



BRIEFING PAPER

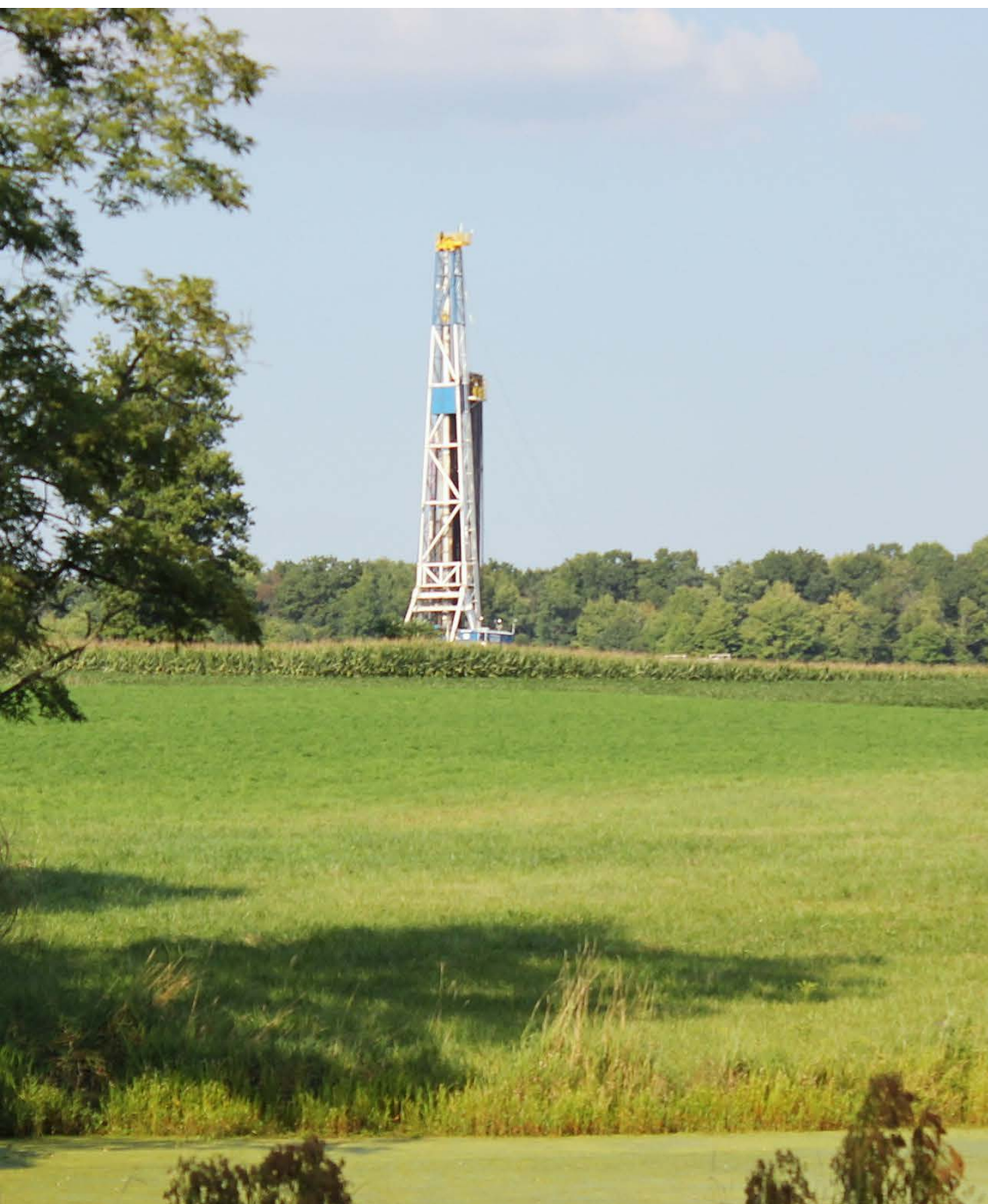
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Shale gas and fracking

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Summary

The rapid development of shale gas resources in the US has transformed the world gas-market outlook. Despite this, the consensus was for a long time that shale gas would not be a 'game changer' in the UK as it has been in the US. This is because the UK has less land available to drill on and landowners do not own the rights to hydrocarbons beneath their land. Additionally, opposition from local communities and environmental groups is strong.

The current state of fracking in the UK

Shale gas drilling in the UK is still at an exploratory phase – no commercial operations have yet been authorised and a lengthy application process must be completed before commercial drilling could start. However, the recent approval of two planning decisions in Lancashire and North Yorkshire suggest that the UK is getting closer to commercial shale gas exploitation:

- In May 2016 the first planning approval for fracking in the UK in five years was granted for Third Energy's application at Kirby Misperton, North Yorkshire. A judicial review of the application brought by anti-fracking campaigners [ruled](#) in December 2016 that the planning approval was legal. Third Energy's application can therefore go ahead onto the next stage.
- In June 2015 Cuadrilla's planning application for exploration at two Lancashire sites – Preston New Road and Roseacre – was [rejected](#) by Lancashire County Council. The firm appealed against this decision. In October 2016 the Secretary of State for Communities and Local Government Sajid Javid [recovered](#) Cuadrilla's appeal, thus allowing the application to go ahead onto the next stage. Anti-fracking campaigners sought judicial review of the Secretary of State's decision on the grounds that it was "not fair or lawful". On 12 April 2017, a High Court judge ruled to dismiss their judicial review actions on the grounds that none of the arguments had been "made out in substance".¹

Planning permission is only one of many steps required for commercial fracking operations to begin in the UK. This means that the two events described above do **not** mean that commercial fracking will necessarily happen in the sites in question. The regulatory regime for fracking applications is described at length in section 3 of this paper.

What is fracking?

The Government and British Geological Survey [published](#) raised estimates of the shale gas resource in Northern England in 2012.

Shale gas is extracted from solid rock using a process called hydraulic fracturing, or 'fracking'. A number of environmental concerns have been raised about fracking, including the potential for seismic events,

¹ The Independent, '[Anti-fracking campaigners lose High Court challenge against drilling in Lancashire](#)', 12 April 2017

air pollution, surface and groundwater contamination, and greenhouse gas emissions.

Environmental concerns

The Royal Society and Royal Academy of Engineering have [reviewed](#) the risks associated with fracking. They concluded that the health, safety and environmental risks can be managed effectively in the UK, by implementing and enforcing best operational practice. However, they also made several recommendations, including calling for more research on the carbon footprint of shale gas extraction.

A [report](#) on this was published by the then Department for Energy and Climate Change in September 2013, in which shale gas emissions were said to be similar to those of conventional gas and lower than those of coal and Liquefied Natural Gas (LNG), leading the Secretary of State to describe shale gas as a 'bridge' to a low-carbon future. However, the Committee on Climate Change [concluded](#) in July 2016 that the implications of shale gas for greenhouse gas emissions are uncertain, and that shale gas exploitation on a significant scale will not be compatible with UK carbon budgets unless tests in relation to emissions, gas consumption, and carbon reductions elsewhere are satisfied.

Recent legislation and licensing rounds

The Oil and Gas Authority is responsible for awarding onshore oil and gas licenses, which include but are not restricted to exploratory fracking operations. These licenses are offered to successful applicants during so-called '[licensing rounds](#)'. The last round – the [14th Onshore Oil and Gas Licensing Round](#) – closed in October 2015 and resulted in the award of 159 blocks. All the licence blocks are mapped out on the OGA's [interactive map](#).

The [Infrastructure Act 2015](#) includes provisions to streamline the underground access regime, including horizontal or lateral drilling, and make it easier for companies to drill for shale gas. It also provides a number of new 'safeguards'. On 16 December 2015 [regulations](#) were approved by the House that provide some protection against fracking at depths shallower than 1200m in protected areas. Following a consultation, the Government [announced](#) in June 2016 that further protections would be introduced through the licencing process.

The Government has legislated for tax incentives for shale gas exploration, and announced community financial benefits. It is [consulting](#) on investment in communities hosting shale gas developments, and on direct payments to households

The [Scotland Act 2016](#) devolved shale gas licensing to the Scottish Parliament, and the [Wales Bill 2016-17](#) includes provisions to devolve shale gas licensing to the National Assembly for Wales. The Scottish Government announced a [moratorium](#) on fracking in Scotland in January 2015. In February 2015, the Welsh Government issued a [Direction](#) preventing local planning authorities from approving developments which included fracking. The [Labour Party](#) announced in September 2016 that it would ban fracking.

1. Hydraulic fracturing, or fracking

1.1 A note of definitions

In short, 'unconventional gas' is natural gas, but from unconventional sources. 'Shale gas', as the name suggests, is found within organic-rich shale beds, which are actually layers of rock, rather than a conventional 'reservoir' capped by shale or other beds.

The conventional view was that oil and gas would mature within these organic-rich and low-permeability rocks, and then migrate into conventional reservoirs from where they could be recovered. However, with advances in drilling and wellsite technology, and increases in the wholesale prices of hydrocarbons, production of gas directly from the shale beds is now commercially viable. The processes are described below.

The former Department of Energy and Climate Change (DECC)² produced a note on [Resources vs Reserves: What do estimates of shale gas mean?](#)³ The Parliamentary Office of Science and Technology (POST) has also published a POSTbox on [UK Shale Gas Potential](#). POSTnote 374, [Unconventional Gas](#) (April 2011), also gives some background.

Box 1: Commonly used terms⁴

Total Resources: the estimated total volume of oil and gas physically contained in the rock. One measure of total resources used commonly, including by the British Geological Survey (BGS), is the **Gas in Place (GIP)** which is an estimate of the total amount of gas that is trapped within the shale rock.

Reserves: the amount of resources that are deemed to be technically and commercially recoverable.

Technically Recoverable Resource (TRR): the estimated volume of gas that it is possible to extract from the total resource if not constrained by economics (and therefore larger than the reserves estimates).

1.2 What is fracking?

Gas held within shale beds is accessed through a technique called 'hydraulic fracturing' or 'fracking'. Water, containing sand, is pumped at high pressure into the rock. The sand keeps the small fractures in the rock open while the gas is extracted. According to the [British Geological Survey](#) (BGS):

After initial exploration of the shale deposits, a borehole is drilled into the shale horizon at a carefully selected site. It may be drilled horizontally to increase the volume of rock that can be accessed by the borehole. A process called hydraulic fracturing ('fracking') is undertaken. This involves pumping water into isolated sections of the borehole at pressures high enough to fracture the surrounding rock. Sand entrained in the water helps to 'prop' open the fractures, create permeability in the rock and allow the

² The Department of Energy and Climate Change became part of the Department for Business, Energy and Industrial Strategy in July 2016.

³ DECC, [Resources vs Reserves: What do estimates of shale gas mean?](#), 27 June 2013

⁴ Ibid and [UK Shale Gas Potential](#), POSTbox, July 2013

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gas to flow into the borehole. Chemicals are also added to improve the efficiency of the fracking operation.⁵

The chemicals used in fracking are assessed for hazards on a case-by-case basis by the relevant environmental regulator—the Environment Agency in England, the Northern Ireland Environment Agency in Northern Ireland, Scottish Environment Protection Agency in Scotland and Natural Resources Wales in Wales. Some of the fracking fluid returns to the surface as flowback fluid, which may contain sand, chemicals, dissolved minerals, and naturally occurring radioactive minerals. Fracking operators must make arrangements to safely store and dispose of the flowback fluid.⁶

Horizontal drilling is a technique used increasingly in conventional exploration and development. It gives access to harder-to-reach deposits and allows drilling (and fracking) in several directions from a single well bore.

⁵ BGS, [Shale gas: BGS research science briefing](#), 2013

⁶ DECC, [Fracking UK shale: water](#), February 2014

2. The shale gas resource in the UK

2.1 Where is it, and how much is there?

Estimates

Shale beds are not found all over the UK. A 2012 report for the Department of Energy and Climate Change (DECC) by the British Geological Survey (BGS) on the [Unconventional Hydrocarbon Resources of Britain's Onshore Basins – Shale Gas](#) shows the British formations with most shale gas potential.⁷ The diagrams reflect geological maps, where the same outcrops or formations run roughly on a south-east/north-west axis, running for example from the north east of England down to the south/south west coast.

These include the Upper Bowland Shale (the source rock for the Irish Sea conventional fields, and where Cuadrilla were first exploring), and both the Kimmeridge Clay and Lias of the Weald Basin (source rocks for the North Sea and English Channel fields).

The BGS in association with DECC has completed shale resource estimates for several areas in the UK. For more information follow these links:

- [Bowland Shale](#) (27 July 2013)
- [Jurassic shale of the Weald Basin](#) (23 May 2014)
- [Wales](#) (26 June 2014)
- [Midland Valley of Scotland](#) (30 June 2014)

Although the BGS [estimates](#) that large quantities of shale oil are present in the Weald Basin in south-east England, no significant gas resource is recognised using the current geological model because the shale is not thought to have reached the geological maturity required to generate gas.

On 27 June 2013 the BGS/DECC published a [Bowland Shale Gas Study](#), including a gas in place (GIP) resource assessment for the Bowland shale formation in northern England.⁸ This is not an estimate of the commercially recoverable gas, which is likely to be lower.

Their central estimate of GIP is 37.6 trillion cubic meters (tcm). A [POSTbox](#) shows how this can be extrapolated to potentially recoverable resources of 1,800-13,000 billion cubic meters (bcm) by assuming similar recovery factors to North America, of 8-20%. This compares to DECC's published figures of a current annual UK gas consumption of 77

⁷ DECC/BGS, [Unconventional Hydrocarbon Resources of Britain's Onshore Basins – Shale Gas](#), 2012

⁸ Andrews, I J, British Geological Survey for Department of Energy and Climate Change, [The Carboniferous Bowland Shale gas study: geology and resource estimation](#), July 2013

bcm and potentially recoverable conventional gas resources of 1,466 bcm.⁹

These are much higher than earlier BGS estimates, although a 2013 report from the [US Energy Information Agency](#) had suggested the technically recoverable resource could be as high as 736 bcm in the UK.¹⁰

A September 2012 [report](#) from the UK Energy Research Centre (UKERC) formed part of a [larger study](#) of unconventional gas resources by the Joint Research Centre of the European Commission.¹¹ This noted many significant uncertainties in assessing the recoverable volumes of shale gas, at regional and global level. It notes also that recovery rates are much lower than for conventional gas—around 15-30% of original gas in place (OGIP) compared to perhaps 80% in conventional reservoirs.

Test drilling and exploration

The most accurate estimates can really only be obtained by test drilling. A company called [Cuadrilla](#) started drilling shale gas exploration wells near Blackpool in August 2010.¹² In September 2011 Cuadrilla [estimated](#) that 5.7 tcm of gas was in the Bowland shale under Lancashire.¹³ The BGS expressed scepticism about the accuracy of this estimate, and pointed out that recovery rates would be much lower.¹⁴

- In August 2013 Cuadrilla started test drilling at Balcombe in West Sussex before scaling back drilling operations after a protest camp was established. Following the submission of a new planning application for the area in January 2014, Cuadrilla was granted temporary permission for exploration and appraisal, including flow testing and monitoring the existing lateral borehole.¹⁵
- In June 2013 [IGas](#), another company which has been conducting exploratory studies in the UK, [published estimates](#) of “gas initially in place” (or total resource) in shales in the North West (including the Bowland shale) with a “most likely” value of 102 trillion cubic feet (2.9 tcm).¹⁶ Following further drilling in 2013 and 2014 the estimate was updated to a “most likely” value of 80 tcf (2.3 tcm).¹⁷

2016-17 developments: planning permissions at Kirby Misperton and Preston New Road

- In May 2016, Third Energy [received planning approval](#) from North Yorkshire County Council to undertake fracking for shale gas in an existing two-mile deep well called KM8 (first drilled in 2013) at

⁹ [UK Shale Gas Potential](#), POSTbox, July 2013

¹⁰ EIA/ARI, [World Shale Gas and Shale Oil Resource Assessment](#), June 2013, XI-2, converted from original figure of 26 trillion cubic feet

¹¹ European Commission, Energy Security Unit of the Joint Research Centre [Unconventional Gas: Potential Energy Market Impacts in the European Union](#), 2012

¹² Cuadrilla, [Our Lancashire sites](#) [accessed 1 September 2016]

¹³ Cuadrilla, [About natural gas](#) [accessed 1 September 2016]

¹⁴ [‘What the frack?’](#), *Economist*, 1 October 2011

¹⁵ Cuadrilla, [Balcombe](#) [accessed 1 September 2016]

¹⁶ IGas, [Shale Gas in place in IGas’ North West licences of up to ca.170Tcf](#), 3 June 2013

¹⁷ IGas, [Preliminary results for the nine months to 31 December 2015](#) [accessed 1 September 2016]

Kirby Misperton, despite 4,000 objections being lodged against the plans. The scheme was the first to be approved in the UK for five years.

While welcoming the decision, Third Energy [stated](#):

However, don't expect to see any activities on site in the near future. We have conditions from both the planning authority and the Environment Agency to discharge. There are other consents and notifications required prior to receiving final consent from the Secretary of State. Then there is the normal commercial and project management work, such as the letting of contracts and ordering of long lead items.

The purpose of this application is to establish if the gas seen in some samples in this hybrid sandstone shale formation can be made to flow, at what process conditions and for how long. If this flows then we will need to assess how it performs for some months before making any conclusions.

So now we move on to the next stage of obtaining required approvals.¹⁸

Friends of the Earth and [Frack Free Ryedale](#) (a local residents group) [applied](#) for judicial review of the Council's decision on the grounds that the Council failed to properly assess climate change impacts and to secure long term financial protection against environmental damage.¹⁹ The High Court ruled on 20 December 2016 that the Council's decision was legal, thus defeating the anti-fracking campaigners' efforts to stop the application from going ahead.²⁰

- Cuadrilla's appeal against Lancashire County Council's rejection of their planning application for exploration at two Lancashire sites was granted by the Secretary of State for Communities and Local Government on 6 October 2016.²¹ Permission was only granted for one of the two sites – Preston New Road – thus becoming the second UK site with planning permission. If the firm then succeeds in obtaining all remaining authorisations, it will be [the first horizontal drilling operation](#) ever authorised in the UK.

Anti-fracking campaigners (the Preston New Road Action Group – PNRAG) sought judicial review of the Secretary of State's decision on the grounds that it was "neither fair nor lawful". On 12 April 2017, a High Court judge ruled to dismiss their judicial review actions on the grounds that "none of the grounds argued "have been made out in substance".²²

¹⁸ Third Energy, [Onshore and offshore: the next generation of energy](#) [accessed 1 September 2016]

¹⁹ Frack Free Ryedale, [Campaigners seek Judicial Review on KM8 decision](#), 7 May 2016

²⁰ BBC News, [High Court rules fracking can go ahead in North Yorkshire](#), 20 December 2016

²¹ Department for Communities and Local Government, [Recovered appeals: Cuadrilla Bowland Ltd and Cuadrilla Elswick Ltd](#), 6 October 2016

²² BBC News, [Preston New Road fracking protesters lose legal challenge](#), 12 April 2017

2.2 Economic implications

An Energy and Climate Change Select Committee (ECCC) [inquiry](#) in 2011 concluded that shale gas was unlikely to be a “game-changer” in the UK as in the US, or perhaps in countries like Poland.²³ A major factor is that there is less land available to drill on.²⁴

A follow-up inquiry by ECCC in 2013 into [the impact of shale gas on energy markets](#) recommended that further exploratory operations be encouraged to help establish reliable resource estimates. ECCC found that it was “too early to say whether domestic production of shale gas could result in cheaper gas prices in the UK”, but that it would be wrong to assume that prices would necessarily come down as a result of domestic or foreign shale gas.²⁵

In October 2011 Cuadrilla published Regeneris Consulting’s [full economic assessment of the impact of shale gas exploration and production in Lancashire and the UK](#). This estimated that for test wells alone:

0. A single test well operation, in 2011 prices, costs in the region of £10.5 million, made up of Cuadrilla’s own costs, that of its two internal service companies and expenditure on a range of first tier suppliers.
1. Some 18% of expenditure is shown to be deployed on Lancashire workers/suppliers, with a third going overseas. Of all UK expenditure (circa £7 million per test well), a third is deployed on labour costs, with 7% being utilised for subsistence expenditure of workers most of which flows to Lancashire businesses.
2. We estimate the test well activity will support some 250 FTE jobs across the UK over a 12 month period. Half of the jobs will occur within Cuadrilla and its extensive range of 1st tier suppliers.
3. Some 15% of the jobs (circa 40) are estimated to be taken by Lancashire residents. [...] At this stage very few of the specialist supply chain contractors make extensive use of local labour although this would change under a full commercial extraction scenario.²⁶

Cuadrilla’s report estimated that test well activity might support 250 FTE jobs across the UK over a twelve month period. The report estimated that if there were to be a move to commercial extraction, FTE employment at a UK level would peak at some 5,600 FTE jobs in the period from 2016 to 2019, with a build up from 2013 onwards.²⁷

In June 2013 [Centrica acquired](#) a 25% interest in the Bowland exploration licence from Cuadrilla.²⁸

²³ House of Commons Energy and Climate Change Committee, [Shale Gas](#), May 2011

²⁴ BGS, [Shale Gas Prospectivity](#) [accessed 1 September 2016]

²⁵ House of Commons Energy and Climate Change Committee, [The Impact of Shale Gas on Energy Markets](#), April 2013

²⁶ Regeneris Consulting for Cuadrilla, [Economic Impact of Shale Gas Exploration & Production in Lancashire and the UK](#), September 2011, p38

²⁷ Ibid, p44

²⁸ Centrica, [Centrica acquires a 25% interest in UK shale exploration licence](#), 13 June 2013

A May 2013 [report](#) from the Institute of Directors presented a scenario in which UK shale gas production could attract investment of £3.7 billion per year and support up to 74,000 jobs, often focused in regions with currently high unemployment and in sectors such as manufacturing. It also suggested shale gas production could potentially contribute significant tax revenue.²⁹

In a [speech](#) to the Royal Society in September 2013, the then Secretary of State repeated these IoD figures, and even proposed hypothecation of shale gas revenues, a policy normally opposed by Chancellors:

One policy proposal before our party conference is that a Low Carbon Transition Fund is established from some of the tax revenues from any future shale gas production³⁰

However, he noted that the uncertainties around the amount that could be commercially extracted were too great to know what effect shale gas would have on energy prices. Reporting the speech, [Business Green](#) noted that the Secretary of State was therefore being more cautious than the Prime Minister and the Chancellor, both of whom had argued that shale gas could play a significant role in bringing down energy costs.³¹

²⁹ IoD, [Infrastructure for Business: Getting shale gas working](#), 22 May 2013

³⁰ DECC, [The Myths and Realities of Shale Gas Exploration](#), 9 September 2013

³¹ [Davey: UK shale gas is compatible with climate change targets](#), *Business Green*, 9 September 2013

3. Regulatory regime

Summary

Before carrying out fracking, operators must obtain a number of permissions, including:

- Petroleum Exploration and Development licence
- planning permission
- access rights from landowners
- environmental permits, including for mining waste, from the relevant environmental regulator
- health and safety regulations and permits from the Health and Safety Executive (HSENI in Northern Ireland)
- consent from DBEIS to drill and frack

DECC published [regulatory roadmaps for onshore oil and gas exploration in each nation of the UK](#), which set out the process to be followed within each legislative and regulatory framework.³²

3.1 Petroleum Exploration and Development licences (PEDLs)

Shale gas drilling is covered by the normal UK regime for all oil and gas exploration and development. A UK Petroleum Exploration and Development licence (PEDL) allows a company to pursue a range of activities, including exploration and development of unconventional gas, subject to necessary drilling/development consents and planning permission.³³

The [Petroleum Act 1998](#) vests all rights to the nation's petroleum resources in the Crown, but the relevant government may grant PEDLs that confer exclusive rights to 'search and bore for and get' petroleum. Each PEDL confers such rights over a limited area and for a limited period. The Oil and Gas Authority (OGA) has published [guidance](#) outlining the onshore licensing system.³⁴

Box 2: Devolution and moratoriums

The [Scotland Act 2016](#) devolved shale gas licensing to the Scottish Parliament, and the [Wales Bill 2016-17](#) includes provisions to devolve shale gas licensing to the National Assembly for Wales. Separate licensing arrangements apply in Northern Ireland.

The Scottish Government announced a [moratorium](#) on fracking in Scotland on 28 January 2015. The Welsh Government issued a [Direction](#) on 13 February 2015 preventing local planning authorities from approving developments including fracking. The Northern Ireland Government's September 2015 [Strategic Planning Policy Statement for Northern Ireland](#) included a "presumption against" fracking.

DECC advised in 2013 that there is no firm licencing distinction between exploration for shale gas and exploration for conventional oil and gas. Some companies who are drilling mainly for conventional oil and gas have decided to drill deeper than they otherwise might have, in

³² OGA, [Regulatory roadmap: onshore oil and gas exploration in the UK regulation and best practice](#) [accessed 1 September 2016]

³³ See the Oil and Gas Authority's website for links to [more information on the regulatory regime](#).

³⁴ The [Oil and Gas Authority](#) is an executive agency, sponsored by the Department for Business, Energy and Industrial Strategy, which works with government and industry to maximise the economic benefit from the UK's oil and gas reserves.

order to see whether there is prospective shale in their licensed areas (coring is all that is envisaged in these cases and no fracking is involved).³⁵

PEDLs are granted in 'rounds' where the OGA calls for applications from interested parties to submit bids for advertised licence blocks. The OGA has produced an [interactive map](#) to provide information about onshore oil and gas exploration and production activity in Great Britain. This includes areas already under licence, areas on offer in an OGA licensing round, and an illustration of shale gas resources.

The 14th Round

The 14th Onshore Oil and Gas Licensing Round was launched on 28 July 2014 and closed on 28 October 2014. The [OGA website](#) states:

A total of 95 applications were received from 47 companies covering 295 Ordnance Survey Blocks. Following scrutiny of the applicants' competency, financial viability, environmental awareness and geotechnical analysis, and following the decision not to award licences in Scotland and Wales, 159 blocks were taken forward for further consideration.

Initial offers and consultation

On 18 August 2015, the OGA [announced](#) that 27 onshore blocks from the 14th Onshore Oil and Gas Licensing Round would be formally offered to companies.³⁶ A second group of 132 further blocks was subjected to detailed assessment under the [Conservation of Habitats and Species Regulations 2010](#).

The Government [consulted](#) on the Habitats Regulations Assessment between 18 August 2015 and 29 September 2015.³⁷ This included consultation on the approach to providing PEDLs for areas where oil and gas developments might impact on European protected areas. EU law requires that an impact assessment is required of any "plan or project" that is likely to have a significant effect on a 'European site'. European sites are conservation areas established by European law.

The consultation proposed a methodology for determining which licencing areas might impact on a European site, and a policy on how conditions could be attached to PEDLs so that European sites would not be impacted by fracking.

Final offers

On 17 December 2015, the OGA [announced](#) the formal offer of licences for 159 blocks to successful applicants under the 14th Onshore Oil and Gas Licensing Round. It stated that following the [consultation](#):

[...] the OGA is now satisfied that the approval of the 14th Licensing Round, and the award of each of the licences under the Round, will not have an adverse effect on the integrity of any protected European site. As a result, the OGA is offering licences for a total of 159 blocks. For 75 of these blocks, the licence will

³⁵ DECC pers. comm., August 2013

³⁶ OGA, [New onshore oil and gas blocks to be offered](#), 18 August 2015

³⁷ OGA, [Habitats regulations assessments 14th onshore oil and gas licensing round: consultation on proposed assessment](#), 18 August 2015

contain a condition that prohibits all or specific activities in parts of the block.³⁸

All the licence blocks are mapped out on the OGA's [interactive map](#).

Once the licence is signed by both the successful company and the OGA a [scanned copy of the licence will be publically available](#).

3.2 Other permissions

PEDLs allow a company exclusivity in an area to search for, bore for and get hydrocarbons. Other permissions beyond the PEDL are also required before fracking can take place.

The UK has, alongside Norway, one of the most stringent onshore drilling safety regimes in the World. According to the [HSE](#):

HSE monitors shale gas operations from a well integrity and site safety perspective. We oversee that safe working practices are adopted by onshore operators as required under the Health and Safety at Work Etc Act 1974, and regulations made under the Act. These specifically are:

1. The Borehole Site and Operations Regulations 1995 (BSOR) applies to shale gas operations. (These regulations are primarily concerned with the health and safety management of the site).
2. The Offshore Installations and Wells (Design and Construction, etc) Regulations 1996 (DCR) apply to all wells drilled with a view to the extraction of petroleum regardless of whether they are onshore or offshore.³⁹

In November 2012 the Environment Agency and HSE produced a [joint working strategy](#) on how they will work together to ensure a joined up approach and that there is appropriate monitoring and inspection of unconventional oil and gas operations.⁴⁰

DECC published [regulatory roadmaps for onshore oil and gas exploration in each nation of the UK](#), which set out the process to be followed within each legislative and regulatory framework.⁴¹ These include:

- planning permission
- access rights from landowners
- environmental permits, including for mining waste, from the relevant environmental regulator
- health and safety regulations and permits from the Health and Safety Executive (HSENI in Northern Ireland)
- consent from DBEIS to drill and frack.⁴²

³⁸ OGA, [Oil and gas: licensing rounds](#) [accessed 1 September 2016]

³⁹ HSE [The regulation of onshore unconventional oil and gas exploration \(shale gas\)](#) [accessed 1 September 2016]

⁴⁰ HSE/Environment Agency, [Working together to regulation unconventional oil and gas developments](#), November 2012

⁴¹ OGA, [Regulatory roadmap: onshore oil and gas exploration in the UK regulation and best practice](#) [accessed 1 September 2016]

⁴² The Department for Energy and Climate Change became part of the department for Business, Energy and Industrial Strategy in July 2016.

The terms of the PEDLs require approval from DBEIS for the choice of operator. One of the issues checked before approving an operator is coverage of relevant insurances.⁴³

All drilling operations are subject to notification to the Health and Safety Executive. Each site is assessed by the relevant environmental regulator,⁴⁴ which regulates discharges to the environment, issue water abstraction licences, and are statutory consultees in the planning process.

The Environment Agency held a [consultation](#) between November 2015 and March 2016 on guidance for the onshore oil and gas sector. Following the consultation, a [summary of responses](#) and [final guidance](#) were published in August 2016. The guidance sets out relevant environmental permits for onshore oil and gas operations in England, other permissions required from the Environment Agency, and information about best available techniques.

The guidance states that a permit would be required for extractive waste generated during construction, operation and decommissioning of sites. This includes, but is not limited to, drilling muds, drill cuttings, waste cement, well completion fluids, flowback fluids, waste gases and wastes left underground. A permit will also be needed if large quantities of gas are to be flared and for groundwater activities, depending on the local hydrology.⁴⁵

Planning permission

In England and Wales, proposals for shale gas exploration or extraction are subject to the requirements of the [Town and Country Planning Act 1990](#) administered by the Minerals Planning Authority (MPA) for the area in which the development is located.⁴⁶ DECC's consent for all drilling or production operations for oil and gas (now DBEIS' consent) is given only once planning permission has been obtained.⁴⁷

In England, the MPA will take the decision in accordance with the policies set out in the [National Planning Policy Framework](#) (NPPF) and the "minerals" section of the online [Planning Practice Guidance](#) (PPG).⁴⁸ DCLG has published [planning guidance](#) that clarifies the interaction of the planning process with the environmental and safety consenting regimes.

The procedure used to determine these applications is set out in the [Town and Country Planning Act 1990](#) and the [Town and Country Planning \(Development Management Procedure\) \(England\) Order 2015](#)

⁴³ DECC pers. comm., 22 February 2013

⁴⁴ Environment Agency in England, Northern Ireland Environment Agency in Northern Ireland, Scottish Environment Protection Agency in Scotland and Natural Resources Wales in Wales.

⁴⁵ Environment Agency, [Onshore oil and gas sector guidance: version 1](#), 17 August 2016

⁴⁶ Planning permission in Scotland is subject to the [Town and Country Planning \(Scotland\) Act 1997](#), as amended. For further information see SPICe Briefing, [Unconventional Gas in Scotland](#), 24 October 2013.

⁴⁷ HC Deb 11 June 2012 c200W

⁴⁸ For further information in relation to Wales, see National Assembly for Wales, [Research Paper: Unconventional Gas: shale gas and coal-bed methane](#), March 2015.

(SI 2010/595). Under these rules planning applications must be publicised by site display and in local newspapers. Information about the application must also be available on the relevant local authority website. This must include a section on how interested people can submit representations about the application, giving a period of at least 14 days.

Following a [consultation](#) in September 2013 and a [Government response](#) in January 2014, changes were made to the system of notification of landowners and tenants by applicants for onshore oil and gas development.⁴⁹ The requirement to serve notice on individual owners and tenants of land on the above ground area where works are required was retained, but the requirement for owners of land beyond this area i.e. the owners of land where solely underground operations may take place, was removed. This was implemented by the [Town and Country Planning \(Development Management Procedure and Section 62A Applications\) \(England\) \(Amendment No. 2\) Order 2013](#) (SI 2013/3194), which came into force on 13 January 2014.

All representations on a planning application must be submitted in writing, either on paper or electronically. Verbal comments are not accepted. If the planning application is to be determined at a planning committee meeting a constituent may be able to speak at the meeting.

When a decision is made on a planning application, only planning matters called “material considerations” can be taken into account. There is no exhaustive list of what constitutes a material planning consideration, although the [PPG](#) lists some “principal issues” for consideration (see Box 3).

Box 3: National Planning Policy Guidance “principal issues” for consideration⁵⁰

- [noise associated with the operation](#);
- [dust](#);
- [air quality](#);
- [lighting](#);
- visual impact on the local and wider landscape;
- landscape character;
- [archaeological and heritage features](#);
- [traffic](#);
- [risk of contamination to land](#);
- soil resources;
- geological structure;
- impact on [best and most versatile agricultural land](#);
- blast vibration;
- [flood risk](#);
- [land stability](#)/subsidence;

⁴⁹ DCLG, [Revised requirements relating to planning applications for onshore oil and gas: Proposals for comment](#), 2 September 2013

⁵⁰ NPPG, [Minerals: what are the environmental issues of minerals working that should be addressed by mineral planning authorities?](#), Paragraph: 013 Reference ID: 27-013-20140306 [accessed 1 September 2016]

- internationally, nationally or locally designated wildlife sites, protected habitats and species, and ecological networks;
- impacts on nationally protected landscapes (National Parks, the Broads and Areas of Outstanding Natural Beauty);
- nationally protected geological and geo-morphological sites and features;
- site [restoration and aftercare](#);
- surface and, in some cases, ground water issues;
- water abstraction.

While there is no definitive list of what is a material consideration, certain types of issue have been held by the courts *not* to be material considerations. These include issues such as loss of property value, loss of view and opposition to the principle of development—representations on these issues will not be considered when a planning decision is taken.

For more information about how to comment on a planning application see the Planning Aid England guide, [Commenting on Planning Applications](#).

MPAs must take relevant comments into account and make their decisions, and the reasons for either accepting or refusing a planning application, public.

In addition to this process, planning authorities should have a section on mineral extraction in their local plan. Government guidance directs that these plans should identify and include policies for extraction of mineral resources. The plan may identify particular sites in an area where the local authority believes such extraction would be suitable. The local plan would have gone through (or will go through if not yet in place) a period of public consultation. For more information about how the public consultation process works see the RTPI factsheet, [The Local Plan: why, when and how to get involved](#).

Faster decisions on shale gas planning applications

In August 2015 a Government [policy statement on shale gas and oil](#) announced a number of measures designed to speed up the planning process for shale gas applications. These measures are:

- Recovery of shale gas appeals. For a period of two years the Secretary of State for Communities and Local Government will “recover” planning appeals relating to exploring and developing shale gas. This means that on appeal against a refusal by a local authority, the Secretary of State would take the final decision on the appeal, rather than a planning inspector.
- Call-in of shale gas applications. The Secretary of State also has powers to “call in” planning applications, for his own determination before they are decided by the local planning authority.⁵¹ The August 2015 statement said that:

the Secretary of State will also actively consider calling in shale applications. Each case will be considered on its individual merits

⁵¹ For more information see [Calling in planning applications](#), Commons Library Briefing paper 16/930, 11 July 2016

in line with his policy. Priority will be given to any called-in planning applications.

- Identifying underperforming local planning authorities. The statutory deadline for determining a planning application where an application is subject to Environmental Impact Assessment is 16 weeks. The August 2015 statement said that the Government would identify underperforming local planning authorities that “repeatedly fail” to determine oil and gas applications within statutory timeframes. When such applications are made to underperforming local planning authorities, the Secretary of State “will consider whether he should determine the application instead”.⁵² A campaign group, the SaFE Alliance, [announced](#) that it would seek to raise funds for a judicial review of the decision, which it said would prevent local communities from stopping fracking in their areas.⁵³ In response to the DECC/DCLG statement, the LGA [stated](#) that:

People living near fracking sites - who are most affected by them - have a right to be heard. Local planning procedure exists for a reason, to ensure a thorough and detailed consultation with those communities.⁵⁴

New permitted development rights

A March 2015 consultation, [Amendment to permitted development rights for drilling boreholes for groundwater monitoring for petroleum exploration: technical consultation](#), proposed to grant permitted development rights for the drilling of boreholes for groundwater monitoring for petroleum exploration (including for shale gas exploration). This would enable limited works to be carried out to establish baseline information on the groundwater environment without the need for planning permission, although a PEDL would still be required. The [Infrastructure Act 2015](#) requires that, as one of a number of conditions that need to be met before certain high volume hydraulic fracturing can occur, methane in groundwater is monitored over a twelve month period. The change to permitted developments was made so that this condition could be met more easily. The proposals included increasing the structure height of the rig that can be used for drilling.

The Government [responded](#) to this consultation in August 2015.⁵⁵ It confirmed that it would amend legislation so that development which consists of the drilling of boreholes for groundwater monitoring for petroleum exploration can take place as permitted development. It also confirmed that the structure height of rigs that can be used would be increased from 12 to 15 metres.

⁵² DECC/DCLG, [Shale gas and oil policy statement by DECC and DCLG](#), 13 August 2015

⁵³ [‘Campaigners to raise £20k for judicial review of new fracking policy’](#), *Local Government Lawyer*, 3 September 2015

⁵⁴ [‘Ministers threaten to take fracking decisions away from councils’](#), *Public Finance*, 13 August 2015

⁵⁵ DCLG, [Amendment to permitted development rights for drilling boreholes for groundwater monitoring for petroleum exploration: Government response to the consultation and invitation for views on further amendments to permitted development rights for petroleum exploration site investigation and monitoring](#), 13 August 2015

The Government's response also contained an invitation for further changes to permitted development rights in this area. The proposed change was for further rights to enable, as permitted development, the drilling of boreholes for seismic investigation and to locate and appraise shallow mine workings. The Government said that this would "speed up the delivery of essential monitoring information for safety and environmental protection and free local resources for where the express attention of the local planning authority is required".⁵⁶

In its response to the [consultation on further amendments](#), published in December 2015, the Government outlined amendments to permitted development rights as follows:

41. In summary, the amendments are to enable the drilling of boreholes for monitoring and investigative purposes in respect of petroleum exploration to be carried out as permitted development for the purposes of:

1. groundwater monitoring – with the duration of the longer term right extended from 6 to 24 months for the longer use of land;
2. seismic investigation and monitoring;
3. location and appraisal of mine workings.

42. In all cases the permitted development rights will apply to both the temporary use of land (no more than 28 days) and the longer use of land (no more than 6 months – except in the case of groundwater monitoring, where the period will be extended to 24 months). Relevant existing conditions and restrictions attached to the current permitted development rights for mineral exploration will apply, together with those previously announced in August.

43. As proposed in this document, in the case of boreholes drilled for monitoring for petroleum exploration, a requirement will be included for operators to notify the Environment Agency and drinking water supply undertaker of all boreholes; and to notify the Coal Authority of boreholes drilled for the purposes of the location and appraisal of mine workings.

44. The detailed wording of the amendments to the Town and Country Planning (General Permitted Development) (England) Order 2015 will be set out in a statutory instrument, to be laid before Parliament in 2016.⁵⁷

From 6 April 2016, the [*Town and Country Planning \(General Permitted Development\) \(England\) \(Amendment\) Order 2016*](#) allows the drilling of boreholes for the purposes of carrying out groundwater monitoring, seismic monitoring or locating and appraising the condition of mines, where this is preparatory to potential petroleum exploration.

⁵⁶ DECC/DCLG, [Shale gas and oil policy statement by DECC and DCLG](#), 13 August 2015

⁵⁷ DCLG, [Further amendments to permitted development rights for petroleum exploration site investigation and monitoring: Government response to the consultation](#), December 2015

4. The Infrastructure Act 2015

4.1 Background and consultation

The 2014 [Queen's Speech](#) confirmed [Government plans](#) to streamline the underground access regime and make it easier for companies to drill for shale gas. It also confirmed that the new underground access regime would apply to drilling for geothermal energy.

Under the previous system, licence holders did not have automatic access rights to drill under landowners' property and had to seek permission before they could do so. If permission was refused then licence holders could apply through the Secretary of State and courts to gain access but the Government considered this route to be too time consuming.

The Secretary of State issues Petroleum Exploration and Development Licences (PEDLs) under powers granted by the [Petroleum Act 1998](#). PEDLs confer the right to search for, bore for and get hydrocarbons, but do not provide access rights to do this. However, section 7(1) of the Act applies the [Mines \(Working Facilities and Support\) Act 1966](#) in England, Wales and Scotland so a licensee can acquire ancillary rights to assist with development, including access rights. Such rights can be granted by the court if it is not reasonably practicable to obtain them by private negotiation. In these instances the landowner is entitled to compensation, determined in line with the principles established by the Supreme Court in *Star Energy Weald Basin Ltd & Anor v Bocardo SA* [\[2010\] UKSC 35](#).

The Government [consulted](#) during summer 2014 on proposals to improve the access regime, including allowing lateral drilling below land without the landowner's permission. The changes set out in the consultation would:

- Grant underground access rights to companies extracting petroleum resources (including shale gas and oil) and for geothermal energy in land at least 300 metres below the surface;
- Provide a voluntary community payment of £20,000 for each unique lateral (horizontal) well that extends by more than 200 metres laterally. Alongside this would be powers to make such payments compulsory if companies fail to volunteer; and
- Provide a public notification system, under which the company would set out drilling proposals along with details of the voluntary payment.⁵⁸

The consultation received over forty thousand responses, the vast majority of which were letters from individuals opposing the proposals.⁵⁹ At the same time the *Guardian* reported a YouGov survey that found 74% of people opposed changes allowing companies to drill

⁵⁸ DECC, [Underground Drilling Access: Consultation on Proposal for Underground Access for the Extraction of Gas, Oil or Geothermal Energy](#), May 2014

⁵⁹ DECC, [Government Response to the Consultation on Proposal for Underground Access for the Extraction of Gas, Oil or Geothermal Energy](#), 25 September 2014

under peoples' property without permission.⁶⁰ Industry stakeholders had few substantial issues with the proposals, other than concerns about the impact of deep drilling on existing mineral rights. The Government considered that existing regulation could manage such issues and that:

[...] the proposed policy remains the right approach to underground access and that no issues have been identified that would mean that our overall policy approach is not the best available solution.⁶¹

During the consultation, the issue of the application of the proposals to Scotland and Wales arose. In particular, their application in Scotland was opposed by Scottish Ministers during the build-up to the 2014 independence referendum.⁶² The UK Government considered that the new rights would apply in both Scotland and Wales, and were compatible with devolved legislative powers.⁶³

The [Scotland Act 2016](#) devolved licensing of onshore oil and gas extraction underlying Scotland to the Scottish Parliament.⁶⁴ The [Wales Bill 2016-17](#) will devolve shale gas licensing to the National Assembly for Wales.

4.2 Issues arising during Parliamentary scrutiny of the Bill

Access to deep-level land

Clauses to provide underground access, in line with the proposals set out in the Government's summer 2014 consultation, were introduced into the Infrastructure Bill during the [Lords Committee stage](#). The new clauses provided a right to use deep-level land—defined as being 300 metres below the surface—for the purpose of exploiting petroleum or deep geothermal energy. The provisions included a power for the Secretary of State to introduce payment and notification schemes, and required the Secretary of State to consult before using the powers.

At Report Stage in the Commons, the extent of the underground access provision was limited by amendment to England and Wales—this reflected the recommendation of the [Smith Commission](#) to devolve onshore oil and gas licensing to the Scottish Government.

Pre-conditions for fracking

Amendments were tabled during the Lords Report stage to put in place a statutory monitoring and assessment process for any wells using the new access rights, and for the access rights to be excluded from protected areas such as National Parks, Sites of Special Scientific Interest

⁶⁰ ['Fracking trespass law changes opposed by 74% of British public, poll finds'](#), *The Guardian*, 6 May 2014

⁶¹ DECC, [Government Response to the Consultation on Proposal for Underground Access for the Extraction of Gas, Oil or Geothermal Energy](#), 25 September 2014, p10

⁶² ['Minister opposes change in fracking residential drilling rules'](#), *BBC News*, 15 August 2014

⁶³ DECC, [Underground drilling access](#) [accessed 1 September 2016]

⁶⁴ As of 1 September 2016, sections 47 to 49 of the [Scotland Act 2016](#) have not yet been commenced.

and Areas of Outstanding Natural Beauty.⁶⁵ Baroness Verma, then DECC Parliamentary Under-Secretary, set out her view that existing planning policy was sufficient to protect such areas, and the amendment were withdrawn following debate.⁶⁶

Amendments were tabled, but not agreed to, during the [Commons Committee Stage](#) to prevent fracking in certain protected areas such as National Parks and to set out, more prescriptively, the process for assessing the environmental impacts of fracking developments, monitoring these sites and disclosing information about processes being used at them.⁶⁷ During the Commons Report Stage, an opposition amendment was agreed, new clause 19, which set out 13 conditions which must be met before fracking could take place. These included conditions relating to site monitoring and inspections; ground water protection; environmental assessment and permitting; community benefits; protected areas; and the depth at which access was permitted.

During Ping Pong, a [Government amendment to amend new clause 19](#) was tabled and agreed in the Lords. Environmental groups reported [concerns](#) that the Lords amendment would 'water down' some of the 13 conditions. The Lords amendment meant that:

- monitoring of fugitive emissions will not be required after a permit had expired;
- residents will not have to be individually notified about fracking;
- fracking could not take place in "protected groundwater source areas", a type of designation to be defined in secondary legislation, rather than established groundwater source protection zones. Secondary legislation will also be used to define the other 'protected areas' within which fracking could not take place. The Act provided that the secondary legislation must be tabled by the end of July 2015.

Use of substances to aid the fracking process

Government amendments made to the Bill during the [Lords Committee stage](#) provided that, when drilling and fracking, companies would be able to pump various substances underground to aid with the fracking process. The new clause included a right of "passing any substance through, or putting any substance into, deep-level land or infrastructure installed in deep-level land". During the debate, Baroness Verma explained that such chemicals are regulated through the permissions process that fracking operators are required to adhere to.⁶⁸

The wording of the legislation was criticised by a number of campaign groups who were concerned it gave 'free rein' to use any chemicals in the fracking process.⁶⁹

The issue of pumping "any substance" into the ground was revisited during the Commons Committee Stage. [Tom Greatrex](#) described the

⁶⁵ [HL Deb, 10 November 2014, cc59-63](#)

⁶⁶ [HL Deb, 14 October 2014 c46GC](#)

⁶⁷ [PBC 13 January 2015 c293](#)

⁶⁸ [HL Deb, 14 October 2014, cc58-61GC](#)

⁶⁹ ['UK to allow fracking companies to use 'any substance' under homes', The Guardian, 14 October 2014](#)

term “any substance” as “needlessly open-ended” and “provocative-sounding”. An amendment was voted against that would have required any fracking fluid substance to be approved by the Environment Agency.⁷⁰

Community benefits

During the Commons Committee Stage, a set of amendments relating to community benefits was tabled with the aim of providing clearer assurance and structure around the way contributions from fracking development would be spent in communities.

The then Minister, Amber Rudd, explained that the industry had agreed to pay £100,000 to communities per hydraulically-fractured well site at exploratory stage, and 1% of revenue if it successfully goes into production. In addition, she stated that the industry had confirmed that operators would contribute a voluntary one-off payment of £20,000 for the right to use deep-level land for each unique lateral well that extends by more than 200 metres, and would notify the public when exercising this power.⁷¹

The Committee on Climate Change

During Commons Report Stage, a new clause was agreed that requires the Secretary of State to seek advice from the Committee on Climate Change and report on the likely impacts of greenhouse gas emissions from onshore petroleum resources and drilling activity.

4.3 Implementation of the Infrastructure Act 2015

Pre-conditions for fracking

[Section 50](#) of the *Infrastructure Act 2015*, which amends the [Petroleum Act 1998](#) to include safeguards in relation to onshore hydraulic fracturing, came into force on 6 April 2016.

Section 50 provides that well consents for fracking may not be issued for a depth of less than 1,000 metres. Where a well consent is issued for fracking deeper than 1,000 metres, fracking may not take place unless the Secretary of State also grants hydraulic fracturing consent.

Hydraulic fracturing consent may only be granted if specified conditions are met (see Box 4), and the Secretary of State is satisfied that it is appropriate to issue the consent. The Secretary of State may also apply any other conditions they consider appropriate.

Box 4: Conditions for the issue of an onshore fracking licence

- The environmental impact of the development which includes the relevant well has been taken into account by the local planning authority
- Appropriate arrangements have been made for the independent inspection of the integrity of the relevant well

⁷⁰ [PBC 13 January 2015 c298](#)

⁷¹ [PBC 13 January 2015 c299](#)

- The level of methane in groundwater has, or will have, been monitored in the period of 12 months before the associated hydraulic fracturing begins
- Appropriate arrangements have been made for the monitoring of emissions of methane into the air, appropriate arrangements have been made for the publication of the results of the monitoring, and a scheme is in place to provide financial or other benefit for the local area
- The associated hydraulic fracturing will not take place within other protected areas
- In considering an application for the relevant planning permission, the local planning authority has (where material) taken into account the cumulative effects of—
 - (a) that application, and
 - (b) other applications relating to exploitation of onshore petroleum obtainable by hydraulic fracturing
- The substances used, or expected to be used, in associated hydraulic fracturing—
 - (a) are approved, or
 - (b) are subject to approval,by the relevant environmental regulator
- In considering an application for the relevant planning permission, the local planning authority has considered whether to impose a restoration condition in relation to that development
- The relevant undertaker has been consulted before grant of the relevant planning permission
- The public was given notice of the application for the relevant planning permission

Definition of protected areas

The Government laid the [Draft Onshore Hydraulic Fracturing \(Protected Areas\) Regulations 2015](#) before Parliament on 16 July 2015. The draft set out that in National Parks, Areas of Outstanding National Beauty, the Broads and World Heritage Sites, hydraulic fracturing could only take place in ground at least 1,200 metres below the surface.

The draft regulations were approved on division by a Delegated Legislation Committee on 28 October 2015. The then Minister, Andrea Leadsom, announced during the debate that further rules would be brought in to provide restrictions that would prevent surface activity associated with fracking in protected areas.⁷²

A key opposition argument against the regulations was that, although the regulations covered activity underground, drilling at the surface within a National Park to allow fracking deep beneath a National Park could still be approved. Another concern raised by the opposition was that the regulations did not provide any protection for Sites of Special Scientific Interest (SSSI).

The [Onshore Hydraulic Fracturing \(Protected Areas\) Regulations 2016](#) were approved by the House of Commons, by 298 to 261, in a [deferred division](#) on 16 December 2015. The regulations came into effect on 6 April 2016.

Protected areas through the licencing process

The [Government launched a consultation on 4 November 2015](#) on further protections for protected areas. These protections will be provided through the licencing process and would prevent any surface operations associated with fracking in the following locations:

⁷² Second Delegated Legislation Committee, [Draft Onshore Hydraulic Fracturing \(Protected Areas\) Regulations](#), 27 October 2015

- National Parks, the Broads and Areas of Outstanding Natural Beauty (AONBs)—representing landscapes with the highest level of protection from damaging development within the planning system.
- World Heritage sites—the highest international heritage designation.
- Source Protection Zones (SPZ) 1—the areas close to a drinking water source where the risk associated with groundwater contamination is at its greatest.
- SSSIs—areas designated by the statutory nature conservation agencies in accordance with the Wildlife and Countryside Act 1981 in order to provide protection for specific flora, fauna, or geological or physiographical features. Around 70% of Sites of Special Scientific Interest carry a European designation which means that the protections in the Conservation of Habitats and Species Regulations 2010 must be observed (see below).
- Natura 2000—an EU-wide network of nature protection areas established under the 1992 Habitats Directive¹⁰ in order to protect biodiversity. Natura 2000 sites are comprised of Special Areas of Conservation (SAC) and Special Protection Areas (SPAs) designated by Member States under the Habitats Directive and the 1979 Birds Directive respectively.
- Ramsar sites—areas designated as Wetlands of International Importance in accordance with the Ramsar Convention. They are afforded the same protection as Natura 2000 sites under current Government policy (see above).

The Government published its [response](#) to the consultation in June 2016. It announced that Wales would be included within the scope of the proposals, in order to bring Wales in line with the scope of section 50 of the *Infrastructure Act 2015*, and concluded that:

Having considered the evidence presented, the Government continues to believe that the proposals provide an appropriate level of additional protections to reassure the public that the shale industry is being taken forward in a measured and reasonable manner. As they strike the right balance between protecting our most sensitive areas while at the same time enabling the nascent shale industry to develop, the Government does not intend to significantly modify them.⁷³

4.4 Labour proposal to ban fracking

At the 2016 Labour Party conference, the Shadow Energy Minister Barry Gardiner [announced](#) that a Labour Government would ban fracking:

There are technical problems with fracking. And they give rise to real environmental dangers. But technical problems can be overcome. So on their own they're not a good enough reason to ban fracking.

The real reason to ban fracking is that it locks us into an energy infrastructure that is based on fossil fuels long after our country needs to have moved to clean energy. So today I am announcing that a future Labour government will ban fracking.

⁷³ DECC, [Surface development restrictions for hydraulic fracturing: Government response to the consultation](#), June 2016

5. Environmental considerations

Summary

Concerns have been expressed about the potential environmental impacts of fracking. The [Royal Society and Royal Academy of Engineering](#) concluded in 2012 that the health, safety and environmental risks could be managed effectively in the UK, by implementing and enforcing best operational practice.

Greenhouse gas emissions: the RS/RAE [recommended](#) that more work was needed to monitor emissions, and to explore the carbon footprint and climate risks associated with extraction and use. In 2016, the [Committee on Climate Change](#) found that the implications of UK shale gas exploitation for shale gas emissions were uncertain, and that exploitation of shale gas on a significant scale would not be compatible with UK carbon budgets or the commitment to reduce emissions by at least 80% by 2050 unless three tests relating to emissions, gas consumption and carbon reductions were satisfied.

Pollution incidents: following reports of potential groundwater contamination in Wyoming, and in response to public concern and the proliferation of fracking, the US Environmental Protection Agency (EPA) undertook studies on the impacts of fracking on drinking water resources. In 2011, the then UK Government Energy Minister said that there was no evidence that “the fracking process itself poses a direct risk to underground water resources”, and that the UK would learn from US incidents of water pollution.

Environmental considerations in the UK: the 2012 RS/RAE study [concluded](#) that because fracking takes place hundreds of metres below aquifers, it is unlikely that fracking will contaminate the aquifers. It found that the more likely cause of possible contamination include faulty wells, and called for the same stringent controls as apply for offshore wells. Public Health England [concluded](#) in 2014 that the currently available evidence indicated that potential risks to public health from exposure to shale gas emissions was low provided operations were “properly run and regulated”.

Water use: excessive water use was highlighted by the [Tyndall Centre](#) as a particular problem for the UK because of the pressure that water resources are under. However, the UK Government said in January 2016 in response to a [written question](#) that before permission was granted for carrying out fracking activities, “a thorough assessment will be made considering the existing water users’ needs and the environmental impact”.

Seismic events: Cuadrilla [suspended](#) fracking operations in Lancashire following small earth tremors near Blackpool in 2011. The BGS stated in 2012 that the risks to groundwater and of earthquakes had been exaggerated. In December 2012, the then Secretary of State [announced](#) that exploratory hydraulic fracturing for shale gas could resume in the UK, subject to new regulatory requirements.

5.1 “Golden rules for a golden age of gas”

In 2012 the Royal Society and Royal Academy of Engineering (RS/RAE) conducted a short [review of the risks associated with fracking](#). The report concluded that the health, safety and environmental risks can be managed effectively in the UK, by implementing and enforcing best operational practice. The report also made some specific recommendations however, referred to further below.

The May 2012 *World Energy Outlook* special report on unconventional gas, [Golden rules for a golden age of gas](#), summarises the concerns around fracking. While unconventional resources could boost energy diversity and security, this has to be done in an environmentally acceptable manner:

Producing unconventional gas is an intensive industrial process, generally imposing a larger environmental footprint than conventional gas development. More wells are often needed and techniques such as hydraulic fracturing are usually required to boost the flow of gas from the well. The scale of development can have major implications for local communities, land use and water resources. Serious hazards, including the potential for air pollution and for contamination of surface and groundwater, must be successfully addressed. Greenhouse-gas emissions must be minimised both at the point of production and throughout the entire natural gas supply chain. Improperly addressed, these concerns threaten to curb, if not halt, the development of unconventional resources.⁷⁴

The IEA has developed a set of 'golden rules' in response, which it estimates would add on 7% to the cost of developing a typical shale gas wellsite, but which it says would give the industry public and environmental acceptance and a "social licence" to operate.⁷⁵

5.2 Greenhouse gas emissions

It has been argued that generating electricity from natural gas is relatively clean in comparison to coal fired generation.⁷⁶ It has been suggested that more gas could help bridge the gap to cleaner renewables or more nuclear generation.⁷⁷ US greenhouse gas emissions were 9% lower in 2014 than 2005, reversing a strong upwards trend (although emissions increased by 1% from 2013 to 2014).⁷⁸ The US Energy Information Administration (EIA) has attributed almost half of the reduction to shale gas use.⁷⁹

From the UK perspective, the IoD highlights the emissions benefits of domestic production over importing liquid natural gas (LNG), the potential of shale gas as a transport fuel, and avoided emissions through supporting energy efficient manufacturing in the UK.⁸⁰

However, cheap gas may divert investment from more expensive (up-front) alternatives such as renewables and nuclear, weakening the case for reducing reliance on fossil fuels.⁸¹ The former Director of the Tyndall Centre for Climate Change Research, Professor Kevin Anderson, has said that "From a climate-change perspective this stuff simply has to

⁷⁴ IEA, [Golden rules for a golden age of gas](#) WEO special report, 29 May 2012

⁷⁵ Ibid, in text box on pp13-14

⁷⁶ For example [The case for shale and tight gas](#), Speech given by Malcolm Brinded, Executive Director, Upstream International at Royal Dutch Shell, at the Foundation for Science and Technology, 9 November 2011

⁷⁷ Pearce, F, '[Fracking: the monster we greens must embrace](#)', *Guardian*, 15 March 2013

⁷⁸ US Environmental Protection Agency, [US greenhouse gas inventory report: 1990-2014](#), 15 April 2016

⁷⁹ 'Frack to the Future', *New Scientist*, 10 August 2013 pp36-41

⁸⁰ IoD, [Infrastructure for Business: Getting shale gas working](#), 22 May 2013

⁸¹ Schrag, D.P., 'Is shale gas good for climate change?' *Daedalus*, 141(2), 72-80, 2012

stay in the ground”.⁸² A Tyndall Centre [report](#) published in November 2011 concluded:

[...] emissions from a fully developed UK shale gas industry would likely be very substantial in their own right. If the UK Government is to respect its obligations under both the Copenhagen Accord and Low Carbon Transition Plan, shale gas offers no meaningful potential as even a transition fuel.⁸³

A [letter to the Guardian](#) (27 September 2011) said that the lower CO₂ emissions of gas compared to coal or oil were countered by methane releases of up to 10% of production. However, in a [letter in response](#) (6 October 2011), a petroleum engineer said that methane leakage with frac fluids can be either captured or flared and leakage of 10% would not be tolerated by any commercial company.

The 2013 Energy and Climate Change Committee [report](#) on the impact of shale gas on energy markets recommended that policies on flaring and venting of methane should be reviewed to keep fugitive emissions as close to zero as possible, and that these emissions should be monitored by DECC.⁸⁴

The RS/RAE, in its [June 2012 report](#), considered that more work was needed to monitor this, and to explore the carbon footprint and climate risks associated with extraction and use.⁸⁵

In June 2013, then Energy Minister Michael Fallon said that a study and report on this had been requested by the Secretary of State, to include recommendations to mitigate the impacts of shale gas exploration, production and use.⁸⁶ On 9 September 2013 DECC published a report by its Chief Scientific Adviser, Professor David Mackay, and Dr Timothy Stone on the [Potential Greenhouse Gas Emissions Associated with Shale Gas Extraction and Use](#).

The report concluded that local emissions should not be significant if properly regulated, compared to the overall emissions from burning shale gas. It found that shale gas’s overall carbon footprint was comparable to gas extracted from conventional sources, lower than that of LNG, and, when used for generating electricity, significantly lower than that of coal.

Responding to the report on the same day in a [speech to the Royal Society](#), the Secretary of State said this meant that gas was “part of the answer to climate change”, as a bridge in our transition to a green future. Indigenous ‘on-shore’ production would allow the UK to control the emissions better than off-shoring them, contribute to energy security, and maintain tax revenues as the North Sea wound down. He said:

⁸² ‘What the Frack?’ *The Economist*, 1 October 2011, p34 and ‘Natural Gas: Should fracking stop?’ *Nature* Volume 477, 15 September 2011, pp271–275

⁸³ Tyndall Centre for Climate Change Research, [Shale gas: an updated assessment of environmental and climate change impacts](#), November 2011, p7

⁸⁴ House of Commons Energy and Climate Change Committee, [The Impact of Shale Gas on Energy Markets](#), April 2013

⁸⁵ RS/RAE, [Shale gas extraction in the UK: a review of hydraulic fracturing](#), June 2012

⁸⁶ HC Deb 3 June 2013 cc942-3W

The continued use of gas is perfectly consistent with our carbon budgets over the next couple of decades.

If shale gas production does reach significant levels we will need to make extra efforts in other areas.

Because by on-shoring production we will be on-shoring the emissions as well.⁸⁷

This overall effect on keeping within Carbon Budgets is likely to be challenged by those who say that any dash for gas risks these.⁸⁸

The Environmental Audit Committee [reported](#) on its inquiry into the environmental risks of fracking in January 2015, concluding that:

Ultimately, fracking cannot be compatible with our long-term commitments to cut climate changing emissions unless full-scale carbon capture and storage technology is rolled out rapidly, which currently looks unlikely. There are also huge uncertainties around the impact that fracking could have on water supplies, air quality and public health.⁸⁹

Committee on Climate Change

The [Committee on Climate Change](#) (CCC) is an independent statutory body established under the [Climate Change Act 2008](#) to “advise the UK Government and devolved administrations on emissions targets and report to Parliament on progress made in reducing greenhouse gas emissions and preparing for climate change”.⁹⁰ [Section 49](#) of the [Infrastructure Act 2015](#) requires the Secretary of State to, from time to time, request advice on the impact of onshore shale gas on meeting the UK’s carbon budgets.

The CCC published a report on 7 July 2016 on [The compatibility of UK onshore petroleum with meeting the UK’s carbon budgets](#). The report found that:

the implications of UK shale gas exploitation for greenhouse gas emissions are subject to considerable uncertainty – from the size of any future industry to the potential emissions footprint of shale gas production. It also finds that exploitation of shale gas on a significant scale is not compatible with UK carbon budgets, or the 2050 commitment to reduce emissions by at least 80%, unless three tests are satisfied.⁹¹

Box 5: Committee on Climate Change’s three tests for UK shale gas exploitation⁹²

Test 1: Well development, production and decommissioning emissions must be strictly limited. Emissions must be tightly regulated and closely monitored in order to ensure rapid action to address leaks.

⁸⁷ DECC, [The Myths and Realities of Shale Gas Exploration](#), 9 September 2013

⁸⁸ See for example [Has the 'greenest government ever' gassed itself?](#), *BBC News*, 19 March 2012

⁸⁹ House of Commons Environmental Audit Committee, [Environmental Audit Committee calls for halt to fracking](#), 26 January 2015

⁹⁰ Committee on Climate Change, [About us](#) [accessed 1 September 2016]

⁹¹ Committee on Climate Change, [The compatibility of UK onshore petroleum with meeting the UK’s carbon budgets](#), 7 July 2016

⁹² Committee on Climate Change, [The compatibility of UK onshore petroleum with meeting the UK’s carbon budgets](#), 7 July 2016, pp7-8

- a) A range of technologies and techniques to limit methane emissions should be required, including 'reduced emissions completions' (also known as 'green completions') and liquid unloading mitigation technologies (e.g. plunger lift systems) should these be needed;
- b) A monitoring regime that catches potentially significant methane leaks early is essential in order to limit the impact of 'super-emitters';
- c) Production should not be allowed in areas where it would entail significant CO₂ emissions resulting from the change in land use (e.g. areas with deep peat soils);
- d) The regulatory regime must require proper decommissioning of wells at the end of their lives. It must also ensure that the liability for emissions at this stage rests with the producer.

Test 2: Consumption – gas consumption must remain in line with carbon budgets requirements. UK unabated fossil energy consumption must be reduced over time within levels we have previously advised to be consistent with the carbon budgets. This means that UK shale gas production must displace imported gas rather than increasing domestic consumption.

Test 3: Accommodating shale gas production emissions within carbon budgets. Additional production emissions from shale gas wells will need to be offset through reductions elsewhere in the UK economy, such that overall effort to reduce emissions is sufficient to meet carbon budgets.

In its [response](#) to the CCC's report, the Government agreed there was uncertainty, and said that there was a need to explore and test shale resources to increase understanding of the potential shale gas reserves and the associated emissions footprint. It also agreed that "appropriate emission mitigation techniques should be employed where practical" during exploration. In relation to the three tests:

xii. The Government believes that the strong regulatory environment for shale gas development, plus the determined efforts of the UK to meet its carbon budgets, means that the three "tests" put forward by the CCC will be met. The necessary actions already underway are described in detail on the following pages.

xiii. Given this view, the Government does not intend to lay regulations under Section 49(3) of the Infrastructure Act 2015, which would provide for the right to use deep-level land to cease to have effect. The Act requires a further report to be provided by the CCC in April 2021. The Government may also request updated advice in the meantime, should it deem it helpful.⁹³

UK Onshore Oil and Gas, the representative body for the UK onshore oil and gas industry including exploration and production, welcomed the report, which it said:

confirms what we have long maintained – that shale gas production is compatible with the country's need to reduce emissions. The report also shows that shale gas has lower lifecycle emissions than imported LNG. As an industry, we look forward to continuing to work proactively with regulators to minimise fugitive emissions from our operations.⁹⁴

Conversely, Friends of the Earth [responded](#) to the CCC's report by calling for "the Government to introduce an immediate halt on all

⁹³ DECC, [Onshore petroleum: the compatibility of UK onshore petroleum with meeting the UK's carbon budgets: Government response to the Committee on Climate Change report](#), 7 July 2016

⁹⁴ UKOOG, [UK onshore oil and gas industry welcomes Committee on Climate Change report](#), 7 July 2016

fracking plans, so that it can undertake a full assessment of whether it is possible to meet the CCC's three tests".⁹⁵

5.3 Pollution incidents in the US and implications for the UK

Regulation of shale gas development in the US takes place at federal, state and local levels, leading to variations in the regulations which apply.⁹⁶ The [Chartered Institution of Water and Environmental Management](#) notes that in some US states, variations in environmental regulations have an impact on the economic viability of fracking schemes.⁹⁷

Anecdotal instances of pollution in the USA received prominence through the [Gasland](#) film. Some states (e.g. [Maryland](#)) have put in place moratoriums on fracking, as have some countries including [Scotland](#), [Northern Ireland](#) and [France](#). Following the publication of a two year study into the impact on public health, fracking was banned in New York in December 2014.⁹⁸

The RS/RAE report noted differences in practice between the UK and North America:

Studies in North America have used well data to identify key factors affecting leakage, especially the number of casings⁹⁹ and the extent to which these casings were cemented. Some of the leaky wells in a Canadian study had only a single casing or were left uncased except in the section from the surface casing down to just below the aquifer (Watson and Bachu 2009). Others had not been cemented at all or the cementation had not reached the required height (Watson and Bachu 2009). Several percent of older oil and gas wells leaked, while fewer than 0.5% of those constructed since 2000 according to stricter standards were found to be leaky (Watson and Bacchu 2009).

In the USA, it is common to have two strings of casings. When intermediate casing is not installed, cementing the production casing to the surface should be considered (API 2009). Intermediate casing is not always cemented all the way back to the surface. At a minimum, the cement should extend above any exposed water or hydrocarbon bearing zones (API 2009). In some states, such as Pennsylvania and Texas, there is a requirement to cement casing to approximately 75 ft below any aquifers. Failure to do this can lead to groundwater contamination as occurred in Pavillion, Wyoming (DiGiulio et al 2011). In the UK, standard

⁹⁵ Friends of the Earth, [The Committee on Climate Change's report into fracking and climate change](#), July 2016

⁹⁶ Office of Fossil Energy, [Shale gas 101](#) [accessed 1 September 2016]

⁹⁷ Chartered Institution of Water and Environmental Management, [Shale gas and water 2016: an independent review of shale gas extraction in the UK and the implications for the water environment](#), February 2016

⁹⁸ ['New York state to ban fracking over 'red flags' to public health'](#), *The Guardian*, 17 December 2014

⁹⁹ Casing is the steel pipe lowered into, and usually cemented into, the borehole as it is being drilled. It serves to permit control of pressure, prevent the formation from collapsing into the well, isolate different formations from each other to prevent crossflow of fluids and gases, and provide a means of controlling formation fluids. For more information see Environment Agency, [Review of assessment procedures for shale gas well casing installation](#), October 2012,

practice is to have three strings of casing with at least two (intermediate and production casing) passing through and thereby isolating any freshwater zones. Best practice is to cement casings all the way back to the surface, depending on local geology and hydrogeology conditions.¹⁰⁰

In 2008, residents of Pavillion, Wyoming, reported potential groundwater contamination of their domestic and municipal drinking water wells following fracking in the local area. The EPA stated in March 2016 that it was “providing input to the State of Wyoming in their ongoing investigation of Pavillion groundwater issues”.¹⁰¹ A separate report published in April 2016 concluded that drilling had taken place at depths of as little as 700ft, resulting in:

[...] dangerous levels of chemicals in the underground water supply used by the 230 residents of Pavillion, a small town in central Wyoming. Levels of benzene, a flammable liquid used in fuel, were 50 times above the allowable limit, while chemicals were dumped in unlined pits and cement barriers to protect groundwater were inadequate¹⁰²

Given public concern and the proliferation of fracking, the US EPA embarked on studies on the '*Potential Impacts of Hydraulic Fracturing on Drinking Water Resources*'. A [progress report](#) was published in December 2012, which noted the difficulty of compiling and isolating statistics on incidents due to fracking (compared to 'conventional' leaks) given also that there is no national database in the US, with many data recorded at State level.¹⁰³

In June 2015, the EPA published an [external review draft of its assessment of the potential impacts of hydraulic fracturing for oil and gas on drinking water resources](#).¹⁰⁴ The Science Advisory Board formally commented on the draft on 11 August 2016, describing it as “comprehensive but lacking in several critical areas”, with concerns including:

[...] several major findings presented within the draft that seek to draw national-level conclusions regarding the impacts of hydraulic fracturing on drinking water resources.¹⁰⁵

In 2011, the former Energy Minister Charles Hendry noted that the investigated US incidents of water pollution were explained by accidents on the surface rather than underground leaks, and said that the UK would learn from this. Regarding US methane leaks:

Also, some incidents of methane contamination of water were not attributable to oil or gas operations at all; they were caused by methane of recent biological origin.

¹⁰⁰ RS/RAE, [Shale gas extraction in the UK: a review of hydraulic fracturing](#), June 2012, p26

¹⁰¹ EPA, [Pavillion groundwater investigation](#) [accessed 1 September 2016]

¹⁰² '[Scientists find fracking contaminated Wyoming water after EPA halted study](#)', *The Guardian*, 7 April 2016

¹⁰³ EPA, [Study of the potential impacts of hydraulic fracturing on drinking water resources: progress report](#), December 2012

¹⁰⁴ EPA, [Assessment of the potential impacts of hydraulic fracturing for oil and gas on drinking water resources \(external review draft\)](#), 5 June 2015

¹⁰⁵ Science Advisory Board, [SAB Review of the EPA's draft Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources](#), 11 August 2016

However, there were cases in which gas leaks had occurred. That was attributed to unsatisfactory well construction or cementing. That confirms, if any confirmation were needed, that drilling for shale gas—like drilling for any other kind of oil or gas—is a hazardous operation that requires careful and consistent regulation. However, that also supports the Committee's conclusions that there is no evidence that the fracking process itself poses a direct risk to underground water resources, and that the risks are related to the integrity of the well and are not different from those encountered in conventional oil and gas extraction.¹⁰⁶

5.4 Environmental considerations in the UK

The [2011 Tyndall Centre report](#) set out concerns about ground and surface water contamination, possibly even affecting quality of drinking water and wetland habitats, depending on factors such as the connection between ground and surface waters.

The depth of shale gas extraction gives rise to major challenges in identifying categorically pathways of contamination of groundwater by chemicals used in the extraction process.¹⁰⁷

The ECC Committee's 2011 [inquiry](#) found no evidence that fracking poses a direct risk to underground water aquifers provided the drilling well is constructed properly.¹⁰⁸ In its [response](#) to the Committee's report, the Government noted:

The technologies used in shale gas operations are not generically novel or unfamiliar. Hydraulic fracturing, water injection and lateral drilling, individually or in combination, are all familiar techniques that DECC and the other regulators have had to deal with robustly for a long time.¹⁰⁹

The RS/RAE considered that because fracking takes place many hundreds of metres or even several kilometres below aquifers, it is very unlikely that fracking will affect those aquifers. More likely causes of possible contamination include faulty wells, and the [report](#) called for the same stringent controls for offshore wells to be applied onshore:

Ensuring well integrity must remain the highest priority to prevent contamination. The probability of well failure is low for a single well if it is designed, constructed and abandoned according to best practice. The UK's well examination scheme was set up so that the design of offshore wells could be reviewed by independent, specialist experts. This scheme must be made fit for purpose for onshore activities.¹¹⁰

Public Health England published a [report](#) in June 2014 assessing the risk to human health of extracting shale gas. The report evaluated available

¹⁰⁶ [HC Deb 3 November 2011 c363WH](#)

¹⁰⁷ Tyndall Centre for Climate Change Research, [Shale gas: an updated assessment of environmental and climate change impacts](#), November 2011, pp9-10

¹⁰⁸ House of Commons Energy and Climate Change Committee, [Shale gas gets support from MPs in new report](#), 23 May 2011

¹⁰⁹ House of Commons Energy and Climate Change Committee, [Shale Gas: Government Response to the Committee's Fifth Report of Session 2010-12](#), 19 July 2011

¹¹⁰ RS/RAE, [Shale gas extraction in the UK: a review of hydraulic fracturing](#), June 2012, p4

evidence on air quality, radon gas, naturally occurring radioactive materials, water contamination and waste water. It concluded that:

An assessment of the currently available evidence indicates that the potential risks to public health from exposure to the emissions associated with shale gas extraction will be low if the operations are properly run and regulated.

[...]

Where potential risks have been identified in the literature, the reported problems are typically a result of operational failure and a poor regulatory environment. Therefore, good on-site management and appropriate regulation of all aspects including exploratory drilling, gas capture, use and storage of hydraulic fracturing fluid, and post-operations decommissioning are essential to minimise the risk to the environment and public health.¹¹¹

DECC [confirmed](#) in November 2015 that operators carrying out fracking are required to disclose the composition of fracturing fluid additives as part of their application for environmental permits. The Environment Agency assesses the potential hazards, and has powers to restrict or prohibit the use of chemicals where they would pose an environmental risk. Information on the chemical substances and their maximum concentrations is published with the permit on the public register.¹¹²

According to an answer given by then Energy Minister Charles Hendry in June 2011, the fluids used by Cuadrilla comprised:

fresh water and sand—99.96% and polyacrylamide friction reducers—0.04%. Other potential additives include hydrochloric acid, typically at a concentration of 0.125%, or biocide at a concentration of 0.005% if required to purify the local water supply.¹¹³

5.5 Water use

The [Tyndall Centre](#) highlighted excessive water use for fracking as a particular problem “given that water resources in many parts of the UK are already under pressure”.¹¹⁴ The RS/RAE report recommends recycling and re-use of wastewaters and that water disposal options should be planned from the outset.¹¹⁵ Cuadrilla [states](#) that during its operations at Preese Hall in Lancashire, it used 8,400m³ of water for fracture treatments, with each site using around 900m³ of water, some of which was recycled water. It notes that most fracturing water is not recycled during the exploration phase, but that “during the production phase, it is more practical to recycle the water across our sites”.¹¹⁶

¹¹¹ Public Health England, [Review of the potential public health impacts of exposures to chemical and radioactive pollutants as a result of the shale gas extraction process](#), June 2014

¹¹² PQ [HL2905](#) [on fracking], 3 November 2015 and Environment Agency, [Access the public register for environmental information](#), [accessed 1 September 2016]

¹¹³ [HC Deb 29 June 2011 c853w](#)

¹¹⁴ Tyndall Centre for Climate Change Research, [Shale gas: a provisional assessment of climate change and environmental impacts](#), January 2011, pp6-7

¹¹⁵ RS/RAE, [Shale gas extraction in the UK: a review of hydraulic fracturing](#), June 2012

¹¹⁶ Cuadrilla, [Water sourcing](#), [accessed 1 September 2016]

Because shale gas reserves are more diffuse than conventional reservoirs, productivity at each well falls relatively quickly. In 2009, the IEA [reported](#) that, apart from local community buy-in, the most important above-ground considerations for unconventional gas developments are the availability of sufficient land and water. Shale gas drilling leaves “a large and comparatively invasive footprint on the landscape” because of the large number of wells needed. The IEA also notes that access to water may be a barrier to unconventional gas developments, although technology is starting to reduce the amount required.¹¹⁷

In its [response](#) to the 2011 ECC Committee inquiry, the Government said that “Adverse effects on water resources as a result of possible expansion of the shale gas industry in the UK are not expected”.¹¹⁸

In response to a [written question](#) in January 2016, then Minister Andrea Leadsom said that while usage would depend on individual sites, “estimates suggest that the amount needed to operate a fracked well for a decade may be equivalent to the amount needed to water a golf course for a month, or the amount needed to run a 1,000 MW coal-fired power plant for 12 hours”. She confirmed that:

In order to carry out hydraulic fracturing activities, an operator is required to seek an abstraction permit from the Environment Agency if more than 20 cubic metres per day of water is to be abstracted from surface or groundwater bodies. If water is instead sourced from a mains supply, the water company will need to ensure it can still meet the conditions of the abstraction permit that it will already be operating under. Whichever source an operator chooses to use, a thorough assessment will be made considering the existing water users’ needs and the environmental impact before permission is granted.

The Infrastructure Act 2015 states that the Secretary of State will only be able to issue hydraulic fracturing consent if satisfied that planning authorities have consulted the relevant water company.¹¹⁹

Because abstraction is controlled in the UK, the RS/RAE consider that water use can be managed sustainably.¹²⁰

5.6 Seismic events

In April and May 2011 there were some small earth tremors near Blackpool.¹²¹ Cuadrilla issued a [statement](#) on 31 May 2011 saying it was postponing fracking operations while it interpreted seismic information.¹²² In its July 2011 [response](#) to the ECCC report, the

¹¹⁷ IEA, [World Energy Outlook 2009](#), Chapter 11, p415

¹¹⁸ House of Commons Energy and Climate Change Committee, [Shale Gas: Government Response to the Committee's Fifth Report of Session 2010-12](#), 19 July 2011

¹¹⁹ PQ [22950](#) [on water usage for exploratory fracking operations], 21 January 2016

¹²⁰ RS/RAE, [Shale gas extraction in the UK: a review of hydraulic fracturing](#), June 2012

¹²¹ ‘Gas drilling on hold after earth tremor’, *Daily Post (Liverpool)*, 1 June 2011, p14

¹²² Cuadrilla, [Statement on May 27th earthquake in Poulton area](#), 31 May 2011

Government agreed that a pause in hydraulic fracturing operations was appropriate.¹²³

'Induced seismicity' can occur in previously aseismic areas following oil and gas activities. Thousands of induced earthquakes are registered annually, and operators can take steps to reduce or control seismicity.¹²⁴ Natural or mining-induced earthquakes in the UK are not uncommon with around 100 earthquakes recorded on average each year.¹²⁵

The BGS said in January 2012 that the risks to groundwater and of earthquakes had been exaggerated, with the minor earthquakes caused by fracking "Comparable in size to the frequent minor quakes caused by coal mining. What's more, they originate much deeper in the crust so have all but dissipated by the time they reach the surface".¹²⁶

Cuadrilla funded a geomechanical study by the BGS which was given to DECC to consider. In April 2012 DECC [published the report](#), which said:

The report concludes that minor earth tremors detected in the area of Cuadrilla's Preese Hall operations near Blackpool in April and May last year were caused by fracking and, among other measures, recommends a real time seismic monitoring system and a "traffic light" control regime based on this monitoring.¹²⁷

A consultation period was announced. In the meantime the Environment Agency continued studies to ensure it had all the information it needed to regulate the industry. On 13 December 2012 the Secretary of State [announced](#) that exploratory hydraulic fracturing for shale gas could resume in the UK.¹²⁸ New regulatory requirements to mitigate seismic risks from fracking were announced:

- Conduct a prior review of information on seismic risks and the existence of faults;
- Submit to DECC a fracking plan showing how any seismic risks are to be addressed;
- Carry out seismic monitoring before, during and after fracking;
- Implement a "traffic light" system which will be used to identify unusual seismic activity requiring reassessment, or halting, of operations.¹²⁹

In 2014 DECC [published](#) a guide to fracking and earthquake risk, which outlines the traffic light monitoring system.¹³⁰

In his 2012 statement, the Secretary of State also said that the Government would act on the RS/RAE recommendations regarding regulation of a future production phase and environmental risk assessment:

¹²³ House of Commons Energy and Climate Change Committee, [Shale Gas: Government Response to the Committee's Fifth Report of Session 2010-12](#), 19 July 2011

¹²⁴ 'Shakin' all over', *Petroleum Review*, April 2012, p16

¹²⁵ BGS, [Seismic monitoring](#) [accessed 1 September 2016]

¹²⁶ 'Fracking risk is exaggerated', *New Scientist*, 11 January 2012

¹²⁷ HC Deb 23 April 2012 c617WA

¹²⁸ [HC Deb 13 December 2012 c44WS](#)

¹²⁹ DECC, [New controls announced for shale gas exploration](#), 13 December 2012

¹³⁰ DECC, [Fracking UK shale: understanding earthquake risk](#), February 2014

[...] the academies have in addition recommended that an environmental risk assessment should be mandatory for all shale gas operations, involving the participation of local communities at the earliest possible opportunity, and that this assessment should address risks across the entire lifecycle of shale gas extraction.

DECC will therefore take steps to enhance the existing frameworks for consultation and consenting to these activities, in line with these recommendations. Licensees will be required to carry out a comprehensive high-level assessment of environmental risks, including risks to human health, and covering the full cycle of the proposed operations, including well abandonment; and to consult with stakeholders including local communities, as early as practicable in the development of their proposals.¹³¹

While exploratory drilling has taken place in Lancashire, North Yorkshire and West Sussex, shale gas is still some way away from full commercial development. Unlike in the USA, where landowners own subsurface mineral rights, in the UK the Crown holds the right to gold and silver, and the State to oil, petroleum and natural gas—landowners hold only the remaining mineral rights. In its 2014 report on the economic impact on UK energy policy of shale gas and oil, the House of Lords Economic Affairs Committee called for changes to legislation to:

ensure that subsurface drilling for oil and gas can go ahead without undue delay or cost. This change should ensure that the fact that UK landowners do not own petroleum rights makes little difference to the speed of shale gas and oil development; in practice, it may even make subsurface drilling under third party land easier in the UK than it is in the US.¹³²

Changes to this effect were subsequently introduced in the *Infrastructure Act 2015*.

5.7 Advertising Standards Agency Rulings

The Advertising Standards Agency (ASA) has made a number of rulings on various fracking adverts. In April 2013 it ruled against several statements made by Cuadrilla Resources in a brochure in which the firm claimed that fracking used ‘proven, safe technologies’.¹³³

More recently the ASA made a ruling reversing an earlier ban of an advertising campaigns by Greenpeace from January 2015. The advert had stated that experts agree that fracking will not reduce energy bills in the UK, and was earlier ruled incorrect. On appeal the ASA concluded that “the claim as it was likely to be interpreted by readers had been substantiated and was not materially misleading”.¹³⁴

On 4 January 2017, the ASA [informally ruled](#) that Friends of the Earth (FoE) must withdraw a fundraising leaflet about fracking because it made claims that ‘could not be backed up with evidence’.¹³⁵ The

¹³¹ [HC Deb 13 December 2012 c51WS](#)

¹³² House of Lords Economic Affairs Committee, [The economic impact on UK energy policy of shale gas and oil](#), 8 May 2014

¹³³ The Guardian, [‘Friends of the Earth ticked off over claims in anti-fracking leaflet’](#), 4 January 2017

¹³⁴ ASA, [ASA Ruling on Greenpeace Ltd](#), 21 September 2016

¹³⁵ Financial Times, [‘Friends of the Earth forced to withdraw anti-fracking leaflets’](#), 4 January 2017 [subscription required]

complaint against the leaflet had been made by energy firm Cuadrilla. The firm contested claims made in the leaflet that fracking can cause cancer and included a photo of Grasmere in the Lake District where there are currently no plans for fracking. FoE agreed to the ASA's request that they should also no longer make unsubstantiated claims about the effect of fracking on health, drinking water or property prices.¹³⁶

6. Support for the industry and support for communities

6.1 Support for the industry

In the [2012 Autumn Statement](#), the Chancellor set out the overall Government policy for support for the shale gas industry:

Today, we publish our gas strategy to ensure that we make the best use of lower-cost gas power, including new sources of gas under the land. We are consulting on new tax incentives for shale gas and announcing the creation of a single office so that regulation is safe but simple. We do not want British families and businesses to be left behind as gas prices tumble on the other side of the Atlantic.¹³⁷

The Coalition Government's [Gas Generation Strategy](#) noted in 2012 that shale gas production might commence in the second part of the decade, but production was likely to grow more slowly than in the US. The strategy made two main commitments:

- A new DECC [Office for Unconventional Gas and Oil](#), to join up responsibilities across Government, ensure a simplified and streamlined regulatory process, and engage with communities.
- A 'fair tax regime' for future shale gas production.¹³⁸

[Budget 2013](#) said that the Government would introduce a new field allowance for shale gas and consult on the detail.¹³⁹ In July 2013 the Government launched a consultation on [tax incentives for drilling companies](#).¹⁴⁰ Following this it was announced in the [2013 Autumn Statement](#) that the tax rate on a portion of a company's profits would be reduced from 62 to 30% and that companies will receive a tax allowance equal to 75% of capital spent on projects.¹⁴¹ The Government [consulted](#) on the draft legislation, and the [Finance Act 2014](#) received Royal Assent on 17 July 2014.

¹³⁶ The Guardian, ['Friends of the Earth ticked off over claims in anti-fracking leaflet'](#), 4 January 2017

¹³⁷ [HC Deb 5 December 2012 c881](#)

¹³⁸ DECC, [Gas Generation Strategy](#), Cm 8407, 5 December 2012

¹³⁹ DECC, [New Office to look at community benefits for shale gas projects](#), 20 March 2013

¹⁴⁰ HM Treasury/ DCLG, [Shale gas: government unveils plan to kick start investment with generous new tax breaks](#), 19 July 2013

¹⁴¹ HM Treasury, [Autumn Statement 2013](#), 5 December 2013

The House of Lords Economic Affairs Committee, in its [2014 report on the economic impact on UK energy policy of shale gas and oil](#), stated its support for the exploration of shale gas resources in the UK:

We strongly believe that the UK should seize the opportunity offered by its shale gas resource. It could bring regional economic growth and employment, reduce dependence on imports and improve security of supply, help guard against energy shortage in future and perhaps cut prices. The Government should make a sustained and concerted effort to get shale development moving within a robust and responsive regulatory framework. This effort needs to be directed from the top.¹⁴²

The [2016 Budget](#) included measures to reduce the tax rates for onshore and offshore oil and gas. Announcing the measures, HMRC stated:

These measures support the government's objective of providing the right conditions to maximise the economic recovery of the UK's oil and gas resources at a time when the industry is facing considerable challenges.

The cuts to headline tax rates will simplify the tax regime for investors, and level the playing field between investment opportunities in older fields and infrastructure and new developments. They will increase the attractiveness of projects in the UKCS [UK Continental Shelf] relative to investment opportunities elsewhere, encouraging investment in the UK and UKCS, and could lead to increased production of oil and gas, helping to increase the UK's energy security, balance of payments and supporting jobs and supply chain opportunities.¹⁴³

6.2 Support for communities

The then Energy Minister Michael Fallon said in June 2013 that the Government would consult on community benefits "through grants or expenditure, or, better still, through discounts on their bills, which could be significant".¹⁴⁴ Details of the package, which are set out in the [UK Onshore Oil and Gas Shale Community Engagement Charter](#),¹⁴⁵ were announced on 27 June 2013, including:

1. The Government has also welcomed a package of community benefits that has been brought forward by industry today. Companies have pledged to engage with communities early (prior to any application for planning permission), and to provide community benefits in areas where shale is commercially extracted.
2. These will include £100,000 for communities situated near each exploratory (hydraulically fracked) well, and 1% of revenues from every production site.¹⁴⁶

¹⁴² House of Lords Economic Affairs Committee, [The economic impact on UK energy policy of shale gas and oil](#), 8 May 2014

¹⁴³ HMRC, [Oil and gas taxation: reduction in petroleum revenue tax and supplementary charge](#), 16 March 2016

¹⁴⁴ [HC Deb 6 June 2013 c1655](#)

¹⁴⁵ UKOOG, [Community engagement charter: oil and gas from unconventional reservoirs](#), June 2013

¹⁴⁶ DECC, [Estimates of shale gas resource in North of England published, alongside a package of community benefits](#), 27 June 2013

In the [2014 Autumn Statement](#), the Government announced a range of measures to further encourage the development of shale gas resources in the UK. These were:

- a £5 million fund to provide independent evidence directly to the public about the robustness of the existing regulatory regime;
- £31 million of funding to create world class sub-surface research test centres through the Natural Environment Research Council. This aims to establish world leading knowledge which will be applicable to a wide range of energy technologies including shale gas and carbon capture and storage;
- setting up a long-term investment fund from tax revenues from shale for the North and other areas hosting shale gas developments, to capture the economic benefits of shale gas for future generations.

In the [Spending Review and Autumn Statement 2015](#), the then Chancellor announced the creation of a Shale Wealth Fund to deliver up to £1 billion of investment in local communities hosting shale gas developments in the north of England and other shale-producing regions.¹⁴⁷ On 8 August 2016, the Treasury launched a [consultation](#) on the delivery methods and priorities for the Shale Wealth Fund to seek views on:

3. what the government's priorities should be for the Shale Wealth Fund
4. the allocation of funding from the Shale Wealth Fund to different stakeholder groups
5. the extent to which the industry community benefits scheme and the Shale Wealth Fund should be aligned
6. potential delivery models for the Shale Wealth Fund – to ensure that households and communities benefit, and to
7. decide how funds are spent, and how any process should be administered¹⁴⁸

The consultation closes on 26 October 2016.

Announcing the consultation, the Financial Secretary to the Treasury, Jane Ellison MP, [said](#):

We are backing the safe development of shale gas because natural gas is absolutely vital to the economy, currently providing around one third of our energy supply.

We've made safety and the environment our top priorities but we also want to ensure local people and communities see extra benefit, beyond the jobs and growth that the safe use of shale gas delivers.

The announcement stated that the consultation included the potential for direct payments to households, and that the fund could be worth:

up to £1 billion in total, and pay out to communities over 25 years. In what will be entirely new funding, up to 10% of tax

¹⁴⁷ HM Treasury, [Spending Review and Autumn Statement 2015](#), November 2015

¹⁴⁸ HM Treasury, [Shale Wealth Fund: consultation](#), 8 August 2016

revenues arising from shale gas production will be used for the benefit of people who live in areas which host shale sites

[Business Green](#) reported on 15 August 2016 that a YouGov poll published by Friends of the Earth found that one third of people would either 'strongly' or 'tend to' support fracking in their local area if households were given direct payments of up to £10,000. The poll of 1,704 people found that 43% would oppose fracking despite a potential cash payment.¹⁴⁹

6.3 Business rates

In a statement on 13 January 2014, the then Prime Minister announced that councils would be able to keep 100% of business rates collect from shale gas sites. This doubled the existing 50% figure under the Government's business rate retention scheme which according to a Government estimate could be worth up to £1.7 million for a typical 12 well site.¹⁵⁰

The Local Government Association [described](#) the announcement as a "step in the right direction". However it argued that more financial support should be given to communities, and that returns should be set at between 5 and 10%.¹⁵¹

The Government [consulted](#) on draft regulations to allow the 100% local retention between October and December 2014. The [*Non-Domestic Rating \(Shale Oil and Gas and Miscellaneous Amendments\) Regulations 2015*](#) were subsequently made in March 2015.

¹⁴⁹ [Survey: Only a third of public would support local fracking projects, despite offer of 'bribes'](#), *Business Green*, 15 August 2016

¹⁵⁰ Prime Minister, [Local councils to receive millions in business rates from shale gas developments](#), 13 January 2013

¹⁵¹ LGA, [LGA responds to Government fracking announcement](#), 13 January 2014

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