Fracking: Minding the gaps

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Abstract
Fracking, an extraction technique for unconventional oil and gas, has proved highly controversial in England, with environmental and health impacts being a central concern. Although the topic has been widely debated, such debate has focused on the pros and cons of the technique and little attention or literature has focused on the current regulatory system. At present, uncertainty surrounds numerous aspects of the extraction technique and the promotion of fracking in England is largely founded on the assumption that a strong regulatory system is already in place to control any impacts. This article will examine the current suites of regulation and will highlight the gaps that are present within the existing European Union (EU) and national controls and their connection to potential environmental and public health damage. Such an examination will consider legislation as well as the ability of regulators in England to act. This article will show that, at present, the system governing fracking is far from satisfactory. In light of this, the regulatory approaches now available will be evaluated and the need for a more precautionary approach to regulation highlighted.

Keywords
Environmental, fracking, precaution, regulation, shale gas

Introduction
With energy demand rising and UK home-grown energy sources dwindling, the prospect of a wealth of shale gas under our very feet is an understandably tempting prospect. However, the extraction of such ‘unconventional’ gas is not without its issues, particularly the technique of hydraulic fracturing – commonly known as fracking – which is used to release it. Current literature surrounding shale gas exploration in England has focused on examining the positive and negative consequences associated with the development of such an industry. Only brief comment has been made on the state of the current English regulation. Since the shale gas industry is at a critical stage of development in England, examining the

1. Shale gas is the primary source of unconventional gas in the UK. Fracking can be used to extract Coal Bed Methane which is also found in the UK.
2. See for example C. Clement-Davies ‘Editorial: Defence in Depth: The Need for Meticulous Regulatory Vigilance’ (2012) International Energy Law Review 79; S. Sandilands ‘Shale Gas: The Energy Saviour’ (2012/2013) 206 In House Lawyer 11.

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corresponding regulatory and legal frameworks which will govern the industry’s development is imperative. The focus of this article will be upon the regulatory framework and role of authorities in England; as such, it will not be a comparative piece.

Whilst there have been arguments based on the assertion that fracking is, in fact, not a new technology, such arguments are misleading as technological advances and changes in intensity and depth mean that, in the present context, the current fracking techniques are novel. The relationship between regulation and new technologies is something that is apparent, but not unique, in relation to fracking. The issue of regulatory gaps and the imposition of controls after the event is a problem that can be seen in relation to other novel technologies such as genetically modified organisms and nano-technology.³ In the context of fracking, the time and political pressure for development, due to energy supply and energy security demands, highlights the tensions and problems that can emerge in the relationship between the law and novel technologies. For reasons of space, this aspect is not a core concern of this article, but is worthy of further future study.

The first part of this article outlines what fracking is and the concerns associated with it. An examination of the current regulatory gaps and uncertainties will then be undertaken. The final part of this article will examine how the regulation of fracking should proceed, highlighting the options available and demonstrating the benefits of a temporary moratorium whilst a more precautionary approach to the regulation is developed.

**What is hydraulic fracturing/fracking?**

Fracking is the extraction technique for natural gas or oil found within unconventional resources such as shale formations. Artificial fractures are created by injecting wells at high pressure with water, tracers (that allow the fracturing fluids to be tracked), chemical additives (such as friction reducers) and proppants (which keep the created fractures open allowing the gas released to flow).⁴ The resources are unconventional because the oil and gas trapped within them is not recoverable using conventional methods. Additional stimulation techniques are required, hence the use of fracking. To conduct onshore shale gas exploration involving fracking in England the following process must be followed. Petroleum Exploration and Development Licences (PEDL) for shale gas exploration are obtained through licensing rounds, planning permission is then sought for a particular exploration site, relevant permits are obtained from the Environment Agency, an independent well inspection is arranged and notification to drill given to the Health and Safety Executive. Monitoring plans are then agreed before consent to drill is awarded by the Department of Energy and Climate Change (DECC), followed by the submission of a hydraulic fracturing plan which, when approved, sees consent to fracture awarded.⁵ Hydraulic fracturing by shale gas exploration companies first took place in England in 2011.⁶

Hydraulic fracturing does not have a fixed or commonly shared meaning. Fracking only comprises one part of the process of shale gas extraction, but this is not always how the term is used and variations in the use of the term can account for miscommunications between stakeholders. The general meaning attached by

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3. E. Stokes ‘Regulating Nanotechnologies: Sizing up the Options’ (2009) 29(2) Legal Studies 281; M. Lee EU Regulation of GMOs. Law and Decision Making for a New Technology (Edward Elgar: Cheltenham, 2008).
4. Department of Energy and Climate Change, Developing Onshore Shale Gas and Oil: Facts About Fracking, URN 13D/341 (December 2013) 3–4.
5. For more detail on the application process see Department of Energy and Climate Change ‘Onshore Oil and Gas Exploration in the UK: Regulation and Best Practice’ (December 2013) 13. Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/265988/Onshore_UK_oil_and_gas_exploration_England_Dec13_contents.pdf 13–47.
6. The Preese Hall exploration site was hydraulically fractured in 2011.
members of the industry is that of the actual process of injecting wells at high pressure to fracture the rock formation. However, outside the industry, the term is used to cover the whole process of shale gas extraction from the drilling of a wellbore to the underground injection and, even further, to the abandonment of the well at the end of its life.\(^7\) The definition is crucial as a number of concerns associated with fracking are not tied solely to the technical underground injection, but are related to other practices associated with extraction. It is only through looking at the process as a whole, from design through to abandonment, that this article can effectively evaluate the control system currently in place. As such, the term fracking will be used to cover the entire process of exploration and utilisation unless otherwise stated.

**Key issues with fracking**

Fracking has enabled the exploitation of previously inaccessible gas resources, giving rise to a boom in US shale gas production and a fall in gas prices. Although a corresponding fall in prices here in England/the UK is unlikely,\(^8\) the potential tax revenue and increased security of supply are proving to be driving factors in government policy. However, concerns surrounding fracking have been raised and these have both environmental and health implications. At present, public opposition to fracking poses a potentially significant barrier to the development of a UK shale gas industry.\(^9\) The absence of social acceptance or approval of fracking in turn means the absence of a social licence to operate. Following the anti-fracking protests at the exploration site in Balcombe in the summer of 2013, there has been a noticeably negative impact on public perceptions of shale gas.\(^10\) A detailed examination of the role of a social licence to operate is beyond the scope of this article and as such will not be discussed in detail here. Notably, however, in many ways the concerns expressed are not new and mirror concerns with other energy sources, both traditional and renewable.

**Water.** One of the prime concerns with fracking, for the environment and public health, is its potential link to water contamination. There are a number of facets to this concern. The first is the risk of migration into groundwater of pollutants within the fracturing fluid, potentially polluting natural substances and methane gases through the fractures created. Due to the height to which fractures extend and the low porosity of shale in the absence of pressure conditions (that is, fracking), contamination through these methods is considered unlikely.\(^11\) Additional concerns which may have more of a scientific basis surround the migration of gas released during fracking, fracking fluids and polluting natural substances due to inadequate well integrity, and the impact of surface spills.\(^12\) Finally, there are concerns over the volume of water used during fracking. At present the recycling of water is not common practice (this may change if production begins)\(^13\) and the

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7. E.J. House ‘Fractured Fairytales: The Failed Social License for Unconventional Oil and Gas Development’ (2013) 13(1) Wyoming Law Review 5, 45.
8. The Select Committee on Energy and Climate Change, The Impact of Shale Gas on Energy Markets. Volume I, HC 785 (2012–2013) 26, para. 52.
9. Control Risks ‘The Global Anti-fracking Movement. What it Wants, How it Operates and What’s Next’ (2012). Available at: www.controlrisks.com/Oversized%20assets/shale_gas_whitepaper.pdf.
10. S. O’Hara, M. Humphrey, R. Jaspal, B. Nerlich ‘Public Perception of Shale Gas in the UK: How People’s Views are Changing’ (21 March 2013). Available at: www.scribd.com/doc/131787519/public-perceptions-of-shale-gas-in-the-UK-March-2013-pdf; S. O’Hara, M. Humphrey, R. Jaspal, B. Nerlich ‘Public Perception of Shale Gas Extraction in the UK: The Impact of the Balcombe Protest in July-August 2013’ (Oct 2013). Available at: http://nottspolitics.org/wp-content/uploads/2013/10/public-perceptions-of-shale-gas-in-the-UK-september-2013-1-2.pdf.
11. Royal Society, Shale Gas Extraction in the UK: A Review of Hydraulic Fracturing, DES2597 (June 2012) 31–35.
12. Ibid. at 19, 22, 30, 34.
13. Cuadrilla Resources ‘Water Sourcing’ (cuadrillresources.com). Available at: www.cuadrillaresources.com/protecting-our-environment/water/water-sourcing/.
supply of freshwater required (approximately 15,000 m$^3$ during the entire fracturing process into a well) is a significant problem, particularly in drier areas.\textsuperscript{14}

\textbf{Air quality.} Pollution concerns are not confined to water impacts, but also extend to the effect fracking sites will have on air quality. Emissions from machinery and gaseous escape from flaring raise issues for local air quality and the effects on the local environment/health from exposure. In addition, fracking brings into question wider issues relating to whether exploiting more fossil fuel is compatible with the UK’s binding climate change targets.\textsuperscript{15}

\textbf{Seismic activity.} Another concern, especially after the tremors near Blackpool in 2011, is the risk of seismic activity, particularly in areas where natural geological faults lie. Fracking at this exploration site saw a number of seismic events with a maximum magnitude of 2.3 M, and triggered a temporary moratorium on fracking in England.\textsuperscript{16}

\section*{Current regulation\textsuperscript{17}}

Reports, such as those conducted by the Royal Society and Public Health England, have expressed the opinion that if a ‘robust’ regulatory system is in place the risks associated with fracking can be reduced and controlled. Such claims have been repeated by political figures.\textsuperscript{18} The next section discusses whether the assumption that a ‘robust’ regulatory system exists in England is justified by examining whether current controls effectively translate and map onto the operation of a new technology and industry in England.

The government insists that current regulation for conventional oil and gas extraction is adequate to control fracking.\textsuperscript{19} However, these controls were designed pre-fracking and, as will be discussed, whilst current oil and gas regulations do not fail to offer any relevant controls, their application leaves a number of gaps which may risk harm to human health and/or damage to the environment. The emergence of such gaps is not surprising and has been seen in the regulation of other novel and new technologies.\textsuperscript{20} In addition, the lack of

\textsuperscript{14} Commission Staff Working Document, \textit{Impact Assessment to Accompany Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions on Exploration and Production of Hydrocarbons (Such as Shale Gas) Using High Volume Hydraulic Fracturing in the EU}, SWD 21 final (22/01/2014) 6; Water UK ‘Briefing Paper: The Impacts of Exploration and Extraction of Shale Gas on Water and Wastewater Service Providers’ (26 November 2013). Available at: www.water.org.uk/home/policy/positions/shale-gas.

\textsuperscript{15} J. Broderick and K. Anderson ‘Has US Shale Gas Reduced CO\textsubscript{2} Emissions? Examining Recent Changes in Emissions for the US Power Sector and Traded Emissions’ (Oct 2012) 3. Available at: www.tyndall.ac.uk/sites/default/files/broderick_and_anderson_2012_impact_of_shale_gas_on_us_energy_and_emissions.pdf; Climate Change Act 2008, s. 1.

\textsuperscript{16} British Geological Society ‘Blackpool Earthquake, Magnitude 2.3, 1 April’ (bgs.ac.uk). Available at: www.bgs.ac.uk/research/earthquakes/BlackpoolApril2011.html.

\textsuperscript{17} Regulation at present governs the exploratory stages of shale gas and fracking. It is not clear whether any regulatory changes will take place before production begins.

\textsuperscript{18} Public Health England, \textit{Review of the Potential Public Health Impacts of Exposure to Chemicals and Radioactive Pollutants as a Result of Shale Gas Extraction: Draft for Comment}, PHE-CRCE-002 (October 2013) iii; see Royal Society, above, n. 11 at 4; Rt Hon D. Cameron ‘Speech by David Cameron’ (World Economic Forum, 24 January 2014).

\textsuperscript{19} Rt Hon D. Cameron, ibid.

\textsuperscript{20} The Centre for Business Relationships, Accountability, Sustainability and Society (BRASS) ‘Report for Department of Environment, Food and Rural Affairs: An Examination of the Nature and Application Among the Nano Technologies Industries of Corporate Social Responsibility in the Context of Safeguarding the Environment and Human Health’ (2009). Available at: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16262.
English experience and expertise in relation to the regulation of fracking questions the ability of local authorities and other regulators to deal with and monitor such developments, particularly when resources are limited.\(^{21}\)

Assertions that any risk to the environment and health from exposure to emissions related to fracking are expected to be low are highly dependent on the ‘proper operation’ of activities and the imposition of ‘proper regulations’.\(^{22}\) As this article will show, this assumption regarding the current regulatory structure is misplaced and uncertainty renders defining ‘proper operation’ standards problematic. Evidence of the inadequacy of a borrowed regulatory regime has already become apparent. Prior to the occurrence of seismic tremors near Blackpool in 2011 there were no seismic controls in England. Although DECC has now implemented regulation following a short suspension of fracking, this was only done in response to the materialisation of the risk (i.e. the earthquake).\(^{23}\)

With similar uncertainty surrounding other environmental risks associated with fracking, there is concern that such a reactive approach will provide little consolation if damage to health or to the environment has already occurred. The key question surrounding the concerns on shale gas exploration and fracking at this early stage must be: how far do these risks and uncertainties coincide with the current regulatory gaps? Environmental and health consequences must also be considered. What has happened so far with fracking mirrors a number of other narratives in EU and UK environmental regulations where specific, targeted controls have been imposed after the event, not before.\(^{24}\)

The European Commission has recently published a Recommendation setting out the minimum principles for the exploration of oil and gas using fracking.\(^{25}\) Although the recognition that current EU regulation fails to comprehensively cover fracking operations is welcome, Member States are only encouraged to apply the non-binding suggestions. This fails to guarantee that the problem areas are addressed. As such, this article focuses on the existing enforceable regulatory controls on shale gas exploration under EU and English law whilst considering how the recent EU Recommendation impacts on their operation. The following section examines the use of conventional oil and gas regulation in the context of fracking and the affect this has had on the regulatory protection offered.

### Regulatory mismatch

Current conventional oil and gas regulation fails to translate into adequate controls for the shale gas industry and fracking leading to a regulatory mismatch and uncertainty over if and how regulations apply. Regulation is dependent on existing controls in a wide number of sectors and media: laws on waste, water quality, air quality, environmental impacts and liability, chemical controls, noise emissions, planning and

\(^{21}\) A. Marshall ‘Environment Agency to Cut 15% of Staff Within the Year’ (November 2013) 465 ENDS Report 5.

\(^{22}\) See Public Health England, above, n. 18 at iii; See Royal Society, above, n. 11 at 4.

\(^{23}\) Rt Hon E. Davey ‘Press Release: New Controls Announced for Shale Gas Exploration’ (13. December 2013). Available at: www.gov.uk/government/news/new-controls-announced-for-shale-gas-exploration; C.A. Green, P. Styles, B.J. Baptie ‘Preese Hall Shale Gas Fracturing, Review and Recommendations for Induced Seismic Mitigation’(April 2012). Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/15745/5075-preese-hall-shale-gas-fracturing-review.pdf.

\(^{24}\) See E. Stokes, above, n. 3; European Parliament and Council Regulation 1333/2008 (OJ L354/16) on food additives; European Parliament and Council Regulation 1223/2009 (OJ L342/59) on cosmetic products; see M Lee, above, n. 3; European Parliament and Council Directive 2001/18/EC (OJ L106/1) on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EC; European Parliament and Council Regulation 1829/2003 (OJ L268/1) on genetically modified food and feed.

\(^{25}\) Commission (EC) Recommendation 2014/70/EU (OJ L39/72 22.01.14) on the exploration and production of hydrocarbons (such as shale gas) using high-volume hydraulic fracturing in the EU, COM 23 Final (22 January 2014).
development controls. The current regime is not conducive to clarity and consistency. The following section discusses this mis-match in further detail.

**Water.** The emergence of regulatory gaps is clearly evident when the controls on fracking and water are examined. There is no guarantee that a borehole passing through groundwater will require a permit under the Environmental Permitting Regulation.\(^{26}\) This is due to the fact that many chemicals used in drilling muds\(^{27}\) and fracturing fluids are categorised as non-pollutants (pollutants being defined as any substance liable to cause pollution, in particular those listed in Annex VIII of the Water Framework Directive (WFD)).\(^{28}\) This means that their direct injection into groundwater is not controlled, despite the fact this may ultimately impact on groundwater quality and aquifers. In addition, with many of the chemicals used in fracking only assumed to be non-hazardous based on current information, there is a risk that inadequate controls will be applied as such chemicals do not currently fall under the hazardous or priority substances listed under the WFD.\(^{29}\)

Failure in regulatory translation is again apparent due to the present lack of control on water abstraction.\(^{30}\) These controls limit the amount of groundwater an operator can extract for industrial purposes. Such controls are, however, rendered ineffective due to the current sourcing of water supplies from local utility operators. Water supply moves beyond legislative controls, becoming an issue of utility provider policy on water allocation and priority.

**Chemicals.** As detailed above, the chemicals used in fracking are not necessarily regulated via a groundwater permit. Nor are they effectively regulated via dedicated chemicals regulation. REACH, the regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals, is the EU flagship regime for chemicals risk assessment and management. As downstream users (that is, users of chemicals in an industrial process), registration of new usages of chemicals is key in ensuring appropriate risk management and exposure scenarios are considered. Despite the ‘new use’ of chemicals during fracking, an assessment of registration dossiers found that neither hydraulic fracturing nor shale gas were explicitly mentioned.\(^{31}\) In addition, the current description system for chemical use does not provide a suitable category to describe the use of chemicals in fracking. Compounding these gaps is the fact that none of the investigated dossiers explicitly quantified potential releases into the environment and associated environmental exposure. Where they did, it was in relation to marine surface waters which are not relevant to English onshore fracking.\(^{32}\) There is a clear need for alteration of the controls/descriptors available. Without such alteration the controls offered by REACH will not operate effectively. The recent EU recommendation emphasises that registration of chemicals used in fracking is required to comply with REACH

\(^{26}\) European Parliament and Council Directive 2006/118/EC (OJ L372/19 12.12.06) on the protection of groundwater against pollution and deterioration; The Environmental Permitting Regulations 2010 (SI 2010 No. 675); The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (SI 2003 No. 3242).

\(^{27}\) Drilling muds are used to aid the drilling of the borehole.

\(^{28}\) European Parliament and Council Directive 2000/60/EC (OJ L327/1 23.10.00) establishing a framework for community action in the field of water policy.

\(^{29}\) Ibid., Annex X; Environment Agency ‘Hydrogeological Assessment of Oil Well Drilling for Protecting Groundwater. Hydrogeological Assessment – Lower Stumble Wood, Balcombe (in Conjunction with Method Statement for Permit application EPR/AB3307XD)’ (July 2013) at 9.

\(^{30}\) The Water Resources (Abstraction and Impounding) Regulations 2006 (SI 2006, No. 641).

\(^{31}\) JRC Scientific and Policy Reports, *Assessment of the Uses of Substances in Hydraulic Fracturing of Shale Gas Reservoirs under REACH*, EUR26069EN (September 2013) 38.

\(^{32}\) Ibid. at 40.
Waste. The classification of fracking fluids and drilling muds as non-hazardous is based on assumptions from current information. This is of particular concern when the controls offered by the Mining Waste Directive (MWD) are considered. The MWD should govern the way in which waste from fracking operations is dealt with. However, it is not clear whether fracturing fluids that remain underground whilst the site is still active will be discarded for the purposes of the directive. As such they may only be subject to directive controls when operations at the site are suspended or wells abandoned.

Regulatory mis-match is once again visible when the supposed role of Best Available Techniques (BATs)/Best Available Techniques Reference Documents (BREFs) under the Industrial Emissions Directive (IED) is considered. Such documents are used to improve industrial practices and avoid/reduce emissions and the impact of installations on the environment. However, with uncertainty as to whether the IED applies to fracking, and with no such BREF documents existing for the treatment of fracting waste or for drilling equipment (even if the IED is applicable), their role in controlling operations is redundant. The EU Recommendation emphasises that risk assessment should be based on BAT and BREF, but does nothing to fill the gap where no such documents exist. Notably, as part of the policy initiative, the Commission has pledged to review the BREF on extractive waste in light of fracking operations (although this is not contained in the Recommendation). In addition, as a result of fracking waste, some shale gas operators are likely to classify their sites as mining waste facilities. Facility categorisation affects the relevant prevention and emergency plans in place; with uncertainties over the classification of Category A waste facilities there is a risk of inadequate waste controls and safeguards if the appropriate category is not applied.

Emissions. There is uncertainty over whether the IED will apply (shale gas and fracking are not mentioned and do not necessarily qualify under hazardous waste/combustion capacity criteria). This brings into question whether a permit under the IED will be necessary. If no permit is needed, monitoring requirements of emissions to air, water and land, including measures concerning waste, may not be applied. The impact on local air quality is also compounded by the absence of emission limits for non-road mobile machinery above 560 kW used on fracking sites.

33. See Commission Recommendation 2014/70/EU, above, n. 25 at rec. 10.1.
34. European Parliament and Council Directive 2006/21/EC (OJ L102/15 15.3.06) on the management of waste from the extractive industries and amending directive 2004/35/EC.
35. European Parliament and Council Directive 2010/75/EU (OJ L334/17 24.11.10) on industrial emissions (integrated pollution prevention and control).
36. See Commission Staff Working Document, above, n. 14 at 42; For further evaluation of the recent Recommendation see E. Stokes ‘New EU Policy on Shale Gas’ (2014) 16(1) Environmental Law Review 42.
37. Environment Agency ‘Permit with Introductory Note EPR/AB3307XD’ (24/07/2013).
38. European Parliament and Council Directive 2010/75/EU, above, n. 35; IED is triggered if flaring more than 10 tonnes a day; IPPC Directive, above, n. 37.
39. M. Broomfield Support to the Identification of Potential Risks for the Environment and Human Health Arising from Hydrocarbons Operations Involving Hydraulic Fracturing in Europe. Report for European Commission, DG of Environment AEA/R/ED57281 (10 August 2012) xii.
40. European Parliament and Council Directive 97/68/EC (OJ L59/1 16.12.97) on the approximation of the laws of the member states relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery; Machinery (Emission of Gaseous and Particulate Pollutants) Regulations 2008 (SI 2008, No. 2011).
Inappropriate thresholds. The imposition of inappropriate thresholds is another problem which has previously been an issue in relation to other novel and new technologies. This section focuses on current EU and English legislation whilst planning controls will be discussed further in the subsequent section.

When looking at controls on safety, Seveso II (which requires operators handling dangerous substances to have a major accident prevention policy) is unlikely to apply as the storage of hydrocarbon products fails to reach the relevant threshold.

The unsuitability of these thresholds can also be seen under the Environmental Impact Assessment (EIA) Directive, which was created to ensure that projects likely to have a significant impact on the environment are subject to environmental assessment prior to development. However, exploratory sites can fall short of the national threshold (i.e. 1 hectare or the extraction of more than 500,000 cubic meters of gas per day), meaning that assessment is discretionary rather than mandatory. With the assessment of health impacts by the Health Protection Authority only undertaken after an approach by a Local Authority or as part of the EIA process, the absence of an EIA has clear implications for the environment and health. Whilst the EU recommendation emphasises the need for an EIA, its retention of the directive as the basis for requiring such an assessment means that inappropriate mandatory EIA thresholds are not altered.

The absence of any provision for automatic remediation of any environmental damage is also problematic. The EU Environmental Liability Directive (ELD), operating on the ‘polluter pays’ principle, imposes strict liability for activities classed as dangerous and listed under Annex III. At present, shale gas operations are not included, meaning that fault or negligence is required to attribute liability for environmental damage. In the United States, it has been extremely difficult to assign responsibility for claimed environmental damage from fracking operations. The fault/negligence burden in England looks set to be a significant hurdle to remediation if environmental damage does occur.

When discussing thresholds, it is not possible to ignore the implications of UK climate change targets. Whilst it is not the purpose of this article to engage in wider debates as to the merits of extracting shale gas, in considering the fit of regulatory controls, if a large-scale industry is to develop here in England, the 80% reduction in the emission of greenhouse gases (GHG) by 2050 (compared to 1990 levels) looks problematic.

Having examined the current regulation on shale gas and fracking, it is clear that the inherent problem lies in the fact that old regulations are being used to govern a new technology. This results in inappropriate thresholds, the failure of controls to apply (or lack of clarity as to whether they apply) and the absence of required guidance documents such as BREFs. Clearly, the existing controls offer some regulatory protection, but that should not obscure the fact that there are gaps in the present system.

41. See the Centre for Business Relationships, Accountability, Sustainability and Society (BRASS), above, n. 20.
42. Council Directive 96/82/EC (OJ L10/13 9.12.96) on the control of major accident hazards involving dangerous substances.
43. European Parliament and Council Directive 2011/92/EU (OJ L26/1 13.12.11) on the assessment of the effects of certain public and private projects on the environment, Annex II.
44. Department of Energy and Climate Change ‘About Shale Gas and Hydraulic Fracturing’. Available at: www.gov.uk/government/publications/about-shale-gas-and-hydraulic-fracturing-fracking/about-shale-gas-and-hydraulic-fracturing-fracking 7.4.
45. European Parliament and Council Directive 2008/98/EC (OJ L312/3 19.12.08) on waste and repealing certain directives; European Parliament and Council Directive 2004/35/EC (OJ L134/56 21.04.04) on environmental liability with regard to the prevention and remedying of environmental damage.
46. B.R. Nicholson and S.C. Dillard ‘Analysis of Litigation Involving Shale and Hydraulic Fracturing: Part I’ (2013) International Energy Law Review 50.
47. See Broderick and Anderson, above, n. 15; Climate Change Act 2008.
Lack of English experience

The number of authorities involved and lack of English experience in regulating fracking is of significance. Although the presence of multiple regulators can provide a system of checks and balances, it can also exacerbate the risk of regulatory gaps.\textsuperscript{48}

This is a point of particular concern in England. The authorities involved in regulating fracking range from the Department of Energy and Climate Change (DECC) through to the Local Mineral Authority (LA/usually the County Council), the Environment Agency (EA) and the Health and Safety Executive (HSE). Broadly, DECC is responsible for the initial licence grant (Petroleum Exploration and Development Licence/PEDL), for approval of the hydraulic fracturing plan and agreed method for monitoring induced seismicity, consent to drill, consent to fracture and consent for an extended well test. The LA takes responsibility for screening and defining the scope of an EIA (if applicable), determining the planning application and planning conditions. The EA controls the environmental permits which fracking operations may require, whilst the HSE takes responsibility for well design, integrity and operational safety. In reality however, many of these aspects overlap.

One of the key issues stemming from the current structure is regulators’ lack of relevant experience and knowledge. This is of particular significance to LAs whose general planning experience ill-equips them to deal with fracking applications. The role of LAs is further questioned by the community incentive scheme and Council retention of 100\% of business rates from exploration sites and through their role in the EIA process.\textsuperscript{49} The self-scoping of EIA issues by operators, combined with the LAs’ limited experience in dealing with shale gas operations, risks important issues being excluded from consideration.

Although the above issues are of particular relevance to LAs, it must be noted that planning applications are also subject to consultation both by statutory (e.g. the EA) and non-statutory/relevant consultees as well as the public. Accordingly, other bodies with relevant knowledge and experience are involved in the planning process. Bodies involved in regulation beyond the planning system also have significant knowledge of and experience in related industries. In particular, the EA and HSE both have considerable experience in the conventional oil and gas sector, with the HSE having a long history of regulating well integrity and design. For both bodies involved in the planning and further regulatory stages, this experience and knowledge is of great value, but it must be noted that, like the regulation, it cannot simply be transposed. This is evidenced by recent calls from Public Health England (PHE) for further research into agencies’ analytical capacities.\textsuperscript{50}

In light of the current cut-backs, in many regulatory agencies the capacity of regulators to monitor the industry is questionable. Lack of English expertise and understanding is a two-pronged issue: first, the authorities’ technical capacity to adequately control the industry; and second, the authorities’ resources to ensure that controls are implemented and enforced. These issues have been seen previously in other environmental regimes such as that of contaminated land.\textsuperscript{51}

Despite the absence of regulations specific to shale gas, planning guidance tailored to onshore oil and gas exploration has been issued.\textsuperscript{52} Although aimed at ensuring clarity in the area, the document does add a

\textsuperscript{48} E.C. Powers ‘Fracking and Federalism: Support for an Adaptive Approach that Avoids the Tragedy of the Regulatory Commons’ (2010–2011) 19 Journal of Law and Policy 913 at 916.

\textsuperscript{49} N. Bowles and the Rt Hon G. Osborne ‘Shale Gas: Government Unveils Plan to Kick Start Investment with Generous New Tax Breaks’ (19 July 2013). Available at: www.gov.uk/government/news/shale-gas-government-unveils-plan-to-kick-start-investment-with-generous-new-tax-breaks; Rt Hon D. Cameron ‘Local Councils to Receive Millions in Business Rates from Shale Gas Developments’ (13 Jan 2014). Available at: www.gov.uk/government/news/local-councils-to-receive-millions-in-business-rates-from-shale-gas-developments.

\textsuperscript{50} See Public Health England, above, n. 18.

\textsuperscript{51} S. Vaughan ‘The Contaminated Land Regime: Still Fit for Purpose?’ (2010) 2 Journal of Planning and Environment Law 142.

\textsuperscript{52} Department for Communities and Local Government, Planning Practice Guidance for Onshore Oil and Gas (July 2013).
number of uncertainties and gaps to those already present within the regulations. The guidance, whilst not replacing the LAs’ judgement, is provided as a specific and detailed guidance tool on the relevant considerations and requirements for those dealing with unconventional exploration applications. There are individual issues within the guidance itself, as discussed below, but these are compounded by the presumption that when granting planning permission ‘all other regulatory controls are to be considered fully functional and effective’. As has been shown, there are clear gaps in the current regulation; such an assumption intensifies the risk of damage from regulatory inadequacies.

The planning guidance states that cumulative impacts are unlikely to be a consideration at the exploration stage regardless of how close well pads are. This is despite the National Planning Policy Framework referring to the relevance of cumulative impacts in assessing whether a development is appropriate to its location and in the public interest. This means that fracking impacts are segmented. Separating such aspects imposes an artificial distinction and ignores the full implication of the potential for environmental damage at the exploration stage, particularly when deficiencies in the regulation are ignored.

The planning guidance stresses the importance of mineral extraction for both local and national economies as a relevant planning consideration. However potential future activities and alternative energy developments in the area are not relevant. This emphasis on the economic value of shale gas is likely to be challenged in the context of conservation during appropriate assessments. A project can only be authorised in a protected habitat if the authority has made certain there will be no adverse effects on a protected site. However, the question of how easily exemptions allowing development for imperative reasons of overriding public interest (IROPI) will be invoked on an economic basis remains. This tension will be of even greater concern should clause 58 of the Draft Deregulation Bill come into force. This emphasises the need to consider the desirability of promoting economic growth when exercising regulatory functions. Such economic considerations raise questions as to how the EU requirement to avoid conflict between regulators’ ‘regulatory’ functions and their function relating to economic development of resources is to be met.

Economic implications also extend to English landowners. Whilst section 106 agreements between operators and LAs can be used to impose planning obligations to cover the remediation of sites, the planning guidance highlights the imposition on landowners of a duty to restore the site if the operator defaults. This suggests that the area is open to legal uncertainty and that a lack of precedent could have extreme and unforeseen consequences.

Although a Strategic Environmental Assessment (SEA) has now been conducted for the fourteenth onshore licensing round (consultation ended on 28 March 2014), which compels a more holistic approach to risks, this has been conducted under several problematic assumptions. Whilst recognising significant negative effects and cumulative effects on population health, air quality, geology, soil, water and waste at the local and community level from operations, these are assumed to be mitigated to an acceptable level

53. Ibid. at 7, para. 29.
54. Ibid. at 13, para. 57; Department for Communities and Local Government National Planning Policy Framework (March 2012) 28, para. 120; 29, para. 122.
55. See Department for Communities and Local Government, above, n. 52 at 1, para. 58 and at 15, para. 64.
56. Council Directive 92/43/EEC (OJ L206/7 21.05.92) on the conservation of natural habitats and of wild fauna and flora, Arts 6(3) and 6(4); Conservation of Habitats and Species Regulations 2010 (SI 2010, No. 490).
57. Draft Deregulation Bill CM8642 (2013–2014).
58. See Commission Recommendation 2014/70/EU, above, n. 25 at rec. 13.2.
59. See Department for Communities and Local Government, above, n. 52 at 17, para. 76; Town and Country Planning Act 1990, s. 106.
60. DECC ‘Strategic Environmental Assessment for Further Onshore Oil and Gas Licensing, Environmental Report’ (December 2014); European Council and Parliament Directive 2001/42/EC (OJ L197/30 27.06.01) on the assessment of the effects of certain plans and programmes on the environment.
through planning controls and regulation. With mitigation emphasising the use of current regulations such as the EIA and BAT, it is clear that even the SEA assessment is constrained by the assumption that the current regulatory system is ‘robust’.

Being a new industry in England, the UK and the EU, building a shared resource and knowledge base could prove of significant value. However, Member States have adopted radically different approaches to fracking. Some (e.g. France) have a moratorium in place and others (e.g. the UK) have actively encouraged the technology. The development of shared best practices and accident prevention is likely to face significant hurdles, meaning that any improvements based on EU industry experience will be neither straightforward nor prompt.

Although the United Kingdom Onshore Operators Group (UKOOG) has issued best practice guidance for shale gas operators, it remains voluntary. Relevant legislation and regulatory requirements are collated in the guidance, as are references to other relevant oil and gas guidelines (e.g. the Well Integrity Guidelines) and industry best practices from the conventional sector. Monitoring and transparency within the industry are encouraged (including the public disclosure of fracturing fluids), but without enforceability mechanisms and supporting legislation many guidance provisions still fail to guarantee adequate environmental and health protection.

At present, the uncertainty in relation to fracking controls extends beyond technical regulation and into practical application and enforcement. Such a combination is problematic and highlights that the regulatory system will not remove the current gaps and uncertainties unless the issue of authority experience, expertise and resources is also addressed.

The need for regulatory change

With uncertainty as to application and potential for gaps in the controls, the question that must be addressed is: what now for the regulation of shale gas and fracking? The objective of fracking regulation (leaving aside questions of whether England should develop a new fossil fuel industry) is to ensure that the exploration for shale gas can proceed in a manner which also protects the environment and public health. Under the current regulatory system, the uncertainty and risk associated with fracking is not justifiable. The very way in which the risks have been assessed assumes that a ‘robust’ regulatory system will be in place; this has fed the justification for significant instances of regulatory inaction. Clearly the current regulation is not ‘robust’, and the framing of such risks as ‘low’ based on this assumption highlights the deficiencies in this cyclic determination.

As this article has shown, there are a number of risks associated with fracking and a number of uncertainties as to its impact in England. These correspond with evident gaps and uncertainties within the current regulation and the current regulatory approach risks a non-uniform application of uncertain regulations. Maintenance of the current approach is beneficial in that it requires minimal effort and expenditure, whilst allowing the shale gas industry to develop. However, it risks allowing regulatory gaps to remain until problems materialise.

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61. Ibid. at xix: In the high-activity scenario: Between 50–150 licensed sites, 20–240 test boreholes, 30–120 well pads, between 10,000–25,000 cubic metres of water required for the hydraulic fracturing of each well, between 30–75% of this water returning as flowback, between 14–51 vehicle movements a day during stages 2–3 and assumed production of 3 billion cubic feet of gas per well (over lifetime assumed to be 20 years).

62. European Parliament and Council Decision 1386/2013/EU (OJ L354/171 20.11.13) on a General Union Environment Action Programme to 2020 ‘Living well, within the limits of our planet’.

63. See Commission Recommendation 2014/70/EU, above, n. 25 at 6.

64. United Kingdom Onshore Operators Group ‘UK Onshore Shale Gas Well Guidelines, Exploration and Appraisal Phase’ (February 2013). Available at: www.ukoog.org.uk/images/ukoog/pdfs/ShaleGasWellGuidelines.pdf.

65. See Public Health England, above, n. 18 at iii; See Royal Society, above, n. 11 at 4.
Fracking remains unpredictable in the English context. First, in relation to the natural environment there are a number of unknowns in geological terms (e.g. pathways and receptors for pollution and environmental damage). Second, there are unknowns relating to human behaviour and practices (e.g. the way in which operators will act, particularly in light of the lack of English experience and understanding of shale gas activities). Fracking must be recognised and regulated as a new and uncertain technology.

**What next?**

**Guidance.** There are some arguments in favour of the introduction of guidance on fracking both to avoid regulatory reform and to allow this new technology and industry to develop. This argument is not without merit; however, the assertion that current provisions provide ‘proper environmental safeguards’ and are well understood by businesses is highly questionable. A vast number of regulations apply and misunderstandings surrounding their application have already materialised. Whilst guidance on the applicability of the current provisions would be useful, this does not resolve the problem of the gaps in the current regulation. Once these have been addressed, the value of guidance will be significantly increased. At present, however, it is of limited value. This is exemplified by the current EU Recommendation, which encourages useful processes such as baseline monitoring and public dissemination of information. However, in relation to areas such as environmental impact assessment and chemical registration, the current EU guidance, even if legally enforceable, still leaves regulatory gaps and uncertainties.

**Alteration of current provisions.** An alternative would be to conduct a piecemeal reform of current regulations. Such action fails to address the fundamental problem that controls from one system are failing to translate to another system and its technology. Altering the current controls would not address this issue and would support the misplaced idea that they are sufficient to control new technologies. Such a piecemeal reform poses the potential for clashes in controls and a distinct lack of clarity meaning that, in practice, gaps in the regulation would likely remain.

**A moratorium.** Another available option would be to impose a temporary moratorium on fracking. A moratorium on shale gas extraction is not a new concept in England (as seen following the seismic events in 2011). Further use of a response that allows the materialisation of damage prior to regulatory action should not be adopted.

However, a moratorium could be used to halt activities in England until further information on the risks and uncertainties associated with fracking becomes available based on operational experience in other countries. Nonetheless, information from other jurisdictions with different geological, social and regulatory conditions may prove to be of limited value.

**Precaution and regulatory reform.** The remaining, preferred option, is the development of precautionary regulation for fracking. To develop this, a temporary moratorium must be imposed. This would address the
current deficiencies in the regulatory system by acknowledging the need for change and allowing time for
detailed consideration of how this can be achieved. As precaution is a complex and disputed term the precise
approach needed is something beyond the scope of this article. Further research is required.  

There are too many regulatory gaps and uncertainties in the current legislation relating to fracking. Under
such a system environmental and health risks are self-evident, but could be avoided by the imposition of a
temporary moratorium until these issues can be addressed. Despite recognition at EU level of the need and
value of precautionary measures, these have not been adopted. The need for English operational informa-
tion requires exploratory activity; this will inevitably be delayed by a temporary moratorium and the imple-
mentation of precautionary measures. This carries the risk of economic disadvantage and slower industry
development, as well as delaying any potential benefits from shale gas. However, there is a need to ensure
that during the exploration and development stage, current risks and uncertainties are not left open. A pre-
cautionary approach would not prevent future industry development and would allow for later review of the
regulation, and amendment if necessary, once uncertainty in the English context is reduced (through the
production of operational information without unnecessary risk to the environment and health).

Ensuring that strong precautionary regulation is in place would also permit regulators to develop relevant
experience and knowledge, whilst simultaneously protecting both the environment and public health. This
is crucial to ensuring that regulation is effectively applied in practice.

Current law does not transpose neatly onto the new technology and industry it is trying to control. This
article does not attempt to propose the technical contents of any regulatory changes and, whilst there may
not be an immediately obvious and effective way to do this, until attention is drawn to the issue of regulatory
inadequacy and it is given serious consideration a mismatch of regulatory uncertainty and gaps will
remain. Notably, the use of current industry best practice guidance could prove useful at this stage in help-
ing to design enforceable precautionary regulation.

These issues are not unique to fracking. Despite the problems with allowing new technologies such as
genetically modified organisms and nano-technology to proceed in a manner where regulation is constantly
catching up, fracking indicates that little has been learnt from the historically problematic relationship
between new technologies, the law and environmental and health protection.

**Conclusion**

Exploration for shale gas in England has sparked significant debate, yet little of this has focused in any detail
on the control afforded by current regulation. There are a number of risks and uncertainties associated with
fracking accompanied by a number of corresponding gaps and uncertainties in the regulation. Whilst the
present regulatory systems offers a base of controls built upon conventional oil and gas experience, its suit-
ability is limited. The inability to transpose one set of regulations from an existing context into a new con-
text is apparent. At present gaps emerge as a result of a lack of coherence and uncertainty surrounding the
applicability of regulations as well as through the application of inappropriate thresholds. These are com-
pounded by the lack of regulatory expertise and experience and the questionable capacity of regulatory

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70. E. Fisher ‘Precaution, Precaution Everywhere: Developing a “Common Understanding” of the Precautionary Principle in the
European Community’ (2002) 9 Maastricht Journal of European and Comparative Law 7.
71. See Commission Staff Working Document, above, n. 14 at 1.
72. See M. Lee, above, n. 3 at 23.
73. Commission Staff Working Document, above, n. 14 at 20, para. 3.1.1.
74. R. Brownsword and K. Yeung (eds) Regulating Technologies (Hart: Oxford, 2008) 28.
75. See E. Stokes, above, n. 3; See M. Lee, above, n. 3.
authorities to fulfil their assigned roles. Maintenance of the current approach and controls will leave areas exposed to potential environmental and health damage.

At present, the framing of shale gas and fracking activities as low risk is based on the assumption that a robust regulatory system is in place.\textsuperscript{76} This article has shown that this is not the case and that regulatory change is needed. Such a change requires recognition of the fact that the current regulation does not fit the technology and processes it is trying to control. Until this fact is acknowledged and addressed, the regulation governing fracking will continue to be inadequate.

A number of options exist in relation to the reform of fracking regulation, including the piecemeal reform of current provisions or the production of guidance. The difficulty with such reforms is that they fail to acknowledge the problems raised by trying to map old regulations onto a new technology. The alternative option – a temporary moratorium until further information on fracking in other jurisdictions is available – is of limited value due to the context-specific generation of this information. At present, the state of the regulation suggests the need for a temporary moratorium which utilises the time to examine the current regulation in detail and engages with the notion that gaps and uncertainties are apparent. This would ensure that the regulatory gaps highlighted in this article are filled and that the operation of the new technology of fracking in England is conducted under a precautionary regime enabling context-specific data to be generated. This, in turn, would reduce uncertainty surrounding fracking and help to minimise damage to the environment and to public health.

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\textsuperscript{76} See Public Health England, above, n. 18 at iii; See Royal Society, above, n. 11 at 4; See Business Task Force, above, n. 66.