



## UK Shale Gas Development: Legal, Economic, Environmental and Political Challenges posed to the ambitious UK Shale Gas Plan

### Introduction

The objective of this report is to investigate the benefits that shale gas development could bring to the UK's economy drawing on the U.S paradigm. It also aims at examining the potential challenges that are likely to obstruct the advancement of shale gas and the controversies associated with shale gas activities (horizontal drilling and hydraulic fracturing or "fracking")<sup>1</sup>.

### Geology-shale gas estimates

At this point, it would be worthwhile to provide a brief definition of conventional and unconventional gas. There are several types of *unconventional gas* resources that are produced today, but the three most common types are tight gas, coal-bed methane and shale gas.<sup>2</sup> Given the low permeability (measure of a reservoir's capacity to transmit fluids) of the reservoirs yielding such gas, the gas must be developed via special techniques, including fracking, in order to be produced commercially. *Conventional gas* is accumulated in highly porous reservoirs with sufficient permeability to allow gas to flow out of the reservoir when a well is drilled.<sup>3</sup>

In recent years (between 2000-2012) there has been a decline in the number of exploration and appraisal<sup>4</sup> wells drilled for conventional oil and gas onshore, with a shift to wells drilled for unconventional gas exploration including shale gas. Significant amounts of gas have been discovered in an area between Wrexham and Blackpool in the west, and Nottingham and Scarborough in the east.<sup>5</sup> The British Geological Survey's (BGS) estimates of GIIP (gas initially in place)<sup>6</sup> are 822 tcf<sup>7</sup> (lower limit), 1329 tcf (central estimate) and 2281 tcf (upper limit).<sup>8</sup>

According to the BGS, although there is a possibility that the shale gas resource (gas-in-place) in the UK is very large, the proportion of gas that it is possible to extract is unknown. A better understanding of the shale gas resource and the amount of gas that is potentially recoverable will come from further geological research. If the amount of recoverable shale gas does prove to be large, this will be a significant indigenous source of gas for the UK and may reduce the UK's reliance on imported gas.<sup>9</sup>

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<sup>1</sup> 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 (horizontal drilling). A process called hydraulic fracturing ('fracking') involves pumping water into isolated sections of the borehole at pressures high enough to fracture the surrounding rock and release and extract the gas.

<sup>2</sup> Ismael Alexander Boudiaf, Yuri Yegorov, 'US Shale Gas Revolution and World Gas Supply Shock' (30 July 2012) University of Vienna [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2142180](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2142180) accessed 2 September 2013

<sup>3</sup> Ibid.

<sup>4</sup> Following data appraisal, operators may decide to test the well prior to making any further commercial decision. This may also involve undertaking one or more hydraulic fracturing procedures depending on geology. There are 3 stages of development of unconventional gas sites: exploration, appraisal and production.

<sup>5</sup> British Geological Survey, 'New shale gas resource figure for central Britain' (BGS, 15 July 2013) <http://www.bgs.ac.uk/shalegas/#ad-image-0> accessed 29 July 2013

<sup>6</sup> The total gas volume present in a reservoir or field. Reserve estimates include the proportion of GIIP volumes that can actually be produced.

<sup>7</sup> Trillion cubic feet

<sup>8</sup> Ibid.

<sup>9</sup> BGS, op. cit.

## **The potential economic benefits of shale gas illustrated in the U.S shale gas industry**

### Energy Security<sup>10</sup>

The U.S has experienced a substantial change in the energy sector, with the growing production of shale gas.<sup>11</sup> The application of technological innovations, notably horizontal drilling and hydraulic fracturing, enables natural gas resource to be extracted at a cost which is low enough to allow companies to generate an adequate financial return (economically recoverable resources).<sup>12</sup> Assessments of the proportion of shale gas that might be possible to be extracted have been increasing as knowledge of the shale gas resource grows. In particular, in 2003, the shale gas resource estimates were 28 tcf while in 2009, these estimates escalated to 680 tcf (research conducted by the National Petroleum Council<sup>13</sup> and the Potential Gas Committee<sup>14</sup> respectively).<sup>15</sup> This means that as long as access<sup>16</sup> to this resource is not greatly restricted, domestic natural gas resources would keep the U.S relatively free of any significant natural gas imports for the next couple of decades. What is more, the U.S Energy Information Administration<sup>17</sup> expects the country to become a net exporter of LNG<sup>18</sup> by 2016 and a net exporter of natural gas overall by 2021.<sup>19</sup>

### Investment and Employment

The shale gas industry's contributions to the advancement of a country's economy are generated by the exploration, production, transport and delivery of shale gas to downstream consumers. For instance, key US industries such as paper and chemicals are large consumers of natural gas for fuel and power and are expected to spend \$72 billion in private investment over several years on plant and equipment.<sup>20</sup> Investment in these activities could have a contribution to production levels (output) and the number of workers employed by the industry. This can be demonstrated by the U.S unconventional shale gas production which supported more than 1 million jobs in 2010 and this number is projected to rise to 1.4 million by 2015 having a dramatic impact on employment and economic growth.<sup>21</sup>

## **Tax allowances introduced by the UK Government to realise the development of the UK shale gas**

The UK government, inspired by the US shale gas regime, advocates the great potential of shale gas to transform the UK's future energy supply and bring economic benefits, such as energy security, the creation of thousands of jobs and the generation of substantial tax revenue for the nation.<sup>22</sup> In order to unlock shale gas's potential to improve economic and energy stability in the UK, the government stressed the importance of encouraging investment by putting, what it considers to be, the right fiscal and regulatory framework in place. To this end, it introduced tax breaks for shale gas investment which were unveiled on the 19th of July 2013. In particular, it will provide businesses with financial incentives to

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<sup>10</sup> Energy security refers to the continuous availability of energy in varied forms, in sufficient quantities and at reasonable prices (UN's World Energy Assessment, New York, UNDP, 2000).

<sup>11</sup> I. A. Boudiaf, Y. Yegorov, op. cit. p. 8.

<sup>12</sup> Kenneth B., 'Impact of Shale Gas Development on Global Gas Markets' (02 April 2011), The Institute for Energy and Environmental Research

<http://energy.wilkes.edu/PDFFiles/Economics/Impact%20of%20Shale%20Gas%20Development%20on%20Global%20Gas%20Markets.pdf> accessed 4 September 2013

<sup>13</sup> <http://www.npc.org/>

<sup>14</sup> <http://potentialgas.org/>

<sup>15</sup> Kenneth B., op. cit.

<sup>16</sup> According to the BGS, access to shale gas resource (recoverable shale gas) greatly depends on the economic, geological and social factors that will prevail at each operation.

<sup>17</sup> <http://www.eia.gov/>

<sup>18</sup> Liquefied Natural Gas (LNG) consists of methane and is cooled to -256 degrees Fahrenheit so that it can be transported from countries that have more natural gas than they need to countries that use more natural gas than they produce. The U.S imports a small percentage of its natural gas from Trinidad and Tobago, Egypt, Norway, Qatar and Nigeria.

<sup>19</sup> Dan Lewis, Colin Taylor, 'Britain's Shale Gas Potential' [2013] Infrastructure for Business #6

<sup>20</sup> Economics and Statistics Department, *Shale Gas, Competitiveness and New US Investment: A Case of 8 Manufacturing Industries* (American Chemistry Council, May 2012)

<sup>21</sup> Unconventional Gas Report (IHS, 2012) <http://www.ihs.com/info/ecc/a/unconventional-gas-report-2012.aspx> accessed 4 September 2013

<sup>22</sup> Department of Energy and Climate Change, Written Ministerial Statement by Edward Davey, 'Exploration for Shale Gas' (DECC, 13 December 2012) <https://www.gov.uk/government/news/written-ministerial-statement-by-edward-davey-exploration-for-shale-gas>

enter into the shale gas industry by creating a tax rate of 30% as opposed to the current 62% taxation for oil and gas companies.<sup>23</sup>

### **Challenges to the development of shale gas in the UK**

The rate of production of the shale gas resource can be influenced by the physical features of that resource, the technology available to exploit the resource and the various political, economic and legal factors that have an impact on the behaviour of the organisations involved during the stages of development. Should the size and commercial viability of technically recoverable shale gas resource translate into a large scale production, there will be a wide range of challenges posed to the UK shale gas evolution in need of attention.

#### Geological and Economic

The UK's shale is thicker than that found in North America with lots of different types of rock irregularly layered on top of each other which may make it hard to extract the gas.<sup>24</sup> Moreover, Nicholas Riley, team leader for unconventional gas at the BGS, explained that faulting and changes in the rock type mean that the fuel pools are more separated which would make drilling and completion costs for shale wells higher than in North America.<sup>25</sup> Additionally, the costs associated with shale gas activities tend to be higher because Europe's gas network is not as developed as in the U.S and incremental costs will necessarily be incurred in order to develop the infrastructure required to bring the shale gas to markets<sup>26</sup>.

#### Environmental

The method of fracking has already triggered public concerns and political opposition mainly for environmental reasons and the potential dangers and disruption caused by these activities. According to the BGS, fracking can be associated with certain risks, including "induced seismicity" and the potential for groundwater and surface water contamination.<sup>27</sup> For example, previous shale gas activities evoked low magnitude earthquakes in Lancashire in 2011. In addition, drilling for shale gas may open the possibility of accidental spills and water contamination as seen in Pennsylvania, in the U.S, where local residents complained of methane in their water<sup>28</sup>. Furthermore, the industrialisation of rural areas associated with shale gas may prompt public objections arising from the large amount of wells which may need to be constructed<sup>29</sup>, the water and land use demands, the congestion from the increased traffic from construction works and the noise pollution as a result of shale gas activities. The local residents' objection to potential shale gas projects may not be appeased through the provision of financial incentives since the UK gas is owned by the state<sup>30</sup>, thus the remuneration paid to the landowner would be negligible compared to the types of return experienced by US landowners who may own the gas<sup>31</sup>. However, at this point it would be worthwhile to note that on 27 June 2013 the UK Onshore Operators Group (UKOOG) published a document<sup>32</sup> which provides local communities with benefits at the exploration/appraisal stage of £100,000 per well site where hydraulic fracturing takes place and a share of proceeds at the production stage of 1% of revenues, approximately two thirds of

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<sup>23</sup> Bob Palmer, Priya Shah 'Treasury announces generous tax breaks for shale investment in the UK' (Law-Now, 2013) [http://www.law-now.com/DirectMail/%7B49651052-A3B6-4716-8733-ED8D847A3EEC%7D\\_shaletaxbreaks19july13.htm](http://www.law-now.com/DirectMail/%7B49651052-A3B6-4716-8733-ED8D847A3EEC%7D_shaletaxbreaks19july13.htm) accessed 29 July 2013

<sup>24</sup> Mat Hope, 'Three reasons not to get too excited about the UK's shale oil and gas prospects' (The Carbon Brief, 11 June 2013) <http://www.carbonbrief.org/blog/2013/06/three-reasons-not-to-get-too-excited-about-the-uk%E2%80%99s-shale-oil-and-gas-prospects> accessed 30 July 2013

<sup>25</sup> Ibid.

<sup>26</sup> Ibid

<sup>27</sup> BGS, op. cit.

<sup>28</sup> Ibid.

<sup>29</sup> According to Michael Leibreich from Bloomberg New Energy Finance, in the hypothetical situation where the decline in the North Sea is replaced with UK-produced shale gas up to 2030, the country would need to construct 2500 wells.

<sup>30</sup> Under the *Petroleum Act 1998*, shale gas belongs to the Crown, not the landowner. According to the Gas and Petroleum (Consents) Charges Regulations 2013, exploration can only happen once DECC has issued a licence to the operator following a competitive but stringent process.

<sup>31</sup> Nina M Howell, 'Shale gas in Europe: today and the future' (Lexology, 1 April 2013)

<http://www.lexology.com/library/detail.aspx?q=2458af9f-77da-48dd-898f-44fdc2317afd> accessed 30 July 2013

<sup>32</sup> 'Community Engagement Charter' (2013) UK Onshore Operators Group <http://www.ukoog.org.uk/elements/pdfs/communityengagementcharterversion6.pdf>

which will be allocated to the local community with the remaining third being allocated at the county level.<sup>33</sup>

**Compliance with EU and National legislation**

The UK also needs to comply with EU environment regulations which are stricter than those in North America. For instance, Directive 2011/92/EU<sup>34</sup> requires Member States to consider climate change effects and air emissions and ensure that developers supply certain information, such as a description of estimated air emissions and significant environmental impacts resulting from the project. Moreover, Directive 92/91/EEC<sup>35</sup> sets the minimum requirements for improving the health and safety of workers from harmful/explosive substances. This could apply to methane present in such concentration that it could represent a risk in terms of flammability for workers. In addition, pursuant to the Water Framework Directive<sup>36</sup>, operators of shale gas exploration and exploitation activities must be granted an authorisation for abstraction of fresh water and groundwater. This Directive also prohibits discharges of pollutants into the groundwater. Furthermore, the UK's Environment Agency requires companies to fully disclose which fracking liquids they use, and there are strict rules on the well designs and drill casings.<sup>37</sup> Finally, the Department of Energy and Climate Change (DECC) outlines the authorities responsible for drilling/development consents and permissions including the Secretary of State and local authorities.<sup>38</sup> All the above mentioned legal requirements imposed by the EU and UK authorities may deter companies from investing valuable resources on the development of the shale and gas industry in the UK.

**The Outlook**

It is widely predicted that shale gas will play an important role in the UK's future energy mix but progress is expected to be slow. The UK government is projected to adopt a cautionary approach in order to mitigate all the risks associated with shale gas exploration and exploitation activities. For instance, in his statement, the Secretary of State for Energy and Climate Change announced that new controls will be adopted by his department to prevent the risk of any damage caused by these projects, including tremors caused by seismic activity and water contamination.<sup>39</sup> The Secretary of State further announced that all activities will be scrutinised by the Environmental Agency and other relevant authorities. It is evident that it will take some time for the UK shale gas activities to start operating in order to satisfy environmental concerns and health and safety regulations. But it is also apparent that the UK government is determined to exploit this golden opportunity which may lead the way to the country's gas independence and economic stability at times when it is most needed.

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<sup>33</sup> Stephen Trombala, 'Update, unconventional oil and gas in the UK' (Lexology, 27 August 2013)

[http://www.lexology.com/library/detail.aspx?g=9048b453-32a1-4c29-86ce-2ab7d18a9698&utm\\_source=Lexology+Daily+Newsfeed&utm\\_medium=HTML+email+-+Body+-+General+section&utm\\_campaign=Lexology+subscriber+daily+feed&utm\\_content=Lexology+Daily+Newsfeed+2013-09-04&utm\\_term](http://www.lexology.com/library/detail.aspx?g=9048b453-32a1-4c29-86ce-2ab7d18a9698&utm_source=Lexology+Daily+Newsfeed&utm_medium=HTML+email+-+Body+-+General+section&utm_campaign=Lexology+subscriber+daily+feed&utm_content=Lexology+Daily+Newsfeed+2013-09-04&utm_term) accessed 30 July 2013

<sup>34</sup> Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment [2012] OJ L26/1

<sup>35</sup> Directive 92/91/EEC - mineral-extracting industries – drilling of 3 November 1992 concerning the minimum requirements for improving the safety and health protection of workers in the mineral-extracting industries through drilling [1992] OJ L 348

<sup>36</sup> Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy [2000] OJ L327

<sup>37</sup> Patsy Richards, Mike Fell, House of Commons Library, 'Shale Gas and Fracking' (House of Commons Library, 11 July 2013) Ch. 4, 7

<sup>38</sup> Department of Energy and Climate Change, 'Oil and gas: petroleum licensing guidance' (DECC, 4 December 2012) <https://www.gov.uk/oil-and-gas-petroleum-licensing-guidance> accessed 31 July 2013

<sup>39</sup> Department of Energy and Climate Change, 'Written Ministerial Statement by Edward Davey: Exploration for shale gas' (DECC, 13 December 2012) <https://www.gov.uk/government/news/written-ministerial-statement-by-edward-davey-exploration-for-shale-gas>

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