

The impact of widespread exploitation of shale gas in the US, the discovery of potentially exploitable reserves in the UK and the wider debate around the UK's energy future has driven the issue of shale gas to the fore in public policy debates.

ICE's view

- The factors underpinning UK energy policy - ensuring the security, affordability and decarbonisation of our supplies - remain paramount. Shale gas offers a potential additional source of energy, but Government must not relent in its pursuit of low carbon energy solutions
- Shale gas could potentially replace imported gas supplies, but it should not be viewed as a 'silver bullet' to solve our energy challenges. There are many uncertainties that need to be addressed - particularly over the role that it can play in the UK's energy mix, the safety and environmental concerns associated with its extraction, the extent of commercially available resources and its impact on the UK's wider energy policy objectives. The UK will rely heavily on gas for its electricity and heat needs for many more years and it will have an important role to play in the transition to a low carbon economyⁱ
- Government should continue pursuing lower carbon energy solutions, utilising gas generation for back-up and peaking roles and redouble its efforts to support the development of commercially-viable, large-scale Carbon Capture and Storage (CCS) technology - which has the potential to make a significant contribution to the UK's ambitious carbon reduction targets
- Whilst the US provides a useful case study on the potential impact of shale gas, it is unclear whether similar impacts - such as reduced gas prices for consumers - can or will be replicated in the UK, given the different policy and regulatory conditions which exist. Policy makers should be wary of making blanket assumptions until these issues have been fully addressed
- Further investigation should occur within an appropriate regulatory framework. The concerns of communities affected by fracking should be addressed by means of a public awareness campaign which should also inform the public of the potential benefits of shale gas
- Shale gas policies and regulation should be developed with recognition and understanding of the important interdependencies that exist between energy generation, water resource management - for example, with issues around water scarcity, contaminants and transport. The creation of the Office for Unconventional Gas and Oil (OUGO) will have a role to play in coordinating and overseeing the regulatory process associated with shale exploration

Background

What is Shale Gas?

Shale gas is a subterranean resource exploited through a process called hydraulic fracturing (fracking). Wells are drilled from the surface to shale reserves usually 1-1.5km underground. A high pressure water, sand and chemical mix is then released into the well, fracturing the rock and releasing shale gas which is then piped to the surface.

Large scale fracking is already taking place in the US, where the energy sector has been transformed by the exploitation of shale gas reserves. Formerly an importer, the US is now self-sufficient and moving towards becoming a gas exporter. The discovery of shale gas has led to a reduction in the price of US gasⁱⁱ, although questions have been raised over whether the discovery of UK and European shale reserves would result in similar price reductionsⁱⁱⁱ.

Developments in the US have driven interest in shale exploration around the world. In the UK, a 2010 study by the British Geological Survey^{iv} (BGS) identified areas of suitable geology in many parts of England - especially on either side of the Pennines and south of London - with smaller fields identified in Scotland, Wales and Northern Ireland.

The role of gas in the UK's energy system

The UK faces an energy 'trilemma': it faces a three-fold challenge to ensure the security, affordability and decarbonisation of its energy supplies.

Gas currently meets a large share of the UK's energy needs - providing 41% for electricity generation in 2011^v and 82% of domestic heating fuel^{vi}. In recent decades, the UK has had access to major supplies of North Sea gas but production has halved since 2000 and in 2004, the UK became a net importer of gas. In 2011, UK imports exceeded production for the first time since large scale gas extraction began in the North Sea. Piped gas from mainland Europe and Liquefied Natural Gas (LNG) from the Middle East are increasingly being used to meet demand, at increasing cost to consumers^{vii}

In the next 10-15 years, the importance of gas in electricity generation is likely to increase as many coal and nuclear power stations are decommissioned, delays to proposed nuclear builds persist and the share of intermittent renewable generation grows greatly. Gas generation is a flexible technology; it is able to replace the steady baseload (the amount of power needed to meet customer demands) of coal and nuclear as well as being flexible to meet peak demands and/or to replace the energy generated by wind during low wind periods.

Gas also produces less carbon than coal. In 2011, gas generation produced just 40% of the total CO₂ output per kilowatt hour (KWh) for coal (363g per KWh compared with 887g). However, this is still somewhat short of the Committee on Climate Change's (CCC) call for electricity emissions to be below 100g per KWh by 2030.

To support this aspiration, the Government is looking at carbon capture technology, which has the potential to contribute significantly to our carbon reduction targets. Its implementation has been described by a member of the CCC as being an "absolutely critical" component^{viii}, although it remains unproven at a sufficient scale.

In recent years, the price of gas has risen sharply. The price paid by electricity generators in 2010 was, in real terms, 90% higher than 2000. Future prices are uncertain but global demand seems set to continue rising. Driven in part by rising prices, additional sources of gas have been pursued, with developments in shale gas extraction rising in prominence.

Commercially exploitable resources

A 2010 report by the British Geological Survey (BGS) identified suitable areas of geology across parts of the UK, with the potential for shale gas extraction. In June 2013, a subsequent BGS survey estimated that the total volume of gas in the Bowland-Hodder shale in northern England stood at around 1,300 trillion cubic feet, more than double previous estimates^{ix}.

Whilst not all of this gas will be commercially exploitable, it has been suggested that extracting just 10% of this gas would be enough to supply the UK with gas for 25 years^x. The BGS study is the first in the UK to provide investors, operators and regulators with an indication of where to target future exploratory drilling. The Department of Energy and Climate Change (DECC) has commissioned a similar study for the Weald region of Sussex and has stated that it will commission further studies where appropriate^{xi}.

Whilst energy policy hasn't been devolved from the Westminster Parliament to the devolved nations, there are a variety of policy levers that they could use to support or reject fracking in their area. Scottish Government has not ruled out shale gas as a future contributor to its energy mix and Welsh Government is currently consulting on its approach. In 2011, the Northern Ireland Assembly voted to impose a moratorium on 'fracking', based largely on environmental concerns.

Once extracted, it is unclear what effect shale gas will have on UK gas prices. Compared with the US, the costs of extracting shale gas are expected to be higher in the UK, given the relative density of the population, the presence of tighter regulations and issues around land ownership (in the US, the owner of the land holds the mineral rights, whereas in the UK (and parts of Europe), mineral rights are held by the state).

The impact of US shale gas on international markets has also been raised in recent years. It is unlikely that US shale exports will directly result in lower gas prices, however some indirect effects have been observed, notably:

- LNG intended for the US market has been redirected to Europe, forcing pipeline suppliers to lower prices
- US coal is being pushed out of the US and into European markets, which is hardly compatible with its carbon-reduction agenda

Safety and environmental issues

Fracking has been linked with a range of environmental concerns. In 2011, exploration in Lancashire was halted following earth tremors that were linked to fracking activity. These concerns forced the Government to issue a temporary moratorium on fracking operations (a move that was subsequently reversed in 2012).

Contamination of water supplies has also been linked to the chemicals used in the fracking process, while large volumes of water are also required as part of the process. Regulation can be implemented to manage pollutants^{xii}; however water scarcity issues may be more significant.

ICE's [State of the Nation: Water](#) (2012) raised serious concerns about the growing supply/demand gap in the UK's water resources. At a time when the Environment Agency is reviewing the abstraction licensing regime, it is important that any further demand pressures on water resources are managed with consideration for all water users' current and future requirements and to prevent future water scarcity issues.

Further concerns have been raised about the impact of "fugitive emissions" of methane, although this requires further investigation, and issues relating to the disposal of waste water used during the fracturing process.

Perhaps less-widely discussed is the land area required for extraction. Shale wells tend to have a life of just a few years, and many drilling sites over large areas of land are required for significant extraction. In the UK, achieving such widespread development is likely to be more challenging than in the USA, and concerns have been raised over the economic and political impact of groups opposed to fracking (NIMBY-ism).

Evidence from the US has also suggested that shale extraction operations generate increased road traffic activity^{xiii}, which can place further strains on the local and strategic road network^{xiv}. As concerns over the condition of the UK's roads network featured prominently in ICE's 2013 [State of the Nation: Transport](#) report, ICE will retain a watching brief on the potential impacts of shale gas development on the condition of our roads network.

Impact on wider energy policy objectives

The UK's energy policy is being driven by the triple challenges of security, affordability and decarbonisation. Challenges in delivering new low carbon generation mean that gas has moved further up the policy and political agenda. As nuclear and offshore wind generation will require considerable financial support for the foreseeable future, cheaper gas becomes increasingly attractive to politicians eager to help voters whose household bills have soared in recent years.

The development and deployment of CCS remains uncertain, although the Government remains committed to ensuring its deployment in the long-term. Continuing gas generation without CCS poses problems for climate change targets, and is exacerbated as the development of low carbon alternatives remains slow and expensive.

The UK Government published its draft gas strategy in December 2012, which was followed in June by the announcement of a range of measures designed to support the exploration of shale gas in the UK. These included; the creation of an Office of Unconventional Oil and Gas (OUGO), proposals to introduce tax benefits for shale gas production, planning guidance to local authorities for shale gas exploration sites and incentives for local communities affected by shale developments.

ICE will retain a watching brief on the impact of these developments on the UK's wider energy policy objectives. We would caution that shale gas should not be viewed as a 'silver bullet' that will solve our energy challenges.

ⁱ Even under [National Grid's 'Gone Green' scenario for 2030](#), over one-quarter of electricity generation capacity is gas-based, while the Committee on Climate Change expects [most buildings still to have gas heating](#)

ⁱⁱ [Shale Gas: Hype or Hope?](#) (INSEAD Business School, 7 May 2013)

ⁱⁱⁱ The Impact of Shale Gas on Energy Markets: Government's Response to the Committee's Seventh Report of Session 2012-13 (House of Commons Energy and Climate Change Committee, 17 July 2013, pp7-8)

^{iv} The Unconventional Hydrocarbon Resources of Britain's Onshore Basins - Shale Gas (BGS/DECC, 2012)

^v [Digest of UK Energy Statistics \(DUKES\) 2012](#)

^{vi} Gas's share of high-temperature heating for industrial process was lower – but still 47%

^{vii} UK energy in brief 2013 (DECC, 2013)

^{viii} [Policymakers: Carbon capture and storage delays could cost the UK £40 billion per year](#) (The Carbon Brief, 23 April 2013)

^{ix} [Bowland Shale Gas Study - Main Report](#) (British Geological Society/DECC, 2013)

^x [Britain's shale gas deposits 'could supply country for 25 years'](#) (The Guardian, 27 June 2013)

^{xi} The Impact of Shale Gas on Energy Markets: Government Response to the Committee's Seventh Report of Session 2012-13 (House of Commons Energy and Climate Change Committee (17 July 2013, pp2-3)

^{xii} Buchan, D (2013, p.5) Can shale gas transform Europe's energy landscape? (Centre for European Reform)

^{xiii} A study by the US law firm Baker Botts, reported in Buchan, D (2013, p.6) suggested that in the USA, the process of delivering water to a single shale well could generate as much damage to the road network as 3.5 million car trips

^{xiv} Buchan, D (2013, p.6) Can shale gas transform Europe's energy landscape? (Centre for European Reform)