the short to medium term, because although consumption of petrol in the UK is forecast to fall, demand for diesel and aviation fuel is expected to continue to rise.

5.2.2 Over time, technology changes, including electric vehicles and the generation of more heat from renewables, together with Government energy efficiency policies such as seeking to encourage greater use of public transport, will reduce demand for oil. But as Figure 5.1 illustrates, significant reductions are not expected over the next 10-15 years. This is primarily because the transport sector is the main consumer of oil and will continue to be heavily dependent on it over this period.

5.2.3 Transport's dominant share of UK demand is the culmination of rising absolute demand for transport fuels, declining industrial demand, and a significant shift away from the use of fuel oil for power generation. This growth trend in transport's share of oil demand is expected to continue in the future.

Chart 5.1: Forecast UK oil demand by petroleum product type



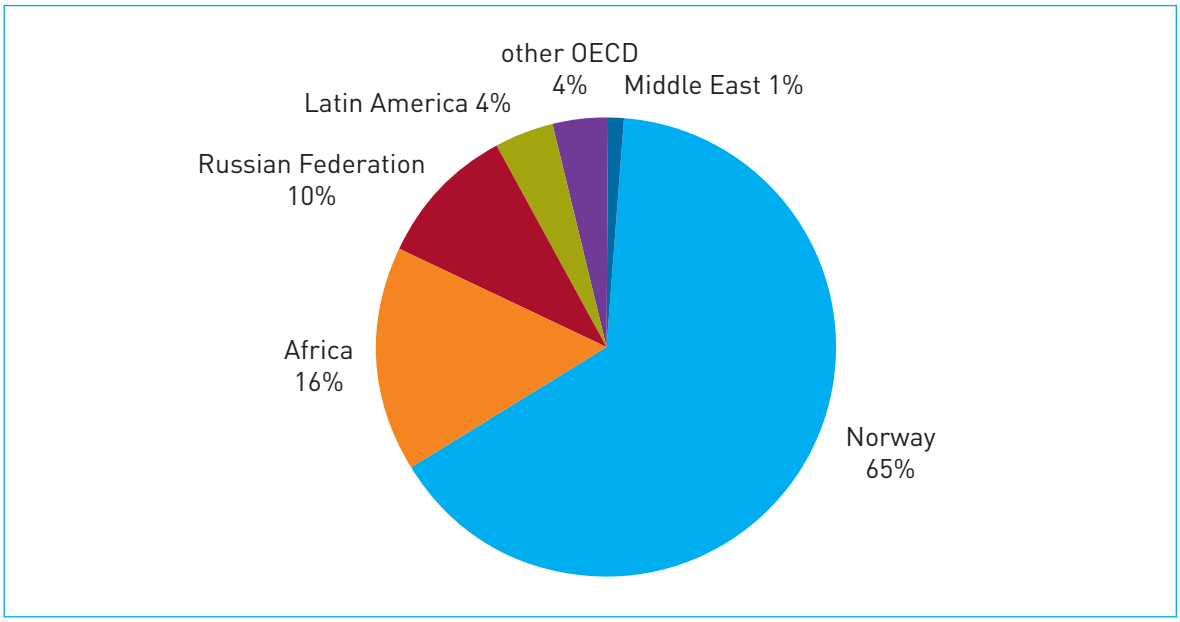
Source: DECC Updated Energy Projections, June 2010

5.3 UK Oil Production

5.3.1 UK oil production peaked in 1999 and is now declining. DECC's latest central projection indicates UK production (including natural gas liquids) falling to 50.2 million tonnes in 2015, down from 67.8 million tonnes in 2009, though there is a wide margin of uncertainty on such projections. The actual rate of future decline will depend on the level of investment and the success of further exploration.

5.3.2 Since 2005, the UK has consistently been a net importer of crude oil, as production from the UK continental shelf has declined. In 2009, net imports accounted for 11% of crude refined in the UK. Most of the UK's crude imports come from Norway, with the remainder largely supplied from Russia and Africa (see Chart 5.2 below). Although supplies tend to be sourced nearby in order to minimise transport costs, the UK's coastal import infrastructure gives us the flexibility to source imports from a range of suppliers. Although we are net importers of crude, the UK remains a net exporter of petroleum products.

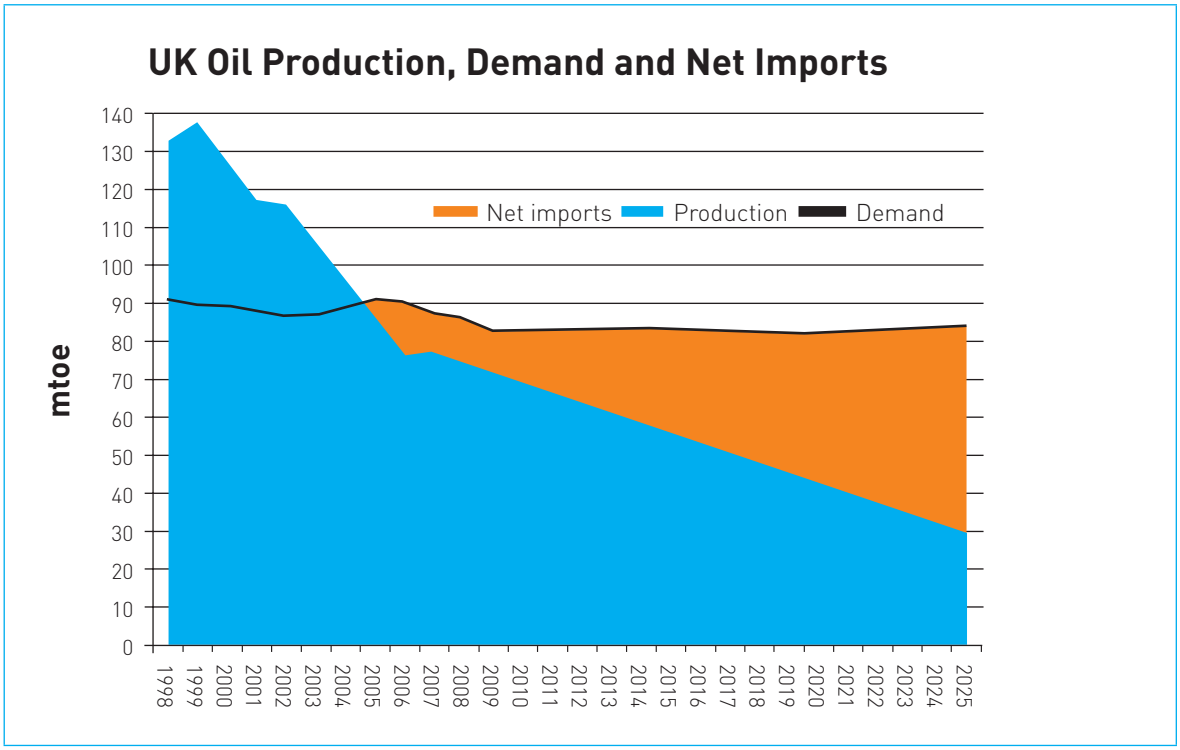
Chart 5.2 – Sources of UK crude oil imports, 2009



Source: DECC data

5.3.3 Given relatively flat demand levels and decreasing domestic production, UK reliance on imported oil is forecast to increase:

Chart 5.3 – UK oil production and demand, forecast to 2025



Source: DECC data

5.4 Downstream oil

5.4.1 The UK demand for oil products has changed over the last 10 to 15 years, driven by growth in the aviation sector, the increasing numbers of diesel vehicles and a reduction in the use of oil for power generation. Although aggregate demand has fallen (from 81 million tonnes in 2005 to 72 million tonnes in 2009, at least partially driven by the economic downturn), there has been a significant shift in the mix of products consumed.

5.4.2 UK refineries have been unable to match the changing pattern of demand. Compared to current UK demand, they produce a surplus of petrol and fuel oil and relatively little middle distillates, as they are still configured to meet the historically higher levels of petrol demand. For refineries to reconfigure their processes to produce more middle distillate requires substantial investment; in particular in new processing/conversion units.

5.5 Global oil issues

5.5.1 Conditions in the global oil market are relevant for UK energy security. Due to the market's liquid and flexible nature there have not been any significant physical supply disruptions in the recent past. However, the International Energy Agency's 2009 World Energy Outlook points to a risk of an oil supply crunch should investment not respond in time to increases in oil demand.

5.5.2 This topic is out of scope for this report and as such will not be covered in detail. It is worth noting, however, that DECC continues to take actions to monitor global oil markets and reduce the risk of price volatility, including:

- working through the International Energy Forum, the International Energy Agency and the G20 to improve the effectiveness of oil markets and encourage the necessary investment in both increasing oil supplies and reducing oil demand by:
- improving the functioning of the oil market by making more and better information available through the Joint Oil Data Initiative, in which all major countries participate;
- promoting better dialogue between oil producers and consumers through the International Energy Forum;
- working with the IEF Expert Group to improve market functioning; and
- supporting countries capable of increasing production over the short term to improve their rate of production.

5.6 Conclusion

5.6.1 Oil products play an important role in the UK economy, providing around 33% of the primary energy used. We currently rely on oil for almost all of the UK's motorised transport needs. Transport accounted for almost 85% of energy consumption of oil products in the UK in 2009, amounting to 49.6 million tonnes of oil.

5.6.2 Over time, technology changes, including electric vehicles and the generation of more heat from renewables, together with Government energy efficiency policies such as seeking to encourage greater use of public transport, will reduce demand for oil in the long term. Significant reductions are not anticipated for the next 10-15 years.

5.6.3 Oil production in the UK peaked in 1999 and is now declining. Oil imports are forecast to increase through the 2025 timeframe.

5.6.4 DECC continues to work with its international partners to improve the effectiveness of oil markets and encourage the necessary investment in both increasing oil supplies and reducing oil demand.

Glossary of Acronyms

Glossary of Acronyms

ACER:	Agency for the Cooperation of European Regulators
BBL:	Balgzand-Bacton Line- Gas import pipeline
BCM:	Billion Cubic Meters
CCGT:	Combined Cycle Gas Turbine
CCS:	Carbon Capture and Storage
CER:	Commission for Energy Regulation
CO2:	Carbon Dioxide
DCMNR:	Department of Communications Marine and Natural Resources
DECC:	Department of Energy and Climate Change
DETI:	Department of Enterprise, Trade and Investment
DUKES:	Digest of United Kingdom Energy Statistics
EU:	European Union
ENSG:	Electricity Networks Strategy Group
ENTSO:	European Transmission System Operators
EP:	European Parliament
FLAGS:	Far North Liquids and Associated Gas System
GB:	Great Britain
GBA:	Gas Balancing Alert
CHP:	Combined Heat and Power
GW:	GigaWatt
IEA:	International Energy Agency
IED:	Industrial Emissions Directive
IEF:	International Energy Forum
IUK:	Gas interconnected import pipelines
IPC:	Infrastructure Planning Commission
IPPC:	Integrated Pollution Prevention and Control
LCPD:	Large Combustion Plants Directive
LPG:	Liquid Petroleum Gas
LNG:	Liquefied Natural Gas

MCM:	Million Cubic Meters
MIPU:	Major Infrastructure Planning Unit
MW:	MegaWatts
MWh:	MegaWatt hours
NDA:	Nuclear Decommissioning Authority
NIAUR:	Northern Ireland Authority for Utility Regulation
NII:	Nuclear Installations Inspectorate
NOX:	Nitrogen Oxides
NPS:	National Policy Statement
NTS:	National Transmission System
OCGT:	Open Cycle Gas Turbine
OECD:	Organisation for Economic Co-operation and Development
OFGEM:	Office of the Gas and Electricity Markets
OFTOs:	Offshore Transmission Owners
OPEC:	Organisation of Petroleum Exporting Countries
SCR:	Significant Code Review
SEM:	The Irish Single Electricity Market
SMP:	System Marginal Price
SOX:	Sulphur Oxide
TBE:	Transporting Britain's Energy
TNP:	Transitional National Plan
TOs:	Transmission Owners
TSO:	Transmission System Operator
TWh:	TeraWatt hours
UEP:	Updated Energy and Emissions Projections
UKCS:	United Kingdom Continental Shelf

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