



## Shale gas and fracking

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This note is intended to update the Energy and Climate Change (ECC) Committee's [Fifth Report](#) "Shale Gas" (May 2011), to which the Government [responded](#) in July 2011, and [POST Note 374](#) "Unconventional Gas" (April 2011).

The recent rapid development of unconventional gas resources (notably shale gas) in North America has transformed the World gas-market outlook. In September 2011 the company Cuadrilla announced the results of test drills that indicate substantial reserves in the UK. In October 2011 it published a full [economic assessment](#) of the potential for shale gas exploration and production in Lancashire and the UK, and estimates of jobs that could be supported. However, there are doubts about how much of the reserves can be exploited.

Concerns have also been raised regarding resource (land and water) use, net effects on greenhouse gas emissions and risk of groundwater contamination. The US Environmental Protection Agency is conducting a long-term study of this.

The UK Government has declined to place a moratorium on fracking, and the ECC Committee report was supportive of the industry.

Following small seismic tremors near Blackpool in April and May 2011 however, drilling is temporarily suspended. In November 2011 a seismicity study was published and Cuadrilla says it is 'highly probable' that fracking triggered the seismic events. The British Geological Survey has said that such small earthquakes associated with mining or occurring naturally are not uncommon, however. The Government has yet to make a decision about resuming fracking at the site.

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## 1 UK and World energy demand and outlook

UK Continental Shelf production of natural gas has been declining and in 2010 was about half of that in 2000. The UK has been a net importer of gas since 2004, with imports in 2010 accounting for just under half of the UK's gross (consumption plus exports) demand.<sup>1</sup>

Natural gas is the only fossil fuel for which global demand is set to be higher in 2035 than 2008 under all scenarios in the OECD/International Energy Agency's (IEA's) [World Energy Outlook](#) (2010).

Around 35% of the global increase in gas production is predicted to come from 'unconventional' sources (shale gas, coalbed methane and tight gas; see next section) in the US and, increasingly, from other regions, notably Asia-Pacific.<sup>2</sup>

The rapid development of shale gas in North America has transformed the gas-market outlook. As early as 2009, announcing the 2009 World Energy Report, the IEA [stated](#) that the boom in North America was expected to prolong the US 'glut of gas supply' and the share of unconventional gas in total US gas output was expected to reach 60% in 2030;

Unconventional gas is unquestionably a game-changer in North America with potentially significant implications for the rest of the world.

According to the *New Scientist*, the EU has said that reserves from proven and conventional sources will run out in 2068 but that unconventional reserves, such as shale gas, could add another 60 years at the current rate of consumption.<sup>3</sup>

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<sup>1</sup> [Digest of UK Energy Statistics 2011](#) Chapter 4 Gas

<sup>2</sup> World Energy Outlook 2010 p. 50

## 2 Unconventional gas reserves

The ECC Committee's report explains what 'unconventional' gas is in detail, but in short, it is natural gas from unconventional reservoirs or sources, and there are three main types. 'Shale gas', as the name suggests, is found within shale beds (as opposed to being within a conventional reservoir capped by shale beds). 'Coalbed methane' is natural gas found within coal seams, and 'tight gas' is found within other low-permeability rocks.

Shale has not previously been considered a hydrocarbon reservoir rock in the UK, because being in essence 'trapped' within low-permeability rocks, unconventional gas cannot be extracted by simply drilling a few boreholes into a large reservoir. But with advances in drilling and wellsite technology, production of gas from these less permeable formations is now commercially viable.

## 3 Fracking

Gas held within shale beds is accessed through a technique called hydraulic fracturing or "fracking", and can use horizontal drilling. Horizontal drilling is not the main issue; the technique is not new and is used increasingly at conventional wellsites to access harder to reach reserves. Indeed, Cuadrilla's wells in UK shales currently use vertical drilling<sup>4</sup>. According to the [British Geological Survey \(BGS\)](#):

Gas exploration companies drill boreholes down into the gas-bearing shales, thousands of metres below the surface. Then, the drilling continues horizontally for thousands of metres.

The borehole is lined with a steel and concrete casing. A 'perforating gun' is lowered into the borehole to make small holes into the concrete casing; explosive charges from the gun create perforations in the borehole casing.

A mixture of water, chemicals and sand is pumped — at very high pressure — along the borehole and through the perforations which fracture the shale. The water opens up cracks in the rock, and the sand grains lodge into the spaces and keep them open, allowing the released gas to flow out of the rocks and to travel back up the borehole casing.

[...]

High volumes of water — up to a million gallons — are required to fracture, and hold open, the shales. About a third of the 'waste' water, containing treatments, sands and other chemicals, is returned to the surface.

## 4 Shale gas reserves in the UK

[Figure 1](#) of the ECC Committee's report shows the UK outcrops of formations with shale gas potential. The Committee was told that the sites with best prospects are likely to be close to the formations that yield conventional oil and gas reserves. In the UK these include the Upper Bowland Shale (the source rock for the Irish Sea conventional fields, and where Cuadrilla are exploring, see below), and both the Kimmeridge Clay and Lias of the Weald Basin (source rocks for the North Sea and English Channel fields).

The BGS estimated for the ECC Committee and in a [report](#)<sup>5</sup> for the Department of Energy and Climate Change (DECC) that, by analogy with similar producing shales in the US, the

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<sup>3</sup> "Wonderfuel gas; plans are afoot to solve our energy crisis with an overlooked fuel" *New Scientist*, 12 June 2010

<sup>4</sup> <http://www.cuadrillaresources.com/what-we-do/technology/> accessed 9 October 2011

<sup>5</sup> DECC 2010 <https://www.og.decc.gov.uk/upstream/licensing/shalegas.pdf>

UK's shale gas reserve potential could be as large as 150 billion cubic metres (bcm). This compares to a 2-6 bcm estimate of undiscovered onshore conventional petroleum. However, while broadly supportive of the industry, the ECC Committee concluded that shale gas was unlikely to be a 'game-changer' to the same extent as in the US, or perhaps countries like Poland. There is less land available to drill on, for instance.

A company called Cuadrilla started drilling shale gas exploration wells near Blackpool in August 2010.<sup>6</sup> Cuadrilla says it is a UK company headquartered in Litchfield, although it is owned by Australian drilling company AJ Lucas and private equity firm Riverstone LLC.<sup>7</sup>

At the time of the Committee's inquiry the company was in exploration phase and declined to disclose too much information of a commercially confidential nature concerning its finds. Under licence terms, the results of its wells will be held confidential for four years from the well completion date.<sup>8</sup>

However, on 1 October 2011 the *Economist*<sup>9</sup> reported that on September 21st Cuadrilla estimated that 200 trillion cubic feet of gas lie in the Bowland shale under Lancashire, nearly 40 times previous projections of all of Britain's shale resources and, in theory, four times as much gas as is still recoverable from the North Sea.

This was downplayed in the same article by the BGS which pointed out the difficulties in extracting the full reserve, with possible recovery rates of only 10-20%.

On 21 September 2011 Cuadrilla published an [economic assessment](#) which predicts that test well activity could support some 250 FTE jobs across the UK, peaking at some 5,600 FTE jobs in the period 2016 through to 2019 if it moves to a commercial extraction phase.

In October 2011 Cuadrilla published its [full economic assessment](#).<sup>10</sup> This includes information about the industry and drilling in the UK and estimated that for test wells alone:

- 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.
- 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.
- 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.
- 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.

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<sup>6</sup> <http://www.cuadrillaresources.com/what-we-do/locations/>

<sup>7</sup> "Doubts raised about giant UK shale gas find", *Reuters News*, 23 September 2011

<sup>8</sup> <https://www.og.decc.gov.uk/upstream/licensing/shalegas.pdf>

<sup>9</sup> "What the Frack?" *The Economist*, 1 October 2011 p.34

<sup>10</sup> *Economic Impact of Shale Gas Exploration & Production in Lancashire and the UK* September 2010 published 5 October 2011

## 5 Regulatory regime; licensing rounds

Shale gas drilling is covered by the normal UK regime for all oil and gas exploration and development activities. A UK Petroleum Exploration and Development licence (PEDL) allows a company to pursue a range of oil and gas exploration activities (including exploration and development of unconventional onshore gas), subject to necessary drilling/development consents and planning permission.<sup>11</sup>

The last (13th) Onshore Licensing Round was run in 2008 and following the grant of planning permission, consent was given to drill for shale gas in five locations. Of these, consent for fracking of the shale has been given to Cuadrilla at two sites at Poulton-le-Flyde. In addition, a number of companies awarded licences in earlier offshore rounds are re-assessing the shale potential of older licences.<sup>12</sup> A [map](#)<sup>13</sup> shows licences offered under the 13<sup>th</sup> round.

In January 2012 the *Guardian* carried a series of reports about local residents in West Sussex opposing plans from Cuadrilla to drill a test well under licence.<sup>14</sup>

An [environmental assessment](#) has been published for the 14th Onshore Round, on which DECC is considering comments and will publish a government response as soon as practicable. Following this DECC will invite applications for the 14th Round.<sup>15</sup>

As well as holding the necessary PEDL, all drilling operations are subject to notification to the Health and Safety Executive and each site is assessed by the Environmental Agency (SEPA in Scotland) who regulate discharges to the environment (through the environmental permitting system) as well as being a statutory consultee in the planning process.<sup>16</sup>

## 6 Environmental considerations

### 6.1 Climate change

Some commentators argue that generating electricity from natural gas is relatively clean, relative, that is, to coal fired generation. It has been suggested that more gas could help bridge the gap to cleaner renewables or more nuclear generation. Equally, there are fears that plentiful gas may increase energy use and divert investment from more pricey (up-front) alternatives, weakening the case for reducing reliance on fossil fuels. 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 stay in the ground.”<sup>17</sup>

A [letter to the Guardian](#) (27 September) has said that lower CO<sub>2</sub> emissions are countered by methane releases of up to 10% of production. However, in a [letter in response](#) (6 October 2011), a petroleum engineer has 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.

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<sup>11</sup> See [http://www.decc.gov.uk/en/content/cms/meeting\\_energy/oil\\_gas/shale\\_gas/shale\\_gas.aspx#7](http://www.decc.gov.uk/en/content/cms/meeting_energy/oil_gas/shale_gas/shale_gas.aspx#7) for more links to information on the regulatory regime

<sup>12</sup> HL Deb 6 October 2011 c213WA

<sup>13</sup> DECC website <http://og.decc.gov.uk/assets/og/licences/rounds/13/13r-offered.pdf> accessed 24.1.12

<sup>14</sup> *Guardian* 12 January 2012 [No fracking in home counties, village residents tell oil company](#)

<sup>15</sup> [http://og.decc.gov.uk/en/olgs/cms/licences/lic\\_rounds/timing\\_of\\_the\\_/timing\\_of\\_the\\_.aspx](http://og.decc.gov.uk/en/olgs/cms/licences/lic_rounds/timing_of_the_/timing_of_the_.aspx) as of 24.1.12

<sup>16</sup> HC Deb 1 February 2011 c669w and <http://www.environment-agency.gov.uk/business/topics/126689.aspx>

<sup>17</sup> “What the Frack?” *The Economist*, 1 October 2011 p.34 and “Natural Gas: Should fracking stop?” *Nature* Volume 477, pp 271–275 15 September 2011

## 6.2 Ground and surface water contamination

The Environment Agency describes fracking as an established technology.<sup>18</sup> In January 2011 the Tyndall Centre for Climate Change Research published a report, *Shale gas: a provisional assessment of climate change and environmental impacts* commissioned by the Co-operative Group. The 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. An analysis of these substances suggests that many have toxic, carcinogenic or other hazardous properties. There is considerable anecdotal evidence from the US that contamination of both ground and surface water has occurred in a range of cases.<sup>19</sup>

Evidence in the US remains anecdotal to date, but some states have put in place moratoriums on fracking.

In December 2011 the US Environmental Protection Agency (EPA) issued a [press release](#)<sup>20</sup> about the initial results of two deep monitoring wells it drilled into an aquifer at one Denver location, where “fracturing is taking place in and below the drinking water aquifer and in close proximity to drinking water wells – production conditions different from those in many other areas of the country”. It found that “ground water in the aquifer contains compounds likely associated with gas production practices, including hydraulic fracturing”. However, private and public drinking water wells in the community were found to be safe.

The EPA issued guidance last year that no company could frack with diesel in the mixture without a permit. The EPA has also sued one company for alleged water contamination in Texas although the industry counters that most wells are well below aquifers and problems are caused by faulty drilling or surface operations.<sup>21</sup> An EPA study in 2004 on hydraulic fracturing for coal bed methane concluded that there was no significant evidence that drinking water aquifers were being affected. But given public concern and the proliferation of fracking, the EPA has embarked on further studies over the next two years. There will be an initial report in 2012 and another in 2014.<sup>22</sup>

President Obama’s January 2012 State of the Union Address said that any companies drilling on government land would have to disclose chemicals used for fracking so “America will develop this resource without putting the health and safety of our citizens at risk”.<sup>23</sup>

According to a parliamentary answer, the fluids used to date by Cuadrilla comprise: fresh water and sand—99.96% and polyacrylamide friction reducers—0.04%. Other potential

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<sup>18</sup> <http://www.environment-agency.gov.uk/business/topics/126689.aspx>

<sup>19</sup> Tyndall Centre for Climate Change Research at Manchester University, *Shale gas: a provisional assessment of climate change and environmental impacts*, January 2011, p5

<sup>20</sup> EPA, *EPA Releases Draft Findings of Pavillion, Wyoming Ground Water Investigation for Public Comment and Independent Scientific Review* 8 December 2011

<sup>21</sup> “Fracking” *Financial Times*, 29 September 2011 p.2

<sup>22</sup> <http://www.epa.gov/hydraulicfracture/> accessed 24 January 2012

<sup>23</sup> “US set to require disclosure from ‘frackers’” *Financial Times* 25 January 2012

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.<sup>24</sup>

The ECC Committee found no evidence that fracking poses a direct risk to underground water aquifers provided the drilling well is constructed properly. The Committee concluded that, on balance, a moratorium in the UK was not justified or necessary at present, while urging DECC to “monitor drilling activity extremely closely in its early stages in order to assess its impact on air and water quality”.<sup>25</sup>

In its response to the Committee, the Government gave an undertaking to do this, and 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.<sup>26</sup>

In a November 2011 Westminster Hall debate, the Energy Minister Charles Hendry noted that most US incidents could be explained:<sup>27</sup>

Where those reports have been investigated by the relevant US regulators, the evidence so far is that no incident of water contamination by methane has been attributed to fracking operations, and that the few incidents of contamination of water resources with fracking fluids were caused by accidents on the surface, rather than underground leaks of any kind. 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.

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.

The Government and their regulatory agencies will continue to study the experience already gained in north America and its relevance to shale gas activities in the UK. It is, of course, necessary to make the point that UK conditions, including its geology and its regulatory framework, are different, and there will not necessarily be any straightforward read-across. However, it is clearly important that we learn from the US experience, as the Committee recommended.

### 6.3 Resource 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”.<sup>28</sup> For the

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<sup>24</sup> [HC Deb 29 June 2011 c853w](#)

<sup>25</sup> Committee Press Release, *Shale gas gets support from MPs in new report*, 23 May 2011 <http://www.parliament.uk/business/Committees/Committees-a-z/commons-select/energy-and-climate-change-Committee/news/new-report-shale-gas/>

<sup>26</sup> Energy and Climate Change - Seventh Special Report Shale Gas: Government Response to the Committee's Fifth Report of Session 2010-12 19 July 2011

<sup>27</sup> HC Deb 3 November 2011 c363WH

<sup>28</sup> Tyndall Centre for Climate Change Research at Manchester University, *Shale gas: a provisional assessment of climate change and environmental impacts*, January 2011, p6-7

current exploration sites Cuadrilla anticipate using approximately 1,600 m<sup>3</sup> of water for each hydraulic fracture operation.<sup>29</sup>

Because shale gas reserves are more diffuse than conventional reservoirs, productivity at each well falls relatively quickly. The IEA considers 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 to produce a given volume of gas.

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.<sup>30</sup>

In its [response](#) to the ECC Committee, 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.”<sup>31</sup>

## 7 Seismic tremors and current suspension of drilling

At around 2.30 am on 1 April 2011 there was a 2.3 local magnitude (ML) earth tremor near Blackpool and a further, small 1.5 ML event at 0.48 am on 27 May 2011.<sup>32</sup>

Cuadrilla issued a [statement](#) on 31 May 2011 saying it was postponing fracking operations at Weeton, near Poulton, while it interpreted seismic information received from monitoring information located around the site.

In its July 2011 response to the Committee report,<sup>33</sup> the Government said that DECC had had discussions with the operator, Cuadrilla, and agreed that a pause in hydraulic fracturing operations was appropriate so that a better understanding could be gained of the cause of the seismic events experienced. A geomechanical study was being undertaken, funded by Cuadrilla, along with further work by the BGS and Keele University, and the implications would be reviewed before any decision on resumption was made.

This study was published on 2 November 2011. Cuadrilla’s [Executive Summary](#) of the *Geomechanical Study of Bowland Shale Seismicity* says

The report concludes that it is highly probable that the fracking at Preese Hall-1 well triggered the recorded seismic events. This was due to an unusual combination of factors including the specific geology of the well site, coupled with the pressure exerted by water injection. This combination of geological factors was rare and would be unlikely to occur together again at future well sites. If these factors were to combine again in the future local geology limits seismic events to around magnitude 3 on the Richter scale as a worst-case scenario.

Cuadrilla’s water injection operations take place over 3km below the earth’s surface. This significantly reduces the likelihood of a seismic event of magnitude 3 or less on the Richter scale having any impact at all at the surface.

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<sup>29</sup> [HC Deb 29 June 2011 c853w](#)

<sup>30</sup> [IEA World Energy Report 2009](#) Chapter 11, p.415

<sup>31</sup> Energy and Climate Change - Seventh Special Report Shale Gas: Government Response to the Committee’s Fifth Report of Session 2010-12, 19 July 2011

<sup>32</sup> “Gas drilling on hold after earth tremor”, *Daily Post (Liverpool)* 1 June 2011 p.14

<sup>33</sup> Op cit.



Natural or mining-induced earthquakes in the UK are not uncommon with around 150 earthquakes recorded on average each year.<sup>34</sup>

The BGS said in January 2012 that the risks to groundwater and of earthquakes have 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”.<sup>35</sup>

There was a [Westminster Hall debate](#) on the Government’s response to the ECC Committee’s report on shale gas on 3 November 2011.<sup>36</sup> The overall consensus was that the Committee had taken a balanced and cautious approach. On the earth tremors, which had happened since publication of the Committee’s report, Tim Yeo, the Committee chair said:

British Geological Survey issued a press release and stated that fracking may have been the cause, although it added:

“It is well established that fluid injection can induce small earthquakes...We would not expect earthquakes of these relatively small magnitudes to cause any damage.”

To put that into context, the European microseismic standard classifies a magnitude 1 earthquake as one that is not felt, a magnitude 2 earthquake as scarcely felt, and a magnitude 3 earthquake as weak. A quick inspection of the British Geological Survey’s seismology webpage shows that, in the past month, the following earthquakes have taken place in the United Kingdom: Caernarfon, magnitude 1.2 on 24 October; Shrewsbury, magnitude 1.1 on 22 October; the northern North sea, magnitude 3.5 on 21 October; and Glen Sheil, Highland, magnitude 2.4 on 20 October. There were several others, the details of which I will not bother to read out to the Chamber, but that shows that a range of such events is occurring almost every week.

Small-magnitude earthquakes are by no means uncommon in the British isles. Nevertheless, any potential correlation between one of these events and hydraulic fracturing activity must, of course, be examined carefully. The report published yesterday concluded that Cuadrilla’s activity triggered—the word used was “triggered” rather than “caused”—very low level seismic activity and that that posed no identifiable threat to people or property in the nearby area. The report concluded that it was a unique series of events and circumstances; 850,000 wells have been explored around the world with virtually no similar events recorded.

The seismic activity was caused by a very unusual combination of factors, including the specific geology of the well site, coupled with the pressure exerted by the injection of the hydraulic fracturing fluid. The Preese Hall-1 well encountered a critically stressed fault, requiring just a small energy input to initiate seismic activity. The fault was sufficiently porous to accept a large volume of fluid and brittle enough to be prone to failing seismically. Those conditions existed before the hydraulic fracturing.

[...]The report also concluded that the fluid used in the fracking process cannot escape the rock that is deep underground and therefore cannot contaminate the local environment.

The Government has yet to make a decision about whether fracking should resume.<sup>37</sup>

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<sup>34</sup> [http://www.earthquakes.bgs.ac.uk/publications/annual\\_reports/2011\\_22nd\\_annual\\_report.pdf](http://www.earthquakes.bgs.ac.uk/publications/annual_reports/2011_22nd_annual_report.pdf)

<sup>35</sup> *New Scientist* [Fracking risk is exaggerated](#) 11 January 2012

<sup>36</sup> HC Deb 3 November 2011 c399WH

<sup>37</sup> HL Deb 10 January 2012 c23WA

...No decision on the resumption of these hydraulic fracture operations will be made until the implications of this report, and of any further analysis which may prove necessary, has been fully considered, and appropriate practical measures have been approved by Ministers to minimise the risk of such events occurring again. Other key regulators will be consulted before any such decision is taken.

## **8 Possibility of a longer term moratorium**

When asked whether it would consider delaying shale gas extraction in the UK in view of the concerns raised by the Tyndall Centre and while the US EPA investigated, the Government said that with a robust regulatory regime in place DECC saw no need for a moratorium on shale gas activities in the UK. The UK's geology and regulation differed from the US so US experience would not necessarily be equally relevant to UK conditions or to the UK regulatory framework.<sup>38</sup>

The Government also said in January 2012 that it has “no plans to introduce a moratorium on shale gas activities in the UK”.<sup>39</sup>

Given full regard to environmental protection, the Government remains supportive of the industry:<sup>40</sup>

A British Geological Survey study in 2010 estimated that if UK shales were similarly productive to those in the USA they could yield some 150 billion cubic metres of gas, equivalent to roughly two years' of UK demand. The BGS is currently undertaking more detailed work on the extent of the underlying resource which will also take into account last year's drilling results of Cuadrilla in Lancashire. However, little drilling has yet taken place and commercial production of shale gas has not been proven in the UK, so it is not yet possible to make a reliable estimate of recoverable reserves. As with conventional oil and gas activity, if there does prove to be commercially producible quantities of UK shale gas, the Government would support industry in tapping in such resources, so long as such exploitation proves to be technically and economically viable, and can be carried out with full regard to the protection of the environment.

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<sup>38</sup> HC Deb 1 February 2011 [c769W](#)

<sup>39</sup> HL Deb 10 January 2012 [c23WA](#)

<sup>40</sup> HC Deb 17 January 2012 [c678W](#)