



House of Commons  
Environmental Audit  
Committee

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# Environmental risks of fracking

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**Eighth Report of Session 2014–15**

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**Eighth Report of Session 2014–15**

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to the report*

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## Environmental Audit Committee

The Environmental Audit Committee is appointed by the House of Commons to consider to what extent the policies and programmes of government departments and non-departmental public bodies contribute to environmental protection and sustainable development; to audit their performance against such targets as may be set for them by Her Majesty's Ministers; and to report thereon to the House.

All publications of the Committee (including press notices) and further details can be found on the Committee's web pages at [www.parliament.uk/eacom](http://www.parliament.uk/eacom).

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[Simon Wright MP](#) (Liberal Democrat, Norwich South)

### The following members were also members of the committee during the parliament:

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## Summary

Exploratory drilling for shale gas has begun in the UK and the Government is encouraging fracking. It has introduced tax concessions and is seeking through its Infrastructure Bill to ease the process for fracking operations, including through proposals for an automatic right of access to “deep-level land” for exploratory drilling and extraction.

Extensive production of unconventional gas through fracking is inconsistent with the UK’s obligations under the Climate Change Act and its carbon budgets regime, which encompasses our contribution to efforts to keep global temperature rise below two degrees. Shale gas, like ‘conventional gas’, is not low carbon, and the objective of government policy should be to reduce the carbon intensity of energy whatever its source. Shale gas cannot be regarded as a ‘transitional’ or ‘bridging’ fuel. Any large scale extraction of shale gas in the UK is likely to be at least 10-15 years away, and therefore cannot drive dirtier coal from the energy system because by that time it is likely that unabated coal-fired power generation will have been phased out to meet EU emissions directives. It is also unlikely to be commercially viable unless developed at a significant scale, to be able to compete against a growing renewable energy sector, but large scale fracking will not be able to be accommodated within still tightening carbon budgets. There is in any case little evidence to suggest that fracking could be undertaken at the scale needed to be commercially viable in the UK or that it will bring gas prices down significantly.

Despite the assurances from some that environmental risks can be safely accommodated by existing regulatory systems, an extensive range of uncertainties remains over particular hazards—to groundwater quality and water supplies, from waste and air emissions, to our health and to biodiversity, to the geological integrity of the areas involved, and from noise and disruption. Uncertainty about their significance is in part a reflection of the fact that fracking operations have yet to move beyond the exploratory stage in the UK. It is imperative that the environment is protected from potentially irreversible damage.

- Fracking must be prohibited outright in protected and nationally important areas.
- Full containment of methane must be mandated.
- Fracking should be prohibited in all water source protection zones.

We identified necessary safeguards in these risk areas, but also a need for a more coherent and more joined-up regulatory system, and one that needs to be put in place before further fracking activity is contemplated. Permit appraisals must consider the cumulative impacts of fracking. Environmental impact assessment must be mandated for all fracking activity. Attention must be paid to the way in which the industry and the risks might scale up in future. The necessary regulatory arrangements must be determined and put in place before any further expansion of the industry. There should be a consolidated regulatory regime specifically for fracking.

The current debate on fracking reveals a lack of public acceptance, or ‘social licence’, for it.

A moratorium on the extraction of unconventional gas through fracking is needed to avoid

both the inconsistency with our climate change obligations and to allow the uncertainty surrounding environmental risks to be fully resolved. We have resolved to publish this report to inform the Report-stage and Third Reading debates of the Infrastructure Bill on 26 January. Members might consider an Amendment to the Bill, which we discuss in our report, which would allow such a moratorium.

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# 1 Introduction

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1. In the US, fracking—a type of ‘unconventional gas’ involving the extraction of oil or gas using water, sand and chemicals injected under pressure to split shale deposits—has produced a ‘shale gas revolution’. In 2013, 11.4bn cubic feet of shale gas from fracking was produced in the US, a nearly nine-fold increase from 2007, and the well-head price of natural gas fell from \$6.3/thousand cubic feet in 2007 to \$2.7 in 2012.<sup>1</sup> The state of development of fracking as a potential energy source in the UK lags behind the United States, but is now reaching a critical stage. Exploratory drilling has begun, and the Government has introduced tax concessions and is seeking through its Infrastructure Bill to ease the process for fracking operations.

2. The most recent onshore petroleum exploration and development licences were awarded in 2008. Following planning permission, consent was given to drill for shale gas in five locations. Of these, consent for fracking of the shale was subsequently given for two sites near Blackpool. DECC opened the process for awarding the next round of exploration and development licences in July 2014.

3. Cuadrilla, which holds those two fracking licences, is the first company to use modern fracking techniques in the UK. Their exploratory drilling operations at Preese Hall near Blackpool were halted in 2011 until the end of 2012 following two earth tremors linked to their activities. The company has submitted two further planning applications for new exploratory wells near Blackpool. It is expected that, if successful, these applications will pave the way for further planning applications at other sites granted licences in 2008 and from other companies.

4. In Budget 2013 the Government said that it would introduce a new field allowance for shale gas and in July 2013 it launched a consultation on tax incentives for drilling companies. In the 2013 Autumn Statement the Government announced that the tax rate on a portion of fracking companies’ profits would be reduced from 62% to 30% and that companies would receive a tax allowance equal to 75% of the capital expenditure on projects. The Prime Minister announced in January 2014 that councils would be able to keep 100% of business rates collected from shale gas sites, doubling the previous 50% under the Government’s business rate retention scheme. He said:

A key part of our long-term economic plan to secure Britain’s future is to back businesses with better infrastructure. That’s why we’re going all out for shale. It will mean more jobs and opportunities for people, and economic security for our country.<sup>2</sup>

The Government estimated that the increase could be worth up to £1.7 million for a typical 12 well site.<sup>3</sup>

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1 U.S. Energy Information Administration, [Release Date: 4/12/2014](#) and [Release date 31/12/2014](#); See also Q10

2 Prime Minister’s Office, [‘Local councils to receive millions in business rates from shale gas developments’](#), 13 January 2014

3 Prime Minister’s Office, [‘Local councils to receive millions in business rates from shale gas developments’](#), 13 January 2014

5. In the 2014 Autumn Statement the Chancellor stated that “The government is taking steps to ensure that the UK leads the way with shale gas regulation. Shale gas could increase the UK’s energy security, support thousands of jobs, reduce carbon emissions, and generate substantial tax revenue.”<sup>4</sup> The Autumn Statement announced:

- a £5 million fund to provide independent evidence to the public about the robustness of the existing regulatory regime.<sup>5</sup>
- £31 million of funding to create sub-surface research test centres through the Natural Environment Research Council, intended “to establish world leading knowledge which will be applicable to a wide range of energy technologies including shale gas and carbon capture and storage”.<sup>6</sup>
- 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”.<sup>7</sup>
- arrangements to make ‘community payments’ by fracking companies compulsory if they failed to make them voluntarily (paragraph 7).

The Autumn Statement also included a Government “commit[ment] to maximising the economic benefits of the oil and gas resources in the UK Continental Shelf [UKCS]. With the equivalent of between 11 and 21 billion barrels of oil still to be exploited, the UKCS can continue to provide considerable economic benefits to the UK through increased energy security, a stronger balance of payments position, high-value jobs and further development of the UK’s strong, export-focused supply chain.”<sup>8</sup>

6. In our *Energy Subsidies* report in 2014 we criticised the financial support for fracking announced in the 2013 Autumn Statement. We noted that a justification sometimes put forward for subsidies was to promote ‘infant industries’, including renewable energy technologies, but we criticised the Government’s reduction of taxes on fracking profits: “Fracking is not a technology warranting financial support to become viable and competitive, and on that basis it does not warrant subsidy through a favourable tax treatment.”<sup>9</sup> The Government’s view was that the reduced tax on profits was “not directed specifically at hydraulic fracturing. The [tax] allowance is designed to support onshore oil and gas projects whose small size and technical challenge lead to higher costs, making them economic but not commercially attractive at current tax rates.”<sup>10</sup>

7. The Infrastructure Bill<sup>11</sup> includes provisions for the Government to produce a strategy for “maximising the economic recovery of UK petroleum”<sup>12</sup> (which includes oil and gas). It

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4 [Autumn Statement 2014](#), para 1.121

5 [Autumn Statement 2014](#), para 1.121

6 [Autumn Statement 2014](#), para 1.122

7 [Autumn Statement 2014](#), para 1.123

8 [Autumn Statement 2014](#), para 1.124

9 Environmental Audit Committee, Ninth Report of Session 2013–14, [Energy Subsidies](#), HC 61

10 [Government Response to Energy Subsidies report](#), Seventh Special Report of Session 2013–14, HC 1103

11 [Infrastructure Bill, as amended in the \(Commons\) Public Bill Committee](#), 16 January 2015

also includes provisions “to introduce a right to use deep-level land” for “petroleum or deep geothermal energy”, including fracking, which will ease the planning difficulties that energy companies would otherwise face in getting access rights to shale deposits under landowners’ properties.<sup>13</sup> At present, a drilling company must reach agreement with each landowner to obtain rights of access. The new provisions follow a Government consultation in 2014 on its *Proposal for Underground Access for the Extraction of Gas, Oil or Geothermal Energy*.<sup>14</sup> That consultation included a voluntary community payment of £20,000 for each horizontal well, previously agreed with the industry, and the Bill includes provisions allowing the Government to impose such community payments (paragraph 5).<sup>15</sup>

8. Fracking raises both climate change and wider environmental issues. On climate change, the UK’s overall emissions—from all types of energy generation as well as from other sectors—are required to be limited by ‘carbon budgets’. Those budgets are set under the Climate Change Act 2008, which requires the UK’s greenhouse gas emissions to be reduced by at least 80% by 2050 against a 1990 baseline. As a fossil fuel, fracked gas could impinge on those carbon budgets. Environmental protection has been a central issue for much of our work during this Parliament. We summed this up in our 2014 *Environmental Scorecard* report,<sup>16</sup> in which we identified inadequate progress on a range of areas including air pollution, biodiversity, soils, the fresh water environment and water availability—all areas which might be vulnerable from onshore fossil-fuel drilling operations.

## Our inquiry

9. We received 70 written submissions, including from community groups potentially affected by fracking operations. We took oral evidence on 14 January from Tom Burke of E3G, Professor Paul Stevens from Chatham House, Dr John Broderick from Tyndall Centre Manchester, Dr Tony Grayling and Mark Ellis-Jones from the Environment Agency, Jane Burston from the National Physical Laboratory, Lord Smith who chairs the Task Force on Shale Gas, and Steve Thompsett from UK Onshore Oil and Gas. We have undertaken our inquiry against a backdrop of the Infrastructure Bill (paragraph 7) and we have resolved to publish this report to inform the Report-stage and Third Reading of the Bill on 26 January. We are grateful to all of those who gave evidence against the necessarily tight time-horizon of our inquiry.

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12 [Infrastructure Bill Explanatory Memorandum](#), paras 224-229. (Clause 37 of the [Infrastructure Bill, as amended in the \(Commons\) Public Bill Committee](#)).

13 [Infrastructure Bill Explanatory Memorandum](#), para 234-247. (Clauses 39-40 of the [Infrastructure Bill, as amended in the \(Commons\) Public Bill Committee](#)).

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

15 [Infrastructure Bill Explanatory Memorandum](#), paras 248-250. (Clause 41 of the [Infrastructure Bill, as amended in the \(Commons\) Public Bill Committee](#)).

16 Environmental Audit Committee, Fifth Report of Session 2014–15, [An Environmental Scorecard](#), HC 215

10. Other Committees have undertaken inquiries into fracking.<sup>17</sup> The purpose of our own inquiry has been to identify the extent to which fracking would be consistent with the UK's climate change obligations (Part 2) and the environmental risks (Part 3).

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17 Environment Food & Rural Affairs Committee, *Defra's responsibilities for fracking*, [Letter to Secretary of State following one-off session, HC \(2014–15\) 589, September 2014](#); Committee; Energy & Climate Change Committee, Seventh Report of Session 2012–13, [The impact of shale gas on energy markets](#), HC 785, and Fifth Report of Session 2010–12, [Shale gas](#), HC 798; Welsh Affairs Committee, First Report of Session 2014–15, [Energy generation in Wales: Shale gas](#), HC 284; Economic Affairs Committee, Third Report of Session 2013–14, [The Economic Impact on UK Energy Policy of Shale Gas and Oil](#), HL 172

## 2 Implications for our climate change obligations

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### Viability

11. The Energy and Climate Change Committee's report on *Shale Gas* in 2011 concluded that "Shale gas resources in the UK could be considerable—particularly offshore—but are unlikely to be a 'game changer' to the same extent as they have been in the US, where the shale gas revolution has led to a reduction in natural gas prices."<sup>18</sup> Tom Burke of E3G told us that:

If you do not go to scale, it is very hard to see how the costs of any gas produced could begin to compete ... The public acceptability will be a very strong issue for investors, as you move from exploration to scale, to question whether or not the prospects and the possible benefits are actually deliverable.<sup>19</sup>

12. In March 2014, E3G dismissed claims that shale gas could reduce energy prices in Europe: "Many of these [US] prevailing conditions do not exist in the EU and, as a result, EU production costs are expected to be 150%-250% higher per unit of gas extracted."<sup>20</sup> Grantham Research Institute told us that:

Domestic shale gas reserves are likely to be too modest to affect gas market prices in the UK, which may remain largely driven by uncertain wholesale prices charged by foreign suppliers. A decrease in gas prices could have positive consequences for the UK economy, but could also affect the profitability of fracking, resulting in lower production.<sup>21</sup>

Similarly, Professor Paul Stevens believed that:

There is the myth that if the UK were to have a shale gas revolution this would bring down the domestic price of gas in the UK. I find that argument extremely weak, not least because we are connected to the continent. Generally speaking ... gas prices on the continent tend to be higher than here, so if you have an increase in gas supply from shale it is going to go to the continent rather than here.<sup>22</sup>

... It is very unlikely that a shale gas revolution in the UK—assuming we can even have one—is going to bring gas prices down.<sup>23</sup>

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18 Energy & Climate Change Committee, Fifth Report of Session 2010–12, [Shale gas](#), HC 798, Summary

19 Q6

20 E3G, [Shale gas: four myths and a truth](#), March 2014

21 Grantham Research Institute ([FRA0009](#)) para 6

22 Q10

23 Q11

## Security of supply

13. Professor Paul Stevens concluded in December 2013 that:

There are two ways in which energy security—defined as physical access to energy sources—can be enhanced by shale gas, at least in theory. First, it represents a diversification of gas supplies away from offshore UK production and imports by pipeline or LNG. ... Second, shale gas represents a domestic source of energy.<sup>24</sup>

The Committee on Climate Change noted in 2013 that, although shale gas “should not mean a dash for gas” (paragraph 19), it:

Can displace [Liquid Natural Gas] imports, improving the UK’s energy sovereignty. Due to the decline in North Sea gas production, the UK is a net importer of gas, by pipeline (e.g. from Norway) and LNG (e.g. from Qatar)—UK shale gas production would reduce our dependence on imports and help to meet the UK’s continued gas demand, for example in industry and for heat in buildings, even as we reduce consumption by improving energy efficiency and switching to low-carbon technologies.<sup>25</sup>

14. But many of those who provided evidence to our inquiry doubted the security of supply potential of UK fracking. Grantham Research Institute told us that “reserves could, at best, make up for the decreasing size of conventional domestic resources as reservoirs are depleting. But shale gas is unlikely to expand domestic gas availability beyond current levels, let alone render the UK energy-independent and free from the need to import natural gas.”<sup>26</sup> The UK Energy Research Centre called promises of greater energy security from UK shale gas “hype” and “lacking in evidence.”<sup>27</sup>

## Climate change impacts

15. In their July 2014 progress report, the Adaptation Sub-Committee of the Committee on Climate Change stated that “The UK Government, together with others around the world, considers rises beyond two degrees to bring increasing risk of dangerous and irreversible impacts. By the end of the century, a 3.2°C to 5.4°C global rise above the baseline can be expected based on continuing emissions growth, with further warming into the next century.”<sup>28</sup> The Climate Change Act’s carbon budgets regime has set a framework for emissions policy since 2008. Between 2008 and 2012 the UK reduced its emissions by 22.5% against a 1990 baseline set by the Kyoto protocol (against a target of 12.5%). UK emissions rose by 3.5% in 2012,<sup>29</sup> but in 2013 fell by 2%.<sup>30</sup> In 2013, 5.2% of our energy was

24 Prof Paul Stevens, *Shale Gas in the United Kingdom*, Chatham House, December 2013

25 Committee on Climate Change website, *A role for shale gas in a low-carbon economy?* (September 2013)

26 Grantham Research Institute ([FRA0009](#)) para 5

27 *Ministers’ shale gas ‘hype’ attacked*, BBC website, 12 November 2014

28 Adaptation Sub-Committee, *Managing climate risks to well-being and the economy* (July 2014), page 15

29 Environmental Audit Committee, Fifth Report of Session 2013–14, *Progress on carbon budgets*, HC 60, page 3

30 Committee on Climate Change, *Meeting carbon budgets* (July 2014), page 55

generated from renewables,<sup>31</sup> towards an EU target for 2020 of 15%. The EU has now set emissions reduction targets for the period to 2030,<sup>32</sup> pending a wider international UNFCCC agreement in Paris in 2015.

16. The first carbon budget (for 2008–12) under the Climate Change Act was met, substantially because of the economic slow-down after 2008, but the prospects for later budget periods are uncertain.<sup>33</sup> As we reported in our October 2013 *Progress on carbon budgets* report, there had been a risk to our longer term emissions reduction because of prolonged uncertainty over low-carbon investment caused by the prospect of a review of the Fourth carbon budget (for 2023–27)—announced in 2011 and undertaken in 2014.<sup>34</sup> We criticised the Government’s reluctance to set a power sector decarbonisation target for 2030 in the Energy Act 2014.<sup>35</sup> In our report on *Green Finance* we identified a significant gap in low-carbon investment, with levels less than half the £20 billion a year required to meet decarbonisation targets.<sup>36</sup> We said that the Government’s decision in July 2014 not to adjust the Fourth carbon budget<sup>37</sup> would bring greater confidence about the UK’s future emissions reduction performance “provided ... that the Government soon identifies the additional emissions reduction policies and programmes that will be needed to deliver against that budget.”<sup>38</sup> We might have added another proviso, that additional fossil fuel sources were not encouraged.

17. A DECC commissioned report by Prof David Mackay (former DECC chief scientific adviser) and Dr Timothy Stone in 2013 found that the carbon footprint of shale gas extraction and use was comparable to that from gas extracted from conventional sources, but lower than the carbon footprint of coal.<sup>39</sup> The Secretary of State for Energy and Climate Change said at the time that:

UK shale gas can be developed sensibly and safely, protecting the local environment, with the right regulation. And we can meet our wider climate change targets at the same time, with the right policies in place. Gas, as the cleanest fossil fuel, is part of the answer to climate change, as a bridge in our transition to a green future, especially in our move away from coal. Gas will buy us the time we need over the coming decades to get enough low carbon technology up and running so we can power the country and keep cutting emissions.<sup>40</sup>

18. Whether shale gas is “part of the answer to climate change”, as the Secretary of State put it, depends on the key question articulated by Professor Paul Stevens: “What is it going

31 Office for National Statistics, [UK energy in brief 2014](#) (July 2014), p31

32 European Council, [Conclusions on 2030 Climate and Energy Policy Framework](#) (October 2014)

33 Environmental Audit Committee, Fifth Report of Session 2013–14, [Progress on carbon budgets](#), HC 60, paras 22, 24

34 Environmental Audit Committee, Fifth Report of Session 2013–14, [Progress on carbon budgets](#), HC 60, para 36

35 Environmental Audit Committee, Fifth Report of Session 2013–14, [Progress on carbon budgets](#), HC 60; Ninth Report of Session 2013–14, [Energy subsidies](#), HC61

36 Environmental Audit Committee, Twelfth Report of Session 2013–14, [Green Finance](#), HC 191

37 HC Deb, 22 July 2014, [col 115WS](#)

38 Committee on Climate Change, [Meeting carbon budgets](#) (July 2014), page 25

39 DECC, [Potential Greenhouse Gas Emissions Associated with Shale Gas Extraction and Use](#), September 2013

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

to substitute for? Is it going to substitute for coal or is it going to substitute for renewables?”<sup>41</sup> He told us:

If it replaces coal this might be regarded as a good thing, although it depends on what assumptions you make about fugitive methane emissions there. On the other hand, if it starts to replace renewables that is bad news.<sup>42</sup>

19. The Committee on Climate Change concluded that “Shale gas lifecycle emissions could be lower than those of imported LNG ... and much lower than coal. ... But it should not mean a ‘dash for gas’ in the power sector. Expanded use of gas for power generation is not needed to drive coal from the system, as most of the UK’s coal plants are already due to close under EU air quality [Large Combustion Plant Directive] regulations.”<sup>43</sup> In 2011, Tyndall Centre had concluded that:

There is little to suggest that shale gas will play a key role as a transition fuel in the move to a low carbon economy ... The need for rapid decarbonisation further questions any role that shale gas could play as a transitional fuel as it is yet to be exploited commercially outside the US. In addition, it is important to stress that shale gas would only be a low-carbon fuel source if allied with, as yet unproven, carbon capture and storage technologies.<sup>44</sup>

20. The Chartered Institution of Water and Environmental Management believed that:

Shale gas, like other forms of gas, cannot be regarded as a low-carbon fuel source. Pursuing a more carbon based fuel strategy will make it more difficult to reach our climate change commitments and potentially our renewable energy targets ... Gas will continue to play a part in our energy mix, especially for its role in heating, in the medium term, but measures to minimise lifecycle emissions will be needed.<sup>45</sup>

Grantham Research Institute believed that shale gas could have a higher carbon footprint than the production of natural gas from conventional sources,<sup>46</sup> but that the “main issue is not whether fracking would be compatible with the UK carbon budgets (to the extent that its potential may be modest, and emissions comparable to conventional gas), but rather whether the overall UK policy concerning gas—including conventional, unconventional and imported resources—is consistent with them.”<sup>47</sup>

21. Professor Paul Stevens told us it would take 10 to 15 years “before there is any significant impact” from any potential shale gas extraction.<sup>48</sup> Whether shale gas could be a

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41 Q9

42 Q3

43 Committee on Climate Change website, [A role for shale gas in a low-carbon economy?](#) (September 2013); Q11

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

45 CIWEM ([FRA0006](#)) para 25

46 Grantham Research Institute ([FRA0009](#)), para 7

47 Grantham Research Institute ([FRA0009](#)) para 9

48 Q30



“bridging” energy source is not dependent on the level of emissions in 2025, 2030 or any other year, but rather its cumulative contribution over a number of years. The carbon budgets regime is founded on that cumulative approach. Dr John Broderick from the Tyndall Centre emphasised that our concern should be whether “we would be adding to the total burden that we place on the atmosphere and on the climate system”.<sup>49</sup> He told us that:

Cumulative greenhouse gas emissions largely determine the extent of climate change so the timescales of changes in the energy system, and the quantities of emissions during this period of change, matter a great deal. Any meaningful claim to gas being a ‘transition fuel’ must relate the time period of transition to the cumulative emissions released along the way and therefore the likelihood of dangerous climate change arising.<sup>50</sup>

22. Timing is an important factor. The carbon budget a decade from now—when fracking might be significant—will be tighter. Dr Broderick explained how this would limit the scope for shale gas:

Consider the claim that the Bowland Shale contains sufficient gas to meet our current demand for gas for up to 51 years on the basis of 10% recovery rate. This amount could not be accommodated in the [Committee on Climate Change’s] Interim budget when deductions are made for non-CO<sub>2</sub> emissions from agriculture. In the UK, it is unlikely we would have commercial production of this scale (>80bcm p.a.) before 2025 even with favourable geology. The budget available from this date is equivalent to 3% to 4% of the central [British Geological Survey] gas-in-place estimate for Bowland shale.<sup>51</sup>

[The] advised emissions reductions pathways from the Committee on Climate Change is what matters—not the ultimate endpoint—the total quantity of emissions up to that point.<sup>52</sup>

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49 Q4

50 Dr John Broderick ([FRA0075](#))

51 Dr John Broderick ([FRA0075](#)); Qq 11, 20

52 Qq11, 12

Greenpeace believed that:

Gas extracted in the UK won't displace other gas that's already been earmarked for extraction—it will just add to fossil fuels already being burnt, which we can't afford to do ... A mature shale gas industry producing gas for domestic use would push the UK's carbon budgets to breaking point.<sup>53</sup>

23. Any pressure on carbon budgets from shale gas extraction will be exacerbated if that coincides with a squeeze on renewable energy. Professor Paul Stevens concluded in 2013 that:

There is a serious danger that UK consumers, growing increasingly concerned about their domestic energy bills, may press for shale gas to substitute for renewables which they see (probably incorrectly) as being responsible for these higher energy bills. This would be bad news for carbon reduction targets if it had an impact on the drive for renewables.<sup>54</sup>

UK Green MEPs argued that shale gas is not needed and will not reduce carbon emissions, but distract from commitments to renewable energy.<sup>55</sup> Grantham Research Institute raised the prospect that shale gas extraction would have to be stopped at a later stage:

To alleviate concerns about the lock-in of gas-based infrastructures, the Government would need to credibly signal to the private sector that gas (without CCS) will be not subject to a favourable regulatory environment in the medium term. The private sector would then invest in gas capital assets (fields, power plants etc.) on the basis that they could make an economic return over the coming 15-year period, but no longer.<sup>56</sup>

24. A recent report by Christophe McGlade and Paul Ekins of University College London identified the types of energy reserves which could not be burned, and their regional location, to keep global temperature rise to two degrees.<sup>57</sup> It suggested that 6% of Europe's gas reserve is unburnable, including 75% of its unconventional gas resources.<sup>58</sup> Our witnesses highlighted that that analysis did not take into account the impact of a binding limit on emissions, which could increase the proportions that would have to remain in the ground.<sup>59</sup> What is clear, however, is that the prospect of a 'carbon bubble', which we examined most recently in our *Green Finance* report,<sup>60</sup> would be increased by fracking.

25. Even without shale gas extraction, the Infrastructure Bill's provision for a strategy to maximise oil and gas extraction from UK reserves (paragraph 7)—a “potentially dangerous

53 Greenpeace ([FRA0050](#))

54 Prof Paul Stevens, *Shale Gas in the United Kingdom*, Chatham House, December 2013

55 UK Green MEPs ([FRA0014](#))

56 Grantham Research Institute ([FRA0009](#)), para 13

57 McGlade, C & Ekins, P., *The geographical distribution of fossil fuels unused when limiting global warming to 2 °C* January 2015, published in *Nature*

58 The Carbon Brief, '[Blog](#),' accessed 21 January 2015

59 Q18 [John Broderick]

60 Environmental Audit Committee, Twelfth Report of Session 2013-14, *Green Finance*, HC 191

addition to a piece of legislation” Lord Smith believed<sup>61</sup>—will make it more difficult to decarbonise our energy sector. As Dr John Broderick put it, “it is counterproductive to be going looking for more fossil fuel reserves when we already know that we have to leave the majority of our existing fossil fuels underground”.<sup>62</sup> As some of our witnesses highlighted, further development of fossil fuel energy in the UK will dilute our authority in the UN climate negotiations leading up to the Paris conference at the end of this year.<sup>63</sup>

**26. Any large scale extraction of shale gas in the UK is likely to be at least 10–15 years away. It is also unlikely to be able to compete against the extensive renewable energy sector we should have by 2025–30 unless developed at a significant scale. By that time, it is likely that unabated coal-fired power generation will have been phased out to meet EU emissions directives, so fracking will not substitute for (more carbon-intensive) coal. Continually tightening carbon budgets under the Climate Change Act will have significantly curtailed our scope for fossil fuel energy, and as a consequence only a very small fraction of the possible shale gas deposits will be burnable.**

**27. A moratorium on the extraction of unconventional gas through fracking is needed to avoid the UK’s carbon budgets being breached in the 2020s and beyond, and the international credibility of the UK in tackling climate change being critically weakened — already a prospect if the provisions in the Infrastructure Bill aimed at maximising North Sea oil extraction are passed.**

**28. The Infrastructure Bill should be amended to explicitly bar fracking of shale gas. This could be done through an Amendment to Clause 37, to qualify the provision in the Bill which seeks to introduce a strategy to maximise the economic extraction of ‘petroleum’ (which includes natural gas) reserves, so that the “principal objective [of the strategy] is not the objective of maximising the economic recovery of UK petroleum but ensuring that fossil fuel emissions are limited to the carbon budgets advised by the Committee on Climate Change and introducing a moratorium on the extraction of unconventional gas through fracking in order to reduce the risk of carbon budgets being breached.”**

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61 Q137

62 Q17

63 Q27 [Tom Burke]

### 3 Environmental risks

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29. The Committee received much evidence on the environmental risks of fracking relating to:

- Groundwater quality
- Waste
- Water supplies
- Air emissions and health
- Habitats and biodiversity
- Geological integrity
- Noise and disruption

We cover each of these below.

30. The evidence from a range of government bodies and independent scientific institutions is generally in agreement that fracking can proceed in the UK safely and without harm to the environment provided proper environmental safeguards are introduced and adhered to. However, uncertainties remain because of the experience in the United States and the fledgling state of the industry in the UK, meaning that the perception that fracking is inherently risky prevails.

#### Groundwater quality

31. Hydraulic fracturing activities pump fracking fluid—water, sand and chemicals—under pressure into a deep well.<sup>64</sup> When the well is depressurised, a proportion of the fracking fluid is returned to the surface as flowback alongside naturally occurring contaminants mobilised by the fracturing process. There is a risk to groundwater through the escape of fracking or flowback fluids, and a risk of polluting surface water or the ground from storage of these fluids above ground.

32. It is critical that groundwater is protected from contamination. The Environment Agency's *Groundwater protection: Principles and practice* state that damage to groundwater may be irreversible, and that the precautionary principle must be followed.<sup>65</sup> Members of the public are clearly concerned about the risks to groundwater from fracking, many

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64 The House of Commons Library note on Shale Gas and Fracking identified the content of fracking fluids used by Cuadrilla in the UK:

Fluids used by Cuadrilla have 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.

*Shale Gas and Fracking*, Standard Note [SN06073](#), House of Commons Library, December 2014

65 Environment Agency, [Groundwater protection: Principles and practice \(GP3\)](#), (August 2013), p 20

looking to the “track record of fracking elsewhere in the world”.<sup>66</sup> The Frack Free Balcombe Resident’s Association raised concerns that “wells or fractures intersecting with natural faults could easily become conduits for leaking gases and liquids” in Britain’s highly faulted geology.<sup>67</sup> ENDS’ *UK shale gas and the environment* reported the make-up of flowback fluid at one of Cuadrilla’s sites:

At Cuadrilla’s Preese Hall site near Blackpool, the fluid was some three-times saltier than sea water and had up to 179 micrograms of lead per litre against a 10µg/l drinking water standard. It had chromium at up to 222µg/l, more than four-times the drinking water standard.<sup>68</sup>

33. British Geological Survey highlighted the recent publication of 3D maps showing the relationship of potential shale gas source rocks and the overlying principal aquifers in the UK, considering it “an important first step” but suggesting that further work is required to adequately assess groundwater vulnerability. They told us:

The difficulty lies in the fact that below c.200m there is very little information and data on the hydrogeological properties and potential for movement of pollutants through rocks below this depth.<sup>69</sup>

The risks to groundwater must be eliminated but, they added, “there is, as yet, very limited experience of this type of industrial activity in the UK to adequately characterise and quantify the risks.”<sup>70</sup> Dr Tony Grayling from the Environment Agency told us the regulatory “regime that we currently have is sufficient,” and sufficiently incorporates the precautionary principle.<sup>71</sup> SaFE believed however that “the Government is putting people and the environment at significant risk” because it is not applying the precautionary principle.<sup>72</sup>

34. In a number of areas, potential oil and gas reserves are located beneath principal aquifers used for water supply in the UK and the concern is that wells passing through these aquifers provide a “potential pathway for migration of pollutants” from the fracking and flowback fluids.<sup>73</sup> Evidence from conventional hydrocarbon fields shows that hydraulic fracturing due to injection of fluids can, in exceptional circumstances, lead to fracture propagation to the surface or near-surface, if it takes place at relatively shallow depths.<sup>74</sup> British Geological Survey told us that “47% of [principal aquifers] are underlain by shales/clays that are potentially prospective for gas or oil.”<sup>75</sup> Dr Tony Grayling told us:

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66 Julia Desch ([FRA066](#))

67 Frack Free Balcombe Resident’s Association ([FRA063](#))

68 UK Shale gas and the environment, *Environmental Data Services*, November 2013

69 British Geological Survey ([FRA077](#))

70 British Geological Survey ([FRA077](#))

71 Qq110-11

72 Safety in Fossil Fuel Alliance ([FRA0060](#))

73 Water UK ([FRA005](#)) para 10

74 Richard J Davies et al, “[Oil and gas wells and their integrity: Implications for shale and unconventional resource exploitations](#),” *Marine and Petroleum Geology*, vol 56 (2014), pp239-254

75 British Geological Survey ([FRA077](#))

In relation to source protection zones, which are the zones where there are abstraction boreholes for drinking water, there is a prohibition by the Environment Agency on drilling in those areas. They are actually defined by pollution travel times rather than by metres ... Our permitting system is such that we will only permit an activity if we are satisfied that there is no significant risk of harm to the water environment or water resources. There is an absolute prohibition in protection zones 1. Outside protection zones 1, we would take a very rigorous case-by-case assessment.<sup>76</sup>

The Environment Agency maintained that the use of 'hazardous substances' for any activity, including hydraulic fracturing, would not be permitted where they would or might enter groundwater and cause pollution.<sup>77</sup>

35. Despite this assurance, concerns remain. Frack Off Fife told us:

It is without doubt that each of these [underground extraction] processes pose a threat to our water supplies. Why the Government need to re-query this is unnecessary as there's an abundance of scientific evidence to support the facts that the chemicals used in the drilling and fracturing processes, are very dangerous in many aspects and once the water supply is contaminated, it cannot be un-contaminated. Water's natural ability to permeate rock means the contaminated waters will eventually find clean/natural/ground waters and thus, contaminate them ... and put at risk the environment around it.<sup>78</sup>

Greenpeace referred to the concerns of UK medical health campaign group Medact that fracking is an inherently risky activity with associated pollutants including "carcinogens, mutagens, teratogens, respiratory irritants and neurological, endocrine and haematological disrupters/toxins" and "industrial-scale fracking would pose unacceptable risks to the health and well-being of local residents."<sup>79</sup> Water UK research has identified that "a small number of the substances present [in fracturing fluids] are likely to be classified as hazardous under EU and UK regulations."<sup>80</sup>

36. Paul Mobbs believed that flowback fluid is a greater risk than the original fracking fluid, due to the mobilisation of deep radioactive and other naturally occurring materials by the fracturing process, mixing with the fracking fluid.<sup>81</sup> The Researching Fracking In Europe consortium informed us that their "research has found that even in the 'worst case scenario', flux in the radioactivity of flowback fluid would not exceed the annual exposure limit set by the UK Environment Agency."<sup>82</sup> The Chartered Institution of Water and Environmental Management considered the risks of contamination from mobilisation of

76 Qq108-9

77 Environment Agency ([FRA064](#)) para 3.3

78 Frack Off Fife ([FRA042](#)) para 3. See also Talk Fracking ([FRA019](#)) para 2.2, Alice Waddicor ([FRA053](#)) para 3 and Dr David Lowry ([FRA059](#))

79 Greenpeace UK ([FRA050](#)) para 5.23

80 Water UK ([FRA005](#)) para 17

81 Mobbs' Environmental Investigations ([FRA051](#)) para 16

82 ReFINE ([FRA007](#))

methane in groundwater to be generally low in the UK.<sup>83</sup> British Geological Survey are currently researching the “temporal variation in methane in groundwater” and are looking to finish the work and develop a baseline by March 2015.<sup>84</sup>

37. Dr David Lowry also raised a concern about endocrine disruptors, noting findings of “higher levels of hormone disrupting activity in water located near fracking wells than in areas without drilling” in the United States.<sup>85</sup> In a letter to Dr Lowry the Environment Agency stated that it was “aware of the use of endocrine disrupters in some parts of the USA and the potential link to shale gas fracking there ... The Environment Agency will not authorise the use of substances hazardous to groundwater in hydraulic fracturing.”<sup>86</sup>

38. The majority of written submissions we received cited well integrity as the key to preventing pollution from fracking operations.<sup>87</sup> Lord Smith believed it was “so crucial for protection in terms of groundwater, waste fluids and impact on the environment.”<sup>88</sup> UK Onshore Oil and Gas highlighted that there would be multiple physical barriers of casing and cement and the natural impermeable geology layers as protection for the well, and integrity testing prior to the commencement of fracturing activities.<sup>89</sup> However, we heard that the only fracking well drilled so far in the UK, at Preese Hall near Blackpool, suffered well integrity issues and that crucial tests had not been carried out.<sup>90</sup> Countryside Alliance calculated that the “probability of an individual well blowing out or leaking is relatively low (typically around 1 in 5000 for onshore wells)” but that “the large number of wells that need to be drilled increases the chance of such an event happening.”<sup>91</sup> Friends of the Earth directed us to evidence from the United States that “found failure rates in newly-drilled shale gas wells in Pennsylvania to be between 6.9% and 8.9%”.<sup>92</sup>

39. Caroline Raffan told us her “greatest worry is that water contamination will get worse over time as wells develop concrete failures, and the methane escapes into the water table and also into the environment.”<sup>93</sup> There is concern that underground pollution events might not be identified before, or may happen after, wells are abandoned. The National Physical Laboratory told us that “there are no monitoring requirements for abandoned wells.”<sup>94</sup> Mark Ellis-Jones from the Environment Agency assured us, however, that:

As long as the operator is holding the permits and is responsible for the site, at any time before, during or after operations we have the powers to take enforcement action if there was a pollution event of any kind or a breach of permit ... Particularly after the sites have been operated and then

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83 CIWEM ([FRA006](#)) para 9

84 British Geological Survey ([FRA077](#))

85 Dr David Lowry ([FRA059](#))

86 Unpublished letter

87 OESG ([FRA017](#)). See also Friends of the Earth ([FRA018](#)) para 4, Halliburton ([FRA021](#)) para 3.4.2

88 Q142

89 UKOOG ([FRA011](#)) para 11

90 Qq96, 104-5. See also Friends of the Earth ([FRA018](#)) para 4

91 Countryside Alliance ([FRA002](#)) para 11

92 Friends of the Earth ([FRA018](#)) para 4

93 Caroline Raffan ([FRA056](#)) para 7

94 NPL ([FRA074](#)) para 3.9

decommissioned, we would not allow the operators to surrender their permits until such a time as we felt that the sites had been restored to a satisfactory environmental condition or there was no long-term risk to the environment ...

Under the Environmental Liability Directive, we can hold companies to account for any environmental damage, even after they have surrendered their permit. So we can take enforcement action even after permit surrender and would do so ...

The conditions in the permit are indefinite, so we have essentially, under the Environmental Permitting Regulations, in theory indefinite powers to not accept an operator surrendering its permit to us if we think there is an ongoing risk. What we would have to do is take every site on a case-by-case basis, depending on the extent of operations, how long the operations have been lasting for, and that will vary.<sup>95</sup>

40. Water UK identified a “risk from ... surface spillages of chemicals and other materials”<sup>96</sup> and the Chartered Institution of Water and Environmental Management pointed out that “any negligence associated with storage, transportation and operational spills represent the greatest threats to surface water, as well as to groundwater.”<sup>97</sup> The Environment Agency told us:

To protect surface and groundwater from potential spills and leaks from onsite equipment and infrastructure, sites must be constructed with an impermeable membrane; storage tanks must have bunds (containment); and any clean surface water run-off from the site would need a water discharge consent before being released into the environment.<sup>98</sup>

However, many witnesses raised concerns about what they saw as a lack of satisfactory solutions for safe ‘containment’.<sup>99</sup>

## Waste

41. Typical wastes arising from hydraulic fracturing include drill cuttings, waste drilling muds, waste flowback fluids, waste gases, and ‘fugitive emissions’. The Institution of Civil Engineers estimate that a single well might produce between 7,500 to 18,750m<sup>3</sup> of waste water and 13,400 to 33,500 tonnes of CO<sub>2</sub> annually.<sup>100</sup> Both volume and content raise concerns.

42. One of these concerns is about the accumulation of naturally occurring radioactive materials, minerals and salts in flowback fluid and drilling muds. UK Onshore Oil and Gas

95 Qq83-4,87

96 Water UK ([FRA005](#)) para 30

97 CIWEM ([FRA006](#)) para 10

98 Environment Agency ([FRA064](#)) para 3.6

99 For example, UK Green MEPs ([FRA014](#)) para 17

100 ICE ([FRA070](#)) para 2.1



told us that these wastes are “stored within secondary containment on site.”<sup>101</sup> The Government told us “a permit for the management of extractive waste (mining waste) is always required” and commercial operators must submit a waste management plan to the Environment Agency detailing how wastes on site will be minimised and managed safely.<sup>102</sup> Dr Tony Grayling told us that in practice all flowback would need to be controlled under the permitting regimes:

Drilling muds, if they are oil-based drilling muds, are classified as hazardous and therefore if they are included in any waste products, the waste materials are themselves hazardous. In terms of waste fracking fluid, it is not automatically a hazardous material, not least because we do not allow the inclusion of substances in fracking fluid that we would deem to be hazardous to groundwater. But it is likely that waste fracking fluids will contain a sufficient but low level of naturally occurring radioactive materials that would invoke the radioactive substances regulations and therefore require permitting on that front, and require that those waste fracking fluids are disposed of at an appropriately licensed wastewater treatment facility.<sup>103</sup>

The Environment Agency added that:

Any hydraulic fracturing fluid left underground at the end of the operation will also be considered an extractive waste. Operators will need to ensure that any waste fluid left underground stays within the target formation and cannot move to geological layers above. They will do this by ensuring that the fractures stay in the shale beds and that the well bore is properly decommissioned.<sup>104</sup>

43. Friends of the Earth warned that “waste disposal remains problematic for fracking companies.”<sup>105</sup> Water UK advised that “elevated salinity presents a challenge for wastewater treatment”<sup>106</sup> and that “It is unlikely that the standard wastewater treatment works will be able to manage waste water from unconventional oil and gas.”<sup>107</sup> They reported however that treatment can be undertaken to recycle wastewaters for re-use in further hydraulic fracturing.<sup>108</sup> The Institution of Civil Engineers confirmed that “onsite water treatment technologies exist (e.g. thermal distillation or reverse osmosis filtration), but this is not yet widely practiced.”<sup>109</sup> Dr Tony Grayling from the Environment Agency told us:

The background levels of naturally occurring radioactive materials are relatively low but we expect them to cross the threshold in which they will

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101 UKOOG ([FRA011](#)) para 23

102 DEFRA, DECC and DCLG ([FRA068](#)) para 3.8, 3.24

103 Q112

104 Environment Agency ([FRA064](#)) para 3.21

105 Friends of the Earth ([FRA018](#)) para 18

106 Water UK ([FRA005](#)) para 19

107 Water UK ([FRA005](#)) para 37

108 Water UK ([FRA005](#)) para 20

109 ICE ([FRA070](#)) para 3.3.2

come into regulation. We consider that we do have the capacity in terms of the waste treatment facilities to deal with that waste in the current stage of development that the industry is at. This is a permissible activity so they will have a permit under our radioactive substances regulations that require that waste be managed in very specific ways to make sure that it is dealt with on site in bunded tanks, for example, and then disposed of at a properly licensed facility. So it is a risk that can be managed.<sup>110</sup>

There are concerns, however, that if the industry scales up the required waste treatment capacity may not be available.<sup>111</sup>

44. Despite assurances from the Environment Agency that use of ‘hazardous substances’ for fracking would not be permitted where they could enter groundwater and cause pollution,<sup>112</sup> Frack Free Balcombe Resident’s Association raised a concern that the access rights provision in the Infrastructure Bill (paragraph 7) effectively allows “any substance to be injected into and left in the lateral wells ... drilled under our property.”<sup>113</sup>

## Water supplies

45. Fracking itself requires considerable quantities of water and could pose localised risks to water supplies if catchments were over-abstracted, or water supplies were stressed already. Commercial operators can source water for hydraulic fracturing either directly from surface water or groundwater, or from the local mains water supply. The Institution of Civil Engineers estimated that 10,000 to 25,000m<sup>3</sup> of water would be required for each well.<sup>114</sup> The Chartered Institution of Water and Environmental Management told us that whilst the volume of water used in hydraulic fracturing for shale gas viewed in isolation appears large, when set in the context of national or regional water supply it is comparable with other industries.<sup>115</sup> UK Onshore Oil and Gas believed that “fears of water shortages arising from shale gas development have been overstated.”<sup>116</sup>

46. We heard from the Environment Agency that they expect commercial operators to source their water from the water companies.<sup>117</sup> Water UK told us:

Water availability is likely to depend on local conditions and local distribution infrastructure. The regions where water resources are less likely to be available are in southeast England, and the southwest Midlands<sup>118</sup> ...

It is essential to involve [water] companies as much and as early as possible, so that companies can plan both for potential extra demand (in water-

110 Q115

111 CIWEM ([FRA006](#)) para 10. See also Water UK ([FRA005](#)) para 36,38

112 Environment Agency ([FRA064](#)) para 3.3

113 Frack Free Balcombe Resident’s Association ([FRA063](#)) para 8(4)

114 ICE ([FRA070](#)) para 2.1

115 CIWEM ([FRA006](#)) para 4

116 UK Onshore Oil and Gas ([FRA011](#)) para 19

117 Q106

118 Water UK ([FRA005](#)) para 11

stressed areas such as the South East, this is crucial) and to consider solutions for removing untreated waste water safely.<sup>119</sup>

47. We welcome the Memorandum of Understanding between Water UK and UK Onshore Oil and Gas establishing a framework for members of each organisation to engage and cooperate,<sup>120</sup> and the Government's agreement that water companies should be statutory consultees in fracking planning applications.<sup>121</sup>

## Air emissions and health

48. During the exploration phase methane is released to test the recoverability of the shale gas. In addition to methane, local air pollutants from the same process can include particulate matter, volatile organic compounds and nitrogen oxides. There is additional potential for local air pollution from haulage associated with the site. The Institution of Civil Engineers estimated that a single well might require between 500 and 1,250 HGV lorry movements.<sup>122</sup>

49. The Environment Agency told the Environment, Food and Rural Affairs Committee that when they consider a permit they look at the contribution the activity will have on overall air quality.<sup>123</sup> In June 2014 Public Health England concluded that 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."<sup>124</sup> Nonetheless, Dr F P Rugman alerted us to a recent study that found "high air concentrations of potentially dangerous chemicals near on-shore fracking sites in the USA," including benzene, formaldehyde, hexane, and hydrogen sulphide.<sup>125</sup> He raised concerns that "the Public Health England Report cites some preliminary short term studies of adverse health impacts of fracking in the USA, but does not address the probable cumulative long-term impact of air emissions such as benzene on the lifetime cancer risks. Another major unknown is how low level, but long-term, exposure from multiple chemicals might affect peoples' health."<sup>126</sup> UK Green MEPs considered that "the health impacts of air pollution will only be exacerbated by fracking and will make it harder for the UK to meet EU air quality standards."<sup>127</sup> They referred to European Commission research in 2012 which stated:

Emissions from numerous well developments in a local area or wider region could have potentially significant effect on air quality. Emissions from wide scale development of a shale gas reservoir could have a significant effect on

119 Water UK ([FRA005](#)) para 38

120 Water UK ([FRA005](#)) para 40

121 Q106. See also Water UK ([FRA082](#))

122 ICE ([FRA070](#)) para 2.1

123 EFRA Committee, *DEFRA's responsibility for fracking*, HC 589, Q57 [Dr Leinster]

124 Public Health England, *Review of the Potential Public Health Impacts of Exposure to Chemical and Radioactive Pollutants as a Result of Shale Gas Extraction*. (June 2014), page iii.

125 Dr F P Rugman ([FRA032](#)) para 3

126 Dr F P Rugman ([FRA032](#)) para 11

127 UK Green MEPs ([FRA014](#)) para 21

ozone levels. Exposure to ozone could have an adverse effect on respiratory health and this is considered to be a risk of potentially high significance.<sup>128</sup>

50. Philip Mitchell has conducted local surveys which, he told us, had led to concerns that “there have been an increase in respiratory symptoms, including acute breathlessness and asthma and that these correlate with the drilling and, predominantly, fracking operations.” Mr Mitchell also said Cuadrilla used polyacrylamide which was an irritant to the respiratory system, and glutaraldehyde which was linked to asthma.<sup>129</sup> Dr David Lowry raised the concern of radiation risk from radon gas which might be released during fracking, referring to Public Health England’s *Review of the Potential Public Health Impacts of Exposure to Chemical and Radioactive Pollutants as a Result of Shale Gas Extraction* which concluded that there is “the potential for radon gas to be present in natural gas extracted from UK shale.”<sup>130</sup> The Geological Society noted concerns relating to mobilisation of natural uranium but stated “we are not aware of any evidence of harm.”<sup>131</sup> No Hot Air believed that “refusing to access local resources of natural gas and oil ... avoids the significant and proven positive health impacts of lowering air pollution from ... coal generation.”<sup>132</sup> We discussed concerns relating to endocrine disruptors above (paragraph 37).

51. The Government told us that “any venting or flaring of gas from a well is regulated by DECC through the Petroleum Exploration Development Licence ... [and] venting is not normally permitted.”<sup>133</sup> The Environment Agency informed us that commercial operators require a permit under the Industrial Emissions Directive to undertake flaring of over 10 tonnes a day of waste gases and that “where flaring does occur, we consider the use of fully enclosed flares as Best Available Techniques. We will not allow open flaring or venting except for safety as a last resort.”<sup>134</sup> They told us:

An air dispersion modelling assessment will be required, to determine the likely impact of flaring the gas on local air quality standards. We will need to be satisfied that the contribution of emissions from the proposed flaring is acceptable in terms of potential environmental and health impacts. The operator will be required to monitor the emissions to air from the flaring activity.<sup>135</sup>

A weakness of the Environment Agency’s consideration of ‘best available techniques’ is that they will take account of costs in the appraisal of permitting applications.<sup>136</sup>

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128 AEA, [Support to the identification of potential risks for the environment and human health arising from hydrocarbons operations involving hydraulic fracturing in Europe](#). (August 2012), page viii

129 Philip Mitchell (FRA058) appendix 1

130 Dr David Lowry (FRA059)

131 The Geological Society (FRA003) para 9

132 No Hot Air (FRA030) para 2

133 DEFRA, DECC and DCLG (FRA068) para 3.21-22

134 Environment Agency (FRA064) para 3.28 - 29

135 Environment Agency (FRA064) para 3.30

136 Q52

52. Unintentional leaks—‘fugitive emissions’—have the same potential consequences as planned flaring. Mark Ellis-Jones told us “from a regulatory point of view, our expectation is full containment. Any industrial process will have fugitive emissions of some kind, but our starting point is the expectation that there is 100% containment.”<sup>137</sup> The Environment Agency assured us that fugitive emissions were subject to extractive waste permit conditions<sup>138</sup> and identified methods to prevent unintended gas release:

- Checking for leaks prior to starting, and during, operations;
- Increasing pressure of drilling fluids; and
- Installing physical control equipment forcing the borehole to be shut.<sup>139</sup>

They told us:

Should elevated levels of methane be detected, we would require the well to be shut and the cause for the increase in levels to be investigated and remedied. The operation will only resume once we are satisfied that the issue has been resolved.<sup>140</sup>

53. We welcome the Government’s announcement that the Environment Agency will enforce ‘green completions’—the collection and separation of water, sand and gas to prevent escape of gas—as a requirement of environmental permits for shale gas production.<sup>141</sup>

## Habitats and biodiversity

54. The direct loss or fragmentation of habitat, noise and vibration, air and water contamination, light and truck movements associated with fracking operations could all have an impact on wildlife. The Royal Society for the Protection of Birds estimated that transportation related to fracking activities “equates to between 4,300 and 6,600 truck trips per well pad.”<sup>142</sup> They also pointed out that “excess water abstraction could negatively affect aquatic habitats that are important for wildlife.”<sup>143</sup> The Woodland Trust raised concerns about “the potential of fracking operations to damage areas of ancient woodland, which are precious, irreplaceable habitats ... covering only 2% of the UK.”<sup>144</sup>

55. On the other hand, the Geological Society highlighted the example of Perenco’s Wytch Farm oil extraction site which, although not subject to fracking, has operated in an area of outstanding natural beauty since the late 1970s.<sup>145</sup> Nevertheless, the Government told us that major development of shale gas extraction in National Parks, the Broads, Areas of

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137 Q93 [Mark Ellis-Jones]

138 Environment Agency ([FRA064](#)) para 3.23

139 Environment Agency ([FRA064](#)) para 3.24-25

140 Environment Agency ([FRA064](#)) para 3.25

141 DEFRA, DECC and DCLG ([FRA068](#)) para 4.7

142 RSPB ([FRA015](#)) para 3.6

143 RSPB ([FRA015](#)) para 3.10

144 The Woodland Trust ([FRA013](#)) para 2,4

145 The Geological Society ([FRA003](#)) para 18

Outstanding Natural Beauty and World Heritage Sites would be allowed only in “exceptional circumstances” and when public benefit can be demonstrated.<sup>146</sup> The Prime Minister informed the House of Commons Liaison Committee: “We have not really defined what they would be but, clearly, there is a much higher threshold to be crossed.”<sup>147</sup>

56. The same restrictions do not apply to include Sites of Special Scientific Interest, despite the legal protections given to these sites.<sup>148</sup> RSPB told us:

18% of the UK’s Sites of Special Scientific Interest fall within land available under the 14th Licensing Round [for petroleum exploration and development licences], so the impacts on our most precious sites and species could be significant. Any damage to the SSSI network could lead to the UK failing to meet its international commitments for biodiversity.<sup>149</sup>

The Government informed us that development cannot normally occur on Special Protection Areas, Special Areas of Conservation and Sites of Special Scientific Interest unless it can be shown there will be no adverse impact on the integrity of the site, and that all public authorities when exercising their functions have a duty to have regard to conserving biodiversity.<sup>150</sup>

## Geological integrity

57. Cuadrilla’s exploratory drilling operations at Preese Hall near Blackpool were halted in 2011 following two earth tremors linked to their activities, before restrictions were lifted at the end of 2012. The Geological Society reported:

The maximum magnitude of any seismic event is dependent on the mechanical strength of the rock in which it occurs. The crust in most of the UK is relatively weak, and unable to store sufficient energy for large seismic events. This means that the largest natural earthquake we can expect is likely to be no greater than magnitude 6. However, based on our understanding of the mechanical strength of shale and case studies of fracking operations in the USA, it is extremely unlikely that seismic events induced by fracking will ever reach a magnitude greater than 3 ... Earthquakes at a magnitude of 3 are likely to be detectable by few people and are highly unlikely to cause any structural damage at the surface.<sup>151</sup>

The Royal Society & Royal Academy of Engineering also said that “seismicity induced by fracking is likely to be of even smaller magnitude than coal mining related seismicity.”<sup>152</sup> IGas Energy told us that seismic activity is a common occurrence in the UK, with the vast majority of events induced naturally. In December 2014 they reported “in the last two

146 DEFRA, DECC and DCLG ([FRA068](#)) para 3.39

147 Liaison Committee, *Evidence from the Prime Minister*, HC887, Q52

148 RSPB ([FRA015](#)) para 3.5

149 RSPB ([FRA015](#)) para 1.1

150 DEFRA, DECC and DCLG ([FRA068](#)) para 3.36-38

151 The Geological Society ([FRA003](#)) para 12-13

152 The Royal Society & Royal Academy of Engineering ([FRA067](#)) para 7

months alone there was one tremor bigger (magnitude 2.6) than the largest recorded in Preese Hall (2.3) and four that were very similar in size (2.2, 2.1, 2.0 and 2.0).<sup>153</sup> However, Campaign to Protect Rural England (Kent) questioned whether Britain's geology is too highly faulted for fracking to be safe.<sup>154</sup>

58. Following the tremors at Preese Hall, DECC introduced new controls to mitigate the risk of seismicity induced by fracking, including prior analysis of seismic risk, systematic monitoring and a 'traffic light' system to halt operations at predefined levels of seismic activity. Dr James Verdon and Professor Michael Kendall told us that the traffic light "thresholds are very conservative", although they suggested that uncertainties related to implementation should be addressed.<sup>155</sup> Dr Tony Grayling from the Environment Agency reported that:

For any individual site, we and the Department of Energy and Climate Change between us require detailed seismic surveys and detailed hydrogeological surveys as part of an application to undertake any drilling activity or any hydraulic fracturing activity. We would expect that information will come to light through those surveys, but it needs to be done ultimately on a site-by-site basis.<sup>156</sup>

He considered the traffic light system to be adequate for the purpose. It "has not been tested in anger, but the threshold they have set of 0.5... is very low and I think provides a very strict safeguard."<sup>157</sup>

## Noise and disruption

59. The amenity impacts caused by fracking include visual intrusion, loss of land, and noise and vibration from 24 hour operations and associated haulage. INEOS told us:

Like any development, a shale gas site must demonstrate that it will not lead to unacceptable visual impact, light pollution, noise or congestion if it is to secure planning permission from local councils. And while operating it must prove that it meets the conditions of its planning permission.<sup>158</sup>

UK Onshore Oil and Gas reported:

The development of onshore oil and gas, like any other industrial activity, will cause an increase in traffic and disruption in some locations, particularly during the periods when wells are drilled or hydraulically stimulated. Planning controls, established by the Minerals Planning Authority will mitigate disturbance along with the demonstration via a traffic management plan how the operator plans to manage routes, traffic safety and amenity of

153 IGas Energy ([FRA027](#)) para 27

154 CPRE (Kent) ([FRA012](#)) para 3.3

155 Dr James Verdon and Professor Michael Kendall ([FRA022](#)) FRA S2

156 Q120

157 Q123

158 INEOS ([FRA020](#)) para 26

introducing new traffic to an area. The industry's community benefits scheme (paragraph 7) will compensate those communities affected.<sup>159</sup>

60. INEOS believed that “local disruption associated with drilling and fracking is comparable in scale to a building site, and only temporary (typically lasting about six months). After this a site produces discreetly for up to a few decades.”<sup>160</sup> However, the Chartered Institution of Water and Environmental Management pointed out that, in the UK, shale gas extraction may be near to large populations, creating a much more noticeable impact on communities and the local environment.<sup>161</sup> Haulage of materials, waste and equipment was a source of concern for Greenpeace, who warned that:

The volume of heavy goods vehicle traffic required for fracking is likely to increase local noise and air pollution associated with road traffic. It will also have a significant traffic impact on local roads, especially in areas where new road building is impractical or environmentally destructive.<sup>162</sup>

Dianne Hogarth highlighted that local roads were not built to withstand increased traffic of heavy lorries from fracking activities.<sup>163</sup> The Institution of Civil Engineers estimated that “a single well might require between 500 and 1,250 HGV lorry movements.”<sup>164</sup> Greenpeace pointed to an Institute of Directors study predicting average truck movements of between 6 and 17 per day over five years<sup>165</sup> and European Commission research warning of up to 250 truck movements a day to a single drilling site.<sup>166</sup>

## Safeguards

61. The range of environmental risks, discussed above, is extensive, and there remains uncertainty about their significance because fracking operations have yet to move beyond the exploratory stage in the UK. Such a situation requires strong safeguards in the following key areas: the regulatory regime, monitoring, liability arrangements and ‘social licence’, as we discuss below.

## Regulatory regime

62. The Government explained to us the roles and responsibilities of departments involved in the regulation of fracking:

DECC has the overall lead on unconventional oil and gas policy, including shale gas, and coordinates activities across Government departments. Defra has policy responsibility for the environmental aspects of shale gas policy,

159 UK Onshore Oil and Gas ([FRA011](#)) para 31

160 INEOS ([FRA020](#)) para 27

161 CIWEM ([FRA006](#)) para 14

162 Greenpeace UK ([FRA050](#)) para 5.28

163 Dianne Hogarth ([FRA049](#))

164 ICE ([FRA070](#)) para 2.1

165 Institute of Directors, [Infrastructure for Business: Getting shale gas working](#) (May 2013) page 16

166 AEA, [Support to the identification of potential risks for the environment and human health arising from hydrocarbons operations involving hydraulic fracturing in Europe](#) (August 2012) page xi



with the exception of climate change and seismicity issues which are a DECC lead. DCLG is responsible for the planning system including environmental impact assessment. Defra and DCLG responsibilities extend to England only, as environmental policy and the operation of respective planning systems are devolved matters.

Operators who wish to explore for shale gas require a number of permissions:

- They must first be granted a Petroleum Exploration Development Licence by DECC which will confer exclusive rights to an area.
- They also require environmental permits from the environmental regulator, access agreement from relevant landowner(s), scrutiny from the Health and Safety Executive and DECC consent before operations can commence.
- All project activities, such as drilling, hydraulic fracturing, or production, require planning permission from a local Minerals Planning Authority or, on appeal, from the Planning Inspectorate. The Secretary of State for Communities and Local Government also has powers to call-in planning applications for his own determination or, similarly, to recover planning appeals for his own determination.<sup>167</sup>

The Environment Agency set out additional requirements:

For a site that is planning to undertake hydraulic fracturing, the following permits and permissions are likely to be required:

- A permit for the management of extractive waste (also known as ‘mining waste’) will always be required where a new well is being drilled and waste needs to be managed.
- A notice under the Water Resources Act to ‘construct a boring for the purposes of searching for or extracting minerals’. The notice will set out details of the well design and construction.
- A permit for a radioactive substances activity to manage Naturally Occurring Radioactive Materials from a well that is producing oil or gas.
- A permit for a groundwater activity, where there is a risk of an indirect discharge to groundwater from the proposed operations.
- A permit for an installation under the Industrial Emissions Directive, if operators intend to flare more than 10 tonnes of waste gas per day.
- A water abstraction licence if the operation abstracts more than 20 cubic metres per day directly from a river or groundwater.<sup>168</sup>

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167 DEFRA, DECC and DCLG ([FRA068](#)) para 1.3-4

168 Environment Agency ([FRA064](#)) para 2.3

63. We took some assurance from Dr Tony Grayling that the Environment Agency “take the potential environmental risk from extracting shale gas extremely seriously, and indeed the public concerns there are around this agenda.”<sup>169</sup> However, we heard much to suggest that there are uncertainties which point to unacceptable gaps, inconsistencies and inadequacies in the current regime. Joanne Hawkins told us:

There is a well developed existing regulatory framework governing conventional oil and gas extraction. However, when applied to the extraction of unconventional oil and gas, gaps in the current regulation are apparent. These can be seen in areas relating to chemical use, waste, emissions, environmental liability, environmental assessment, water and planning. These gaps are the result of uncertainty surrounding if/how current regulations apply and from the presence of inappropriate application thresholds. ... Attention needs to be drawn to the problems in the current regulatory system if the risks of fracking are to be considered in context.<sup>170</sup>

Lord Smith, chair of the Task Force on Shale Gas, told us:

If you add up the range of environmental regulations that are currently in place, mostly in different European directives, you probably have a range of protections that are sufficient for the various issues that we can currently envisage. However, it is all rather diffuse across a range of different directives and it is the responsibility of a range of different public bodies to undertake the regulation. One of the key issues that we are tussling with at the moment is: does that make sense? Would it be better to have a bespoke regulatory regime that had the expertise, the knowledge and developed it, especially if we are going to see a lot of new applications coming online? At the moment you have only a few handfuls of applications and the current regime appears to be reasonably well geared up to be able to deal with that. If that were to expand dramatically, I think there are serious questions about whether it is.<sup>171</sup>

Concerns were also raised about the availability of sufficient regulatory resources to properly regulate fracking in the UK.<sup>172</sup>

64. The existing regime is complex and whilst we welcome the Environment Agency and Health and Safety Executive’s joint working strategy, *Working together to regulate unconventional oil and gas developments*,<sup>173</sup> **it remains to be seen whether this will ensure effective regulatory co-ordination across all the relevant bodies and departments. A joint strategy concerning the regulation of unconventional oil and gas signed by all relevant national and local departments and agencies must be developed and published.**

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169 Q42

170 Joanne Hawkins ([FRA008](#))

171 Q143

172 Countryside Alliance ([FRA002](#)) para 26. See also Rhona MacLeod ([FRA034](#)) para 1m)

173 Environment Agency and Health and Safety Executive, [Working together to regulate unconventional oil and gas developments](#) (November 2012)

65. **The Government must ensure adequate numbers of skilled and experienced staff are in place to regulate unconventional oil and gas now and in the future.**

66. **Work to determine the baseline status of the environment, including baselines related to methane in groundwater and fugitive emissions, and subsequent monitoring requirements must be completed as soon as possible and the findings used to inform fracking permits and permissions.**

67. **The UK has complex geology and more effort is required to understand and map specific local geological conditions and the influence of historic mining activity.**

68. **We have concluded that fracking must be prohibited outright in protected and nationally important areas including National Parks, the Broads, Areas of Outstanding Natural Beauty, Sites of Special Scientific Interest and ancient woodland, and any land functionally linked to these areas.**

69. **Venting of methane emissions is not acceptable. Full containment of methane must be mandated in all fracking permits and permissions.**

70. **It is crucial that groundwater is protected and the restriction on fracking in water source protection zones 1 is welcome. However, fracking should be prohibited in all source protection zones and all fracking activity must require a groundwater permit when wells extend under aquifers. A minimum vertical separation distance between shales being fracked and a groundwater aquifer should be defined and mandated.**

71. **There must be clear and accessible public disclosure on the chemicals used in the exploration and production of shale gas, and the risks they potentially pose.**

72. The Infrastructure Bill proposes an automatic right of access to land 300m below the surface for the purpose of exploiting petroleum or deep geothermal energy (paragraph 7). Frack Free Ryedale consider this “removes the few safeguards that we have.”<sup>174</sup> Steve Thompsett from UK Onshore Oil and Gas thought the fracking activity “probably would go ahead” without this change to the Bill.<sup>175</sup> **Automatic right of access to “deep-level land” is not supported by the majority of the public and is not considered necessary by the industry (paragraph 80). It should be removed from the Infrastructure Bill.**

73. **The changes to the regulatory system identified above, though essential, do not however address the fundamental need for a more coherent and more joined-up regulatory system, and one that needs to be put in place before further fracking activity in contemplated. First, the Strategic Environmental Assessment of the Licensing Rounds, Environmental Impact Assessments, planning and permit appraisals must all consider the cumulative impacts of fracking. UK Onshore Oil and Gas told us “the industry has committed to undertake an [Environmental Impact Assessment] (and equivalent studies) on all sites where hydraulic fracturing for shale gas/oil is proposed”.<sup>176</sup> Second, environmental impact assessment must be mandated for all fracking activity.**

174 Frack Free Ryedale ([FRA047](#)) para 3.8. See also Home Owners Alliance, [74% oppose fracking without homeowners' approval](#), accessed 21 January 2015

175 Q151. See also Q22

176 UK Onshore Oil and Gas ([FRA011](#)) para 26

We share the confidence some of our academic witnesses had in the regulators' capability to build a robust and effective regulatory system to cover fracking,<sup>177</sup> but we have concerns about the Environment Agency's qualified assertion that "the current regulatory regime is satisfactory to enable this industry potentially to develop in a way that protects people and the environment, at least for the exploratory stage of the industry's development."<sup>178</sup> **Third, attention must be paid to the way in which the industry and the risks might scale up. There is the prospect that a regulatory regime for operational extraction would be applied without the same rigour that had been applied to the exploration phase. It is important that the necessary regulatory arrangements are determined and in place prior to the expansion of the industry. Finally, there should be a consolidated regulatory regime specifically for fracking.**

### Monitoring

74. **We welcome the Environment Agency's inclusion of mandatory conditions for baseline monitoring in the draft permits for the two sites currently pending planning permission. Mandatory baselines and continued monitoring covering all relevant indicators, must be conducted.**

75. **It is unacceptable that there are no monitoring requirements for abandoned wells and this should be remedied immediately.** We had misgivings about industry being in control of data-gathering in our *National Pollinator Strategy* inquiry, where pesticide companies were funding the continuing research on the effects of neonicotinoids on pollinators.<sup>179</sup> **We agree with the Environment Agency that it is "essential that [commercial operators] take responsibility for their work"<sup>180</sup> and conduct their own monitoring "in accordance with the standards that are set in [the Environment Agency's] monitoring certification scheme,"<sup>181</sup> and welcome the Agency's recognition of the "the desirability of some independent monitoring at this stage of the industry's development."<sup>182</sup> We note the announcement this month that British Geological Survey will assist Cuadrilla in monitoring groundwater, air quality and seismicity at its Lancashire sites.<sup>183</sup> **Monitoring by the commercial operator should be supplemented with such independent monitoring in all cases to increase public confidence in the results. The regulators must conduct regular unannounced spot checks and audits of all fracking sites, and facilitate a clear and accessible public disclosure of all monitoring data.****

### Liability

76. There are concerns regarding the adequacy of the liability arrangements covering fracking activity, including the continuing safety of wells that are subsequently decommissioned (paragraph 39). It is regrettable that the amendment to the Water Bill to

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177 Q36

178 Q42

179 Environmental Audit Committee, Second Report of Session 2014-15, [National Pollinator Strategy](#), HC 213

180 Q70

181 Q76

182 Qq70,77

183 *UK's first independent research to monitor fracking as it happens*, [BGS press release](#), 15 January 2015

secure a liability guarantee was rejected.<sup>184</sup> Minerals Authorities can ask for bonds, and should do.<sup>185</sup> **It is imperative that commercial operators have sufficient resources and insurance to cover full liability in the event of a pollution incident. Licences, permits and permissions must not be issued if this cannot be demonstrated. We welcome the industry's efforts to develop an insurance mechanism: this must be in place in advance of any fracking activity.**<sup>186</sup>

### 'Social licence'

77. Public concern about fracking is understandable, following examples of poor environmental performance in the United States which have put the risks in sharp focus. Government action has also shown inconsistency, as Tom Burke told us:

I think people have noticed very clearly the inconsistency in the behaviour of a Government that says, "We cannot have more onshore wind because people do not like it and it is not acceptable to the public, but we can have lots of fracking." That inconsistency of approach, again, it seems to me undermines people's confidence.<sup>187</sup>

Poor performance and unacceptable environmental consequences have been witnessed in the United States. Professor Paul Stevens told us:

It is not a good idea to look at the United States' experience on these sorts of things because, largely speaking, the shale gas operations there have not been particularly well regulated. The [US] 2005 Energy Act explicitly excluded fracking from the [Environmental Protection Agency's] Clean Water Act, so an awful lot of what is being done in the United States has been done badly and done in a context of poor regulation.<sup>188</sup>

78. Many of our witnesses acknowledged that the existing UK conventional onshore industry has a generally safe history, with over 200 producing wells and no pollution incidents from well design,<sup>189</sup> although well integrity and monitoring issues at Preese Hall (paragraph 38) act to undermine this position for new fracking technology in the UK.<sup>190</sup>

79. **Public acceptance—what Tom Burke called a 'social licence'—is critical in determining whether fracking should continue in the UK. We can envisage the development of a regulatory regime fit for the purpose of fracking but we are unable to see at this stage how the crucial 'social licence' can be established when the debate around fracking is so polarised. The openness of all involved is vital. Publishing only a redacted report on *Shale Gas Rural Economy Impacts*<sup>191</sup> has not been helpful in this**

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184 Public Bill Committee, Water Bill, 10 December 2013, [col 222](#)

185 Q165

186 Q158

187 Q7

188 Q1

189 Q100

190 Qq102-5

191 Rural Community Policy Unit, [Shale gas rural economy impacts](#), March 2014

**regard. We asked Defra for an un-redacted version of the report during our inquiry, and this should now be published as soon as possible. The Government and industry must be transparent and make publicly available all other information relating to fracking as a matter of course.**

80. The Infrastructure Bill proposal of an automatic right of access to land 300m below the surface for the purpose of extracting energy is equally unhelpful. 74% of the public are against this proposal,<sup>192</sup> and when the industry acknowledges that it is not necessary<sup>193</sup> it is difficult to see why this should remain in place. **This proposed change in trespass law has serious implications for citizens' rights which could unnecessarily undermine the democratic process for objecting to development. On this issue, the public have spoken and the Government must listen.**

81. Public engagement requires trusted sources of research and government policy development to fully reflect the science as well as people's concerns. Paul Mobbs believed there were failings in the three major reports the Government used to support its stance on fracking: the 2012 Royal Society and Royal Academy of Engineering review, 2013 Mackay and Stone review of climate impacts (paragraph 17) and 2014 Public Health England review of health impacts (paragraph 49).<sup>194</sup> Others criticised the Government for failing to implement all of the Royal Society and Royal Academy of Engineering's 2012 recommendations prior to initiating fracking activity in the UK,<sup>195</sup> and those bodies said that further research from the US "on the alleged and real contamination arising from fracking" published after their own report should now be considered.<sup>196</sup>

82. We welcome Lord Smith's Task Force on Shale Gas. Public funding for its work is preferable but we share Lord Smith's view that that is not likely.<sup>197</sup> The Task Force's intention is to issue a series of interim reports over an 18-month period and a final report in the early part of 2016 focusing on local impact issues, local environmental impacts, climate change impact and economic issues.<sup>198</sup> Lord Smith added that he thought health impacts of fracking had not been sufficiently researched<sup>199</sup> and we agree.

**83. The Government must fully engage with the work of the Task Force on the climate change and environmental risks, and await its findings before proceeding further with fracking in the UK. We called in Part 2 for a moratorium on fracking because it cannot be accommodated within our climate change obligations. A halt is also needed on environmental grounds, and it is essential that further independent studies into the impacts of fracking in the UK are completed to help resolve the environmental risk uncertainties. It is vital that the precautionary principle is applied. Until uncertainties are fully resolved, and the required regulatory and monitoring system improvements**

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192 Home Owners Alliance, [74% oppose fracking without homeowners' approval](#), accessed 21 January 2015

193 Q151 ( See also Q22)

194 Mobbs' Environmental Investigations ([FRA051](#)) para 30-40

195 Frack Free Balcombe Resident's Association ([FRA063](#))

196 Royal Society and Royal Academy of Engineering ([FRA067](#)) para 8

197 Q171

198 Q124

199 Q142

**we identify are introduced, there should also be a moratorium on the extraction of unconventional gas through fracking on environmental grounds.**

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## Conclusions and recommendations

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1. Any large scale extraction of shale gas in the UK is likely to be at least 10–15 years away. It is also unlikely to be able to compete against the extensive renewable energy sector we should have by 2025–30 unless developed at a significant scale. By that time, it is likely that unabated coal-fired power generation will have been phased out to meet EU emissions directives, so fracking will not substitute for (more carbon-intensive) coal. Continually tightening carbon budgets under the Climate Change Act will have significantly curtailed our scope for fossil fuel energy, and as a consequence only a very small fraction of the possible shale gas deposits will be burnable. (Paragraph 26)
2. A moratorium on the extraction of unconventional gas through fracking is needed to avoid the UK's carbon budgets being breached in the 2020s and beyond, and the international credibility of the UK in tackling climate change being critically weakened—already a prospect if the provisions in the Infrastructure Bill aimed at maximising North Sea oil extraction are passed. (Paragraph 27)
3. The Infrastructure Bill should be amended to explicitly bar fracking of shale gas. This could be done through an Amendment to Clause 37, to qualify the provision in the Bill which seeks to introduce a strategy to maximise the economic extraction of 'petroleum' (which includes natural gas) reserves, so that the "principal objective [of the strategy] is not the objective of maximising the economic recovery of UK petroleum but ensuring that fossil fuel emissions are limited to the carbon budgets advised by the Committee on Climate Change and introducing a moratorium on the extraction of unconventional gas through fracking in order to reduce the risk of carbon budgets being breached." (Paragraph 28)
4. It remains to be seen whether [the existing regulatory regime] will ensure effective regulatory co-ordination across all the relevant bodies and departments. A joint strategy concerning the regulation of unconventional oil and gas signed by all relevant national and local departments and agencies must be developed and published. (Paragraph 64)
5. The Government must ensure adequate numbers of skilled and experienced staff are in place to regulate unconventional oil and gas now and in the future. (Paragraph 65)
6. Work to determine the baseline status of the environment, including baselines related to methane in groundwater and fugitive emissions, and subsequent monitoring requirements must be completed as soon as possible and the findings used to inform fracking permits and permissions. (Paragraph 66)
7. The UK has complex geology and more effort is required to understand and map specific local geological conditions and the influence of historic mining activity. (Paragraph 67)



8. Fracking must be prohibited outright in protected and nationally important areas including National Parks, the Broads, Areas of Outstanding Natural Beauty, Sites of Special Scientific Interest and ancient woodland, and any land functionally linked to these areas. (Paragraph 68)
9. Venting of methane emissions is not acceptable. Full containment of methane must be mandated in all fracking permits and permissions. (Paragraph 69)
10. It is crucial that groundwater is protected and the restriction on fracking in water source protection zones 1 is welcome. However, fracking should be prohibited in all source protection zones and all fracking activity must require a groundwater permit when wells extend under aquifers. A minimum vertical separation distance between shales being fracked and a groundwater aquifer should be defined and mandated. (Paragraph 70)
11. There must be clear and accessible public disclosure on the chemicals used in the exploration and production of shale gas, and the risks they potentially pose. (Paragraph 71)
12. Automatic right of access to “deep level land” is not supported by the majority of the public and is not considered necessary by the industry. It should be removed from the Infrastructure Bill. (Paragraph 72)
13. Changes to the regulatory system identified above, though essential, do not address the fundamental need for a more coherent and more joined-up regulatory system, and one that needs to be put in place before further fracking activity is contemplated. First, the Strategic Environmental Assessment of the Licensing Rounds, Environmental Impact Assessments, planning and permit appraisals must all consider the cumulative impacts of fracking. Second, environmental impact assessment must be mandated for all fracking activity. Third, attention must be paid to the way in which the industry and the risks might scale up. There is the prospect that a regulatory regime for operational extraction would be applied without the same rigour that had been applied to the exploration phase. It is important that the necessary regulatory arrangements are determined and in place prior to the expansion of the industry. Finally, there should be a consolidated regulatory regime specifically for fracking. (Paragraph 73)
14. We welcome the Environment Agency’s inclusion of mandatory conditions for baseline monitoring in the draft permits for the two sites currently pending planning permission. Mandatory baselines and continued monitoring, covering all relevant indicators, must be conducted. (Paragraph 74)
15. It is unacceptable that there are no monitoring requirements for abandoned wells and this should be remedied immediately. We agree with the Environment Agency that it is “essential that [commercial operators] take responsibility for their work” and conduct their own monitoring “in accordance with the standards that are set in [the Environment Agency’s] monitoring certification scheme”, and welcome the Agency’s recognition of the “the desirability of some independent monitoring at this stage of the industry’s development.” Monitoring by the commercial operator should be supplemented with such independent monitoring in all cases to increase public

confidence in the results. The regulators must conduct regular unannounced spot checks and audits of all fracking sites, and facilitate a clear and accessible public disclosure of all monitoring data. (Paragraph 75)

16. It is imperative that commercial operators have sufficient resources and insurance to cover full liability in the event of a pollution incident. Licences, permits and permissions must not be issued if this cannot be demonstrated. We welcome the industry's efforts to develop an insurance mechanism: this must be in place in advance of any fracking activity. (Paragraph 76)
17. Public acceptance—what Tom Burke called a 'social licence'—is critical in determining whether fracking should continue in the UK. We can envisage the development of a regulatory regime fit for the purpose of fracking but we are unable to see at this stage how the crucial 'social licence' can be established when the debate around fracking is so polarised. The openness of all involved is vital. Publishing only a redacted report on Shale Gas Rural Economy Impacts has not been helpful in this regard. We asked Defra for an un-redacted version of the report during our inquiry, and this should now be published as soon as possible. The Government and industry must be transparent and make publicly available all other information relating to fracking as a matter of course. (Paragraph 79)
18. This proposed change in trespass law has serious implications for citizens' rights which could unnecessarily undermine the democratic process for objecting to development. On this issue, the public have spoken and the Government must listen. (Paragraph 80)
19. The Government must fully engage with the work of the Task Force [on Shale Gas] on the climate change and environmental risks, and await its findings before proceeding further with fracking in the UK. We called for a moratorium on fracking because it cannot be accommodated within our climate change obligations. A halt is also needed on environmental grounds, and it is essential that further independent studies into the impacts of fracking in the UK are completed to help resolve the environmental risk uncertainties. It is vital that the precautionary principle is applied. Until uncertainties are fully resolved, and the required regulatory and monitoring system improvements we identify are introduced, there should also be a moratorium on the extraction of unconventional gas through fracking on environmental grounds. (Paragraph 83)

# Formal Minutes

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**Wednesday 21 January 2015**

Members present:

Joan Walley, in the Chair

Neil Carmichael  
Martin Caton  
Zac Goldsmith  
Mark Lazarowicz  
Caroline Lucas

Dr Matthew Offord  
Mrs Caroline Spelman  
Dr Alan Whitehead  
Simon Wright

Draft Report (*Environmental risks of fracking*), proposed by the Chair, brought up and read.

*Ordered*, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 83 read and agreed to.

Summary agreed to.

*Resolved*, That the Report be the Eighth Report of the Committee to the House.

*Ordered*, That the Chair make the Report to the House.

*Ordered*, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

[Adjourned till Wednesday 28 January at 2.15 pm]

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## Witnesses

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The following witnesses gave evidence. Transcripts can be viewed on the Committee's inquiry page at [www.parliament.uk/environmental-risks-of-fracking-inquiry](http://www.parliament.uk/environmental-risks-of-fracking-inquiry).

### Wednesday 14 January 2015 (AM)

*Question number*

**Tom Burke**, Chair of E3G, **Professor Paul Stevens**, Chatham House, and **Dr John Broderick**, Research Fellow, Tyndall Centre, University of Manchester.

[Q1-41](#)

### Wednesday 14 January 2015 (PM)

**Dr Tony Grayling**, Director of Sustainable Business and Development, Environment and Business, Environment Agency, **Mark Ellis Jones**, Environment and Business Manager, Climate Change Energy and Emerging issues, Environment Agency, and **Jane Burston**, Head of Centre for Carbon Measurement, National Physical Laboratory.

[Q42-123](#)

**Lord Smith**, Chair of Task Force on Shale Gas, and **Steve Thompsett**, Director, UK Onshore Oil & Gas.

[Q124-172](#)

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## Published written evidence

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The following written evidence was received and can be viewed on the Committee's inquiry web page at [www.parliament.uk/environmental-risks-of-fracking-inquiry](http://www.parliament.uk/environmental-risks-of-fracking-inquiry). FRA numbers are generated by the evidence processing system and so may not be complete.

- 1 Alice Waddicor ([FRA0053](#))
- 2 British Geological Survey ([FRA0077](#))
- 3 Burn ([FRA0036](#))
- 4 Carbon Coach Ltd ([FRA0046](#))
- 5 Caroline Raffan ([FRA0056](#))
- 6 Ciwem ([FRA0006](#))
- 7 Concerned Communities Of Falkirk ([FRA0040](#))
- 8 Countryside Alliance ([FRA0002](#))
- 9 Cpre Kent ([FRA0012](#))
- 10 Cyril Andrews ([FRA0029](#))
- 11 Defra, DECC and DCLG ([FRA0068](#))
- 12 Dianne Hogarth ([FRA0049](#))
- 13 Dr David Lowry ([FRA0059](#))
- 14 Dr Francis Paul Rugman ([FRA0032](#))
- 15 Dr John Broderick, Tyndall Centre For Climate Change Research, University Of Manchester ([FRA0075](#))
- 16 Dr. James Verdon and Prof. Michael Kendall ([FRA0022](#))
- 17 Duncan Parsons ([FRA0041](#))
- 18 East Kent Against Fracking (Ekan) ([FRA0076](#))
- 19 Environment Agency ([FRA0064](#))
- 20 Fiona Joyce ([FRA0062](#))
- 21 Frack Free Balcombe Residents Association ([FRA0063](#))
- 22 Frack Free Dee Coalition ([FRA0039](#))
- 23 Frack Free Ryedale ([FRA0047](#))
- 24 Frack Off Fife ([FRA0042](#))
- 25 Frank Cardose ([FRA0045](#))
- 26 Friends Of The Earth ([FRA0018](#))
- 27 Grantham Research Institute On Climate Change And The Environment ([FRA0009](#))
- 28 Greenpeace Uk ([FRA0050](#))
- 29 Halliburton ([FRA0021](#))
- 30 Halsall Parish Council ([FRA0079](#))
- 31 Ian Walton ([FRA0054](#))
- 32 Igas Energy ([FRA0027](#))
- 33 Ineos ([FRA0020](#))
- 34 Institution Of Civil Engineers ([FRA0070](#))
- 35 James Barling ([FRA0016](#))
- 36 Joan Robertson ([FRA0033](#))
- 37 Joanne Hawkins ([FRA0008](#))
- 38 Julia Desch ([FRA0066](#))

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- 39 Laura Eaton-Lewis ([FRA0037](#))
- 40 Luke Ashley ([FRA0071](#))
- 41 Marc Howell ([FRA0065](#))
- 42 Mike Hill ([FRA0055](#))
- 43 Mobbs' Environmental Investigations ([FRA0051](#))
- 44 Ms Rhona Macleod ([FRA0034](#))
- 45 National Farmers Union (Nfu) ([FRA0024](#))
- 46 National Oceanography Centre ([FRA0004](#))
- 47 National Physical Laboratory ([FRA0074](#))
- 48 No Hot Air ([FRA0030](#))
- 49 Our Forth ([FRA0048](#))
- 50 Phil Ball ([FRA0061](#))
- 51 Philip Mitchell ([FRA0058](#))
- 52 Research Council UK ([FRA0069](#))
- 53 Researching Fracking In Europe (Refine) ([FRA0007](#))
- 54 Robert Cockburn ([FRA0001](#))
- 55 Ross Carruthers ([FRA0023](#))
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- 62 Talk Fracking ([FRA0019](#))
- 63 The Geological Society ([FRA0009](#))
- 64 The Onshore Energy Services Group ([FRA0017](#))
- 65 The Woodland Trust ([FRA0013](#))
- 66 Tim Newcombe ([FRA0073](#))
- 67 Tom White ([FRA0043](#))
- 68 UK Green MEPs ([FRA0014](#))
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- 70 Water UK ([FRA0005](#), [FRA0082](#))
- 71 Robert Cockburn ([FRA0001](#))

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