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A Brief History of the UK's Political Debate over Shale Gas, 2009-2019

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Summary of Key Findings

- ▶ Initial government responses to questions concerning shale gas, hydraulic fracturing and its regulation failed to address concerns and created suspicion and ambiguity.
- ▶ The growing difference in wholesale gas prices between the US and Europe, and the 'competitiveness anxiety' this induced was the key reason for growing shale gas support amongst legislators.
- ▶ Government support was cemented in the period 2013-2014 by concerns over the cost of living (and the role of energy bills therein) and potentially volatile international gas markets.
- ▶ Place- and class-based identity was mobilised by advocates and objectors alike in ways that arguably foreshadowed the deep divides that dominated British politics in the second half of this time period.
- ▶ Conditionally supportive Conservative MPs with a constituency interest were active and influential, and increased in number over time. The government failed to satisfy many of them and ultimately lost their conditional support.
- ▶ Attempts to speed up regulatory and planning processes were always politically challenging and were arguably politically impossible after 2017. Many Conservative MPs saw such efforts as contradicting earlier commitments to robust regulation and localism.
- ▶ The government failed to find a clear way to articulate whether and why the 'unburnable carbon' and 'bridging fuel' positions were reconcilable.

Introduction

The moratorium imposed in 2019 on hydraulic fracturing in England provides an opportunity to take stock and learn lessons from the UK's decade-long pursuit of a domestic shale gas industry. These lessons will prove valuable in relation to shale gas should the moratorium ever be lifted, but also offer broader insights into the politics of the environment and innovation. These insights relate especially to the infrastructure required as part of the UK's net zero strategy, irrespective of UK shale policy going forward.

This review takes the form of a brief history of the national formal politics of shale gas in the UK over the period 2009-2019, during which so much and yet so little occurred. By UK formal politics, we refer to political action and discourse within the government and legislature of the United Kingdom at Westminster. Distinct formal national political dynamics exist within the devolved governments and parliaments of Scotland, Wales and Northern Ireland and are covered elsewhere in this collection (see Cotton 2020).

The main body of this review is split into five subsections. Each chronologically ordered section presents the key developments in the UK politics of shale gas over a defined time period. The first period (2009-2010) covers the emergence of shale gas as a political issue in the UK. The following section (2011-2013) covers the early seismicity at Preese Hall and growing controversy surrounding shale gas and its extraction. Section three (2014-2015) deals with the slow progress of exploration and the legislative and planning reforms that attempted to remedy this. The following period (2016-2018) is one of tentative industry optimism amidst a backdrop of protest. The final section brings us more or less to the present day (2017-2019) and details the events that led to the current moratorium. The review ends with some brief concluding lessons.

2009-2010: Murmurings of an American Revolution, Tentative Hopes for a Repeat in the UK

The 13th license round for onshore oil and gas took place in 2008 (Solman and Bradshaw, 2020) but the issue of unconventional hydrocarbons and their extraction flew largely under the political radar in this period. The Labour Energy Minister Joan Ruddock would later note that during this round "industry did show some interest in the potential surrounding shale gas in the UK" and that the Department for Energy and Climate Change (DECC) had asked the British Geological Survey (BGS) to assess the UK's shale oil and gas resource (Hansard, 2009: vol 502 column 327W).

In spite of this early interest in the UK's shale potential, political discourse in this period primarily saw shale gas as a significant development that was occurring in the United States and that would have global knock-on effects. In March 2010 in the House of Lords (HoL), Lord Oxburgh, a geologist, spoke of a profound change occurring in the last 18 months due to shale gas (Hansard, 2010: vol 718 column 919). In the House of Commons (HoC) a few months later, Labour MP Alan Whitehead spoke of shale gas in the US and elsewhere transforming the picture of likely gas reserves (Hansard, 2010: vol 513 column 158WH).

After the Conservative-Liberal Democrat coalition came to power as a result of the 2010 general election, new Energy Minister Charles Hendry set out the potential benefits to the UK of the US shale revolution, which, he argued, would free up LNG for the UK and help to put downward pressure of wholesale gas prices (Hansard. 2010: vol 520 column 14W).

Yet whenever discussions turned to the UK's shale gas prospects in the period, the government was decidedly cautious. When asked about the level of reserves of shale gas in the UK in December 2010, Hendry replied that whilst the BGS "estimates that there could be worthwhile shale gas resources in the UK... it is not possible to make an estimate of reserves without drilling and production testing, and it is not yet clear that the success elsewhere can be replicated in the UK" (Hansard. 2010: vol 519 column 809W).

Alan Whitehead was the first legislator to point out that the process used to extract shale gas, hydraulic fracturing, may be problematic (Hansard. 2010: vol 513 column 158WH). Asked directly about government policy on this technique in late 2010, Climate Change Minister Gregory Baker responded that "[t]he Department has no objection to the use of this technique so long as all of the relevant environmental and planning assessments have been carried out and permissions granted" (Hansard. 2010: vol 520 column 744W).

2011-2013: Preese Hall, a Green Light and a Growing Backlash

By mid-2011 there were the first signs of the issue that more than any other would dog attempts to establish a domestic shale gas industry in the UK. Seismic activity was recorded near Cuadrilla's site at Preese Hall in the Fylde region of Lancashire in April and May and there were suspicions that hydraulic fracturing might be the cause. A pause in operations was agreed whilst a number of studies were conducted into the activity. This work would eventually conclude that the seismicity was indeed induced by Cuadrilla's operations at Preese Hall (Green, Styles and Baptie, 2012).

Undeterred by this effective moratorium on new exploratory activity, excitement started to gather about the UK's shale gas potential. The BGS's initial, rudimentary assessment was a handy but unremarkable reserve potential of 150 bcm for the UK (roughly 2 years of UK demand at the time) (DECC, 2010). However, the tone amongst a number of backbenchers appreciably changed when Cuadrilla released a gas-in-place estimate of 6,000bcm for their license areas alone (The Parliamentary Office of Science and Technology, 2013). The Conservative MP Steve Baker summed up the mood when he said:

"It seems that we have vast, abundant and cheap sources of gas in this country. We should be going through a shale gas revolution" (Hansard. 2011: vol 533 column 977).

The government, however, remained more sober, with Minister Charles Hendry suggesting that in spite of Cuadrilla's estimate it remained too early to know whether shale gas will be a 'game-changer' in the UK (Hansard. 2011: vol 533 column 1006).

The issue of carbon emissions came into sharper focus during 2011. Referring to an assessment of the carbon footprint of shale gas in the International Energy Agency report 'Are We Entering A Golden Age For Gas' (International Energy Agency, 2011), Hendry suggested that provided good practice is adhered to regarding fugitive emissions, the carbon footprint of shale gas should be of the same order as conventional gas and significantly lower than coal (Hansard. 2011: vol 530 column 340W).

Confidence grew in 2012 amongst many legislators who saw shale gas as representing an opportunity to see lower gas prices in the UK. Backbench MPs repeatedly pointed out that gas prices in the US were tumbling because of the shale gas revolution and were now between a third and a quarter of European prices, and that this would have serious ramifications for economic competitiveness with the US re-shoring energy-intensive industry. This enthusiasm was echoed in early January by Chris Huhne, the Energy Secretary, who in an unusually bold statement from the government in this period suggested that:

“Shale gas is potentially an exciting development that could bring enormous prosperity to the parts of the country where it has been found, such as Lancashire... it presents the opportunity to reduce the cost of gas” (Hansard. 2012: vol 538 column 267).

By March, the Labour opposition started to clarify their shale policy. Shadow Energy Minister Tom Greatrex set out Labour’s policy of cautious support that was conditional on six tests. These tests included mandatory disclosure of chemicals used in fracking fluid and 12 months of baseline micro-seismic and groundwater monitoring prior to drilling (Greatrex, 2012).

Gregory Baker fleshed out the potential role of gas in the UK’s energy policy in May. He argued that gas would be crucial in coming decades due to the loss of coal and nuclear generating capacity, the intermittency of renewables and the UK’s continued reliance on gas heating (Hansard. 2012: vol 545 column 54WH). The new Energy Minister John Hayes (replacing Hendry) added that with plans to retire one fifth of electricity generation capacity in the next decade “[f]or the first time in a generation we faced the prospect that at the end of the decade there would simply not be enough electricity to meet demand” (Hansard. 2012: vol 550 column 267WH).

There were also significant developments in parallel debates over hydraulic fracturing and local environmental risk in 2012. In June, the Royal Society and Royal Academy of Engineering published a report into the risks of hydraulic fracturing. The report’s oft-quoted – not least by the government – conclusion stated that the “risks associated with hydraulic fracturing... can be managed effectively in the UK as long as operational best practices are implemented and enforced through regulation” (RS and RAoE 2012, p.4).

In late 2012, Lancashire MPs intensified their efforts in lobbying the government on shale gas. Two crucial figures were the Conservative MPs Mark Menzies, MP for Fylde – the constituency where Cuadrilla’s Preese Hall site was located – and Eric Ollerenshaw, MP for neighbouring Lancaster and Fleetwood.

Menzies tended to focus his attention on ensuring the regulations were robust and seen to be robust by communities on the ground, which included requesting an independent body to co-ordinate a ‘gold standard’ of regulation (Hansard. 2012: vol 550 column 282). In late October, Menzies claimed the regulatory system was not “robust or transparent enough to instil public confidence” (Hansard. 2012: vol 551 column 1038). He mentioned a number of issues including the lack of specific onshore exploration regulations, the need for Environmental Impact Assessments (EIAs) for all sites regardless of size, the need for methane monitoring, and the need for considerable sanctions for any regulatory breaches (columns 1039-1040).

Ollerenshaw focused on the cumulative impact of a range of different energy infrastructures concentrated in Lancashire and demanded that local communities and the wider region receive a fair share of the benefits for hosting this infrastructure. In December, Ollerenshaw pointed out that mineral rights ownership in the UK leaves little direct financial incentive to individual landowners, and that in his view ‘thousands of jobs’ or high-quality employment opportunities for local people were unlikely. Thus, he argued for a financial benefits package that included both direct payments to local residents and extra funding for local authorities (Hansard. 2012: vol 555 columns 293WH-296WH).

December 2012 turned out to be a pivotal month in the UK shale gas story. The Chancellor of the Exchequer, George Osborne, published his Autumn Statement on December 5th, which stated that:

“Today, we publish our gas strategy to ensure that we make the best use of lower-cost gas power, including new sources of gas under the land. We are consulting on new tax incentives for shale gas and announcing the creation of a single office so that regulation is safe but simple. We do not want British families and businesses to be left behind as gas prices tumble on the other side of the Atlantic” (HM Treasury, 2012).

On the 12th of December, in a written ministerial statement, the Energy Secretary Ed Davey announced that he was prepared to consent to new proposals for shale gas exploration including the use of hydraulic fracturing, bringing an end to the ‘pause in operations’ that had been put in place after the Preese Hall seismic events (DECC, 2012). In the statement, Davey announced the establishment of new controls to mitigate the risks of seismicity – including the so-called traffic

light system (TLS) (see Hunter 2020). Davey also announced the establishment of the Office of Unconventional Gas and Oil (OUGO) in response to Menzies' request for an independent co-ordination body (see above), and he commissioned a study into the carbon footprint of shale gas (the 'Mackay and Stone' report, see below).

In 2013, concerns about energy prices, and especially the differential between US and European wholesale gas prices, continued to be highly prominent. A cross-party group of backbench MPs became increasingly critical of renewable subsidies and climate policies because of the effect they argued these policies were having on consumer energy bills and the competitiveness of UK manufacturing. They saw shale development as an opportunity to lower gas prices, save industrial jobs and even help to reindustrialise; and lamented the lack of progress towards a domestic industry. For example, the Labour MP Graham Stringer labelled energy policy a 'deindustrialisation policy' (Hansard. 2013: vol 566 column 340WH). Conservative MP Andrew Tyrie criticised government climate policy for exporting manufacturing jobs (Hansard. 2013: vol 560 column 952) and Conservative MP John Redwood accused the Green MP Caroline Lucas of being a "deliberate architect of dear and scarce energy" (Hansard. 2013: vol 560 columns 964-965).

The EU did not figure prominently in UK political discourse over shale gas, which was overwhelmingly domestically focused. Although decisions about domestic shale gas development rest with individual Member States, EU rules on environment, chemical use and market access can impact Member States' policies. When the EU was raised it was often in the form of the PM informing the House about his efforts to persuade other member states not to stymie European shale gas development with supposedly unnecessarily burdensome regulation (Hansard. 2013: vol 563 column 1233).

By mid-2013, three important reports attempted to clarify the scale of the resource and economic opportunities on offer. In May, the Institute of Directors published a report that suggested that a UK shale gas industry could support up to 74,000 direct, indirect and induced jobs (IoD, 2013). This was significant because prior to this report advocacy for shale gas on the basis of job creation had been fairly muted, with policy-actors unable to give a sense of the scale of the opportunity and many expressing scepticism about the number and quality of jobs that might be generated (see Ollerenshaw's comments above). Around the same time, the industry published their community engagement charter, which included the commitment to pay £100,000 to the local community per well site where hydraulic fracturing takes place at the exploration phase and 1% of revenues at the production phase (UKOOG, 2013). By the end of June the British Geological Survey released their resource estimate for the Bowland Shale (see Figure 1), with a mid-range gas-in-place estimate of 1,300tcf (Andrews, 2013). At the time Danny Alexander (Chief Secretary to the Treasury) noted that the study confirmed the huge potential for shale gas in the UK (Hansard. 2013: vol 565 column 471).



Figure 1. The Bowland Shale. Source: BGS (BGS, 2013)

A Westminster Hall debate on the 18th of July saw a large number of MPs line up to criticise government shale policy. Opening the debate Green MP Caroline Lucas criticised the recently announced tax cuts (announced in the 2012 Autumn Statement, see above), pointed to inappropriate corporate influence within government and uncertainties over the risks of fracking, questioned government rhetoric over the UK's world-leading regulations, and argued that shale gas development would neither lower prices, improve energy security nor contribute to achieving the UK's climate change commitments (Hansard. 2013: vol 566 columns 307WH-318WH). This debate was notably more adversarial and at times bad-tempered than many that had gone before, and included a number of MPs with existing or potential sites within their constituencies making clear to Ministers the scale of the challenge involved in winning local support.

The summer of 2013 saw high-profile public protests at Cuadrilla's oil exploration site at Balcombe, West Sussex, in the affluent, rural commuter belt around London. The protests at Balcombe were not the first protests in the UK over hydraulic fracturing, for instance protests had occurred in Lancashire in 2011 (Wood, 2012). In fact, Cuadrilla's plans at Balcombe did not at that stage include hydraulic fracturing. Nonetheless, these protests catapulted hydraulic fracturing up the political agenda and into the public consciousness¹ (Mazur, 2016), and arguably contributed to a shift in British public attitudes against hydraulic fracturing (O'Hara *et al.* 2015 & 2016).

At the end of July, during a debate in the HoL, Lord Howell of Guildford made one of the more infamous quotes on this topic. "Obviously", he suggested:

"[I]n beautiful rural areas there are worries not just about drilling and fracking—which I think are exaggerated—but about trucks, deliveries, roads and disturbance, which are quite justified. However, there are large, uninhabited and desolate areas, certainly in parts of the north-east, where there is plenty of room for fracking, well away from anybody's residence, and where it could be conducted without any threat to the rural environment" (Hansard. 2013: vol 747 column 1641).

This comment would be endlessly quoted by anti-fracking groups across the north of England in the years to come, and for many was seen as evidence of not only ignorance and contempt but also distributional injustice in the proposed siting of the shale industry.

Whilst the protests in Balcombe were ongoing David Cameron penned an op-ed for *The Telegraph* entitled 'We cannot afford to miss out on shale gas'. In the piece Cameron argued that "fracking has real potential to drive energy bills down", criticised a series of 'myths' over issues such as risk and industrialisation, and situated shale development within what he called Britain's tradition of technological endeavour (Cameron, 2013). Whilst talk of lower gas prices had become commonplace amongst some backbenchers, the government had largely resisted the temptation to tout this as a benefit of a domestic shale gas industry. However, by the end of 2013 the dominant parliamentary view increasingly became that energy security and not lower gas prices was the reason to pursue shale gas in the UK, as the promise of lower prices came to be seen as not particularly plausible in the UK context. For example, this idea was put forward by Lord Stern (crossbencher) (Hansard. 2013: vol 746 column 175) and again later in the year by Lord Oxburgh (crossbencher) (Hansard. 2013: vol 748 column 1334) and Lord Deben (Conservative) (Hansard. 2013: vol 749 column 39).

In September, the Mackay and Stone report was published. This report found that domestic shale gas used for electricity generation would have a carbon footprint similar to other forms of gas and significantly lower than coal (Mackay and Stone, 2013). Ministers would heavily rely on this finding when justifying their argument that domestic shale gas production could provide a 'bridge' to a low carbon economy and help to lower GHG emissions (see DECC 2015a for a prominent example). Most simply, the 'bridging fuel' argument refers to the idea that shale gas represents an intermediate step towards a lower carbon future.

In a final significant development from 2013, *The Sun* reported that David Cameron told aides to 'cut all the green crap' in relation to green taxes on energy bills (Mason, 2013). Although Downing Street denied that particular phrase was used, this story illustrates concerns during this period around consumer energy prices and the cost of living more broadly. In fact, Labour leader Ed Miliband had proposed freezing energy prices 2 months prior to *the Sun's* story (Landale, 2013). The story also represented something of an about turn for Cameron, who a few years earlier, shortly after becoming the leader of the Conservative party, choreographed a 'husky hugging' photograph opportunity and went on to pledge to lead

¹ Some have suggested that this is because Balcombe village is well connected to London, Brighton and Gatwick airport by public transport, making it an attractive location for activists and domestic and international journalists alike (see McWirter 2015).

the 'greenest government ever' (Vaughan, 2016).

In sum, in this period, exploratory operations were paused temporarily due to seismicity at Preese Hall but then allowed to resume with the TLS in place. There was growing enthusiasm for shale at Westminster, including for the role it could supposedly play in cutting gas prices. This occurred amidst a backdrop of growing 'competitiveness anxiety', hostility towards renewable subsidies, and concerns over the cost of living. Whilst broad party-political consensus formed over shale in this period, pressure on the government came from backbench MPs with a constituency interest, and anti-fracking protests at Balcombe and elsewhere underlined the challenges involved in persuading local communities to tolerate a shale industry.

2014-2015: Slow Progress, Legislative and Planning Reforms, and the End of the Party-Political Consensus

The UK government's strong rhetorical support for the fledgling shale gas industry was given its clearest expression in early 2014 as the Prime Minister announced that 'we're going all out for shale' (UK Government, 2014). The period 2014-2016 might have started with a rhetorical commitment to 'go all out' but in practice it was defined by the slow progress of applications going through the planning system.

February 2014 saw Cuadrilla revealing plans for two new sites in the Fylde region, at Preston New Road (PNR) and Roseacre Wood (RW). Cuadrilla formally submitted planning applications for the sites in May and June respectively. These sites were the most ambitious shale development operations proposed during the period covered by this review, with each site planned to house four wells and each well comprised of a vertical and horizontal section (Arup 2014a & 2014b). As this process began the engineering consultancy Pöyry warned that the UK's permitting and planning regimes were time-consuming and resulting in limited exploratory progress. Their report argued that without streamlining these processes "it may not be possible to achieve shale gas production at any scale" (Pöyry, 2014, p. 6).

In March, speaking at the Nuclear Security Summit in the Hague, the PM argued that Europe needed to take a 'long hard look' at its 'energy independence', and suggested that exploiting Europe's shale gas resources was an opportunity to reduce reliance on Russian imports in certain countries (Press Association, 2014). The backdrop to Cameron's comments was the Russian invasion of south-east Ukraine in February 2014, and the annexation of Crimea in the following month. Whilst the UK was not dependent on Russian gas, these events brought anxieties over energy security and volatile international gas markets to the fore (Williams and Sovacool, 2019).

A number of legislative reforms associated with hydraulic fracturing were included within the Infrastructure Bill, which began its passage through parliament in 2014. As announced in the 2014 Queen's Speech, the Bill included a proposal to reform trespass laws in order to grant automatic access to deep-level land (below 300m) for the purpose of exploiting hydrocarbons (Prime Minister's Office, 2014), though landowner and planning permissions would still be required for all surface operations. This proposal was objected to by over 99% of respondents during consultation (DECC, 2014)².

In October the Governor of the Bank of England Mark Carney told a World Bank seminar that the vast majority of fossil fuel reserves are 'unburnable' if global temperature rises are to be kept below 2°C (Shankleman 2014, see also McGlade and Ekins 2015). This was a notable contribution to growing discourse around 'keeping fossil fuels in the ground'. Whilst this argument did not actually directly contradict the government's 'bridging fuel' position on a domestic shale gas industry (for one thing, the two arguments relate to different scales and spheres of responsibility), the 'bridging fuel' and 'unburnable carbon' arguments intuitively seemed to be on an oppositional footing nonetheless. On the issue of climate change, the Committee on Climate Change would eventually suggest that exploiting domestic onshore petroleum could be consistent with UK carbon budgets if three tests were met: (i) the strict limiting of production emissions, (ii) the stipulation that shale gas displaces imported gas rather than being additional, and (iii) shale gas production emissions must be offset by reductions elsewhere (Committee on Climate Change, 2016). However, none of these three tests address the issue of cumulative global emissions raised by the 'unburnable carbon' argument.

By late November, some local Conservative MPs were starting to lose patience with the government. Ollerenshaw described the plan to reform trespass laws as a 'heavy-handed manoeuvre', which, he said, "reinforces the view in my part of the world that the Government are bowing down too easily to international oil and gas companies and their

² This is another little vignette that would be regularly referred to by anti-fracking groups.

financial interests" (Hansard, 2014: vol 588 column 210WH). Menzies went further, suggesting that he would find it difficult to support shale development going forward if regulations were not improved (column 213WH). Both MPs would (unsuccessfully) vote for a moratorium on hydraulic fracturing during the third reading of the Infrastructure Bill in early 2015 (Hayhurst, 2015a).

In the same debate Conservative MP David Mowat again expressed the concern about the implications of the price differential between the US and UK for the fate of the UK's energy intensive industries. This price differential may not matter in Lewes (the largely rural, picturesque southern constituency of the MP Norman Baker who called the debate and spoke against fracking), he said, but "it matters on Teesside, where marginal chemicals investment decisions are being made on whether to put the next production unit or piece of kit on the eastern seaboard of the USA or in our country" (column 206WH). Here Mowat was reversing the distributive justice argument mentioned above – that shale advocates in government were imposing shale development on disadvantaged areas of the country whilst sparing more affluent parts of the country. Instead Mowat implied that opposition to hydraulic fracturing and indifference to its benefits by those in more affluent parts of the country could deny those benefits to the areas of the country that most needed them (see a similar argument from Lord Tugendhat, Hansard, 2014: vol 756 column 1594).

Once again, the Autumn Statement brought a noteworthy announcement at the end of the year. Osborne set out his ambition to geographically 'rebalance' the economy with investment in infrastructure, industry and science in the north of England, invoking his vision of the 'Northern Powerhouse'. As a part of this project, he announced a 'Sovereign Wealth Fund for the North of England' so that "the shale gas resources of the North are used to invest in the future of the North" (HM Treasury, 2014).

The passage of the Infrastructure Bill through the Houses of Parliament continued into early 2015, eventually receiving royal assent in February. The final act included a number of conditions originally proposed by Labour, which the government was accused of accepting but then watering down (see Hayhurst 2015b). The 13 original conditions known as new clause 19 were accepted in January. At the time, this was described by the Shadow Energy Secretary Caroline Flint as "a huge U-turn by the government and big victory for the protection of Britain's environment" (quoted in Carrington 2015). These conditions included mandatory EIAs for fracking operations, a ban on fracking in groundwater source protection zones and in or under protected areas, and the notification of local residents on an individual basis (Hansard, 2015: vol 591 column 577).

In the Lords two weeks later Baroness Verma (junior minister, DECC) argued that Labour's conditions were not legally viable, and the government replaced them by an alternative set of conditions (Hansard, 2015: vol 759 columns 1065-1068). These conditions left it to the Secretary of State to define which groundwater protection zones and protected areas would be covered by the ban through secondary legislation, referred to prohibiting fracking within but not under protected areas, and removed the need for individual notification and mandatory EIAs (Hayhurst, 2015c, 2015d, 2015e). The Government then won the vote on these new conditions two days later in the Commons. During the debate, Labour's Shadow Energy Minister Tom Greatrex accused the government of watering down aspects of the conditions and warned that they would come to regret undermining the approach that the HoC had initially united around (Hansard, 2015: vol 592 column 906).

During 2015, a number of companies' shale gas exploration plans suffered setbacks in the planning system. For example, the decisions over RW and PNR were taken in late June at a meeting of Lancashire County Council's (LCC) development control committee. The committee refused both sites permission, refusing RW on traffic grounds and going against their planning officer's recommendation to refuse PNR on landscape and noise grounds. Around a month later Cuadrilla announced that they would appeal both decisions (see Williams 2018).

The 2015 UK General Election, held on May 7, was won by the Conservative Party, which gained a small majority of twelve. In her first interview since being appointed as Energy Secretary in the new government, Amber Rudd expressed confidence that the new Conservative Government would "deliver shale", as well as their manifesto pledge to scrap subsidies for onshore wind farms and give local communities the final say on granting them planning permission (quoted Shipman 2015). To anti-fracking groups, the onshore wind proposals introduced a clear double standard and were a further sign of hostility towards renewables after Cameron's alleged 'cut all the green crap' comments.

Amber Rudd later articulated her approach to energy policy in more detail in a speech to the Institute of Civil Engineers in November. In the speech, Rudd described energy security as 'the number one priority' (DECC, 2015a). Rudd pointed to the decline in North Sea production and the fact that the UK at the time imported 50% of its gas, which was predicted

to rise as high as 75% by 2030. "That's why we're encouraging investment in our shale gas exploration", said Rudd, "so we can add new sources of home-grown supply to our real diversity of imports" (DECC, 2015a). Rudd took a tough tone on renewable subsidies, offering conditional support for offshore wind but not at any cost, and promised to be "tough on subsidies to keep bills as low as possible" (DECC, 2015a). Rudd also announced a consultation on plans to phase out coal-fired generation by 2025, with the slack to be picked up by a shift to 'new gas' (DECC, 2015a).

The election result also precipitated a change in the opposition leadership, ending what had become a slightly uneasy party-political consensus over shale at Westminster. Jeremy Corbyn replaced Ed Miliband as Labour leader and under his leadership Labour would call for a moratorium by the end of the year (Hayhurst, 2015f).

On the 16th of September, DECC published a written ministerial statement in which Rudd claimed that exploring and developing the UK's shale resource "could potentially bring substantial benefits and help meet our objectives for secure energy supplies, economic growth and lower carbon emissions" (DECC, 2015b). Perhaps more importantly, the statement announced that the Communities Secretary would consider both calling in shale applications and recovering appeals against refusal or non-determination (DECC, 2015b). By late November, Communities Secretary Greg Clark moved to exercise this recall power to decide the appeal over LCC's refusal of planning permission for Cuadrilla's PNR and RW sites.

Finally, in December, the 14th licensing round concluded. The Oil and Gas Authority offered licenses for a total of 159 blocks to 22 companies. INEOS, a large petrochemical multinational, was the most successful company in the round, receiving 21 licenses (OGA, 2015). INEOS' success was significant because it is a much larger player than the smaller companies that had populated the nascent industry up until that point.

This period saw the government double-down on their backing for shale whilst increasingly signalling hostility to renewables. Alongside its clear rhetorical commitment, the government pursued a number of supportive reforms in law and planning policy. However, such interventions did not accelerate the flow of successful exploratory applications through the planning system. Also, during this period, Labour broke from the party-political consensus, the Lancashire Conservative backbenchers lost patience with the government and there were signs of growing momentum behind the 'keep it in the ground' movement.

2016-2018: Planning Permission Amidst Persistent Protest

The year 2016 began with the planning inquiry into Cuadrilla's appeal of LCC's refusal of permission to PNR and RW (see Bradshaw and Waite 2017, Williams 2018). The planning inspector, Wendy McKay, recommended granting permission to PNR but not RW, again on the grounds of unacceptable traffic impacts (McKay, 2016). This recommendation informed but did not bind the decisions of the Communities Secretary – by this point Sajid Javid. In October, Javid accepted the inspector's reasoning and recommendation on PNR and granted the site permission, overturning LCC's initial refusal of permission (DCLG, 2016). On RW, whilst he agreed with the inspector's assessment that the proposals gave rise to unacceptable traffic impacts, Javid decided to re-open the inquiry to allow Cuadrilla to submit new traffic management plans³.

The PNR decision was part of a modest wave of shale exploration sites receiving permission from planning authorities, leading to some optimism that exploration in the UK might finally get properly under way. Alongside the PNR decision, Third Energy received planning permission to frack at their Kirby Misperton site in May and IGas received permission for their Springs Road site in November. Further encouragement came in July from an interview given to the *Financial Times* by Tom Crotty, a director at INEOS. In the interview, Crotty set out plans to submit up to 30 applications for test wells across the north of England by the end of the year, noting that the company hoped to begin drilling in early 2017 and to be producing gas in around 18 months (Hollinger, 2016)⁴.

As Third Energy's site at Kirby Misperton emerged as a contender to be the first site fracked since Preese Hall, Kevin Hollinrake - the MP for the Thirsk and Malton, the constituency in which it is located – became more prominent in the debate over shale development. Much like Menzies, Hollinrake is a Conservative backbencher representing a largely rural constituency in the north of England. Hollinrake, who entered Parliament after the 2015 general election, initially adopted a position of conditional support for shale development. Whilst supporting shale development as a "low-cost, low-carbon

³ The reopened inquiry would not occur until April 2018, and the final decision to eventually refuse the appeal took until February 2019 to be published.

⁴ In the end, INEOS failed to submit any applications for test drilling before the end of 2016, and at the time of writing (March 2020) they have planning permission for two exploration sites but have not begun work on either (Hayhurst, 2019a).

home-grown energy source that supports domestic businesses [and] creates local, well-paid jobs" and an opportunity too good to ignore, Hollinrake also called for a single regulator, independent monitoring, buffers zones around settlements and national parks, and a maximum well pad density (Hansard, 2016: vol 605 column 45WH).

The major political development of 2016 was the June vote to leave the European Union. The immediate consequence of the Brexit vote was a new government, after Theresa May won the Conservative leadership election precipitated by the resignation of David Cameron. Whilst the new Conservative government remained committed to the development of a domestic shale industry, Labour's opposition was strengthening. At the Labour Party conference in September, the Shadow Energy Secretary Barry Gardiner announced that a future Labour Government would ban fracking in England because "it locks us into an energy infrastructure that is based on fossil fuels long after our country needs to have moved to clean energy" (quoted in HoC Library 2017, p. 27).

With planning permissions secured for exploratory sites in Lancashire, North Yorkshire and the East Midlands, 2017 began with optimism amongst shale advocates that fracking would recommence in the UK. However, no fracking would take place in 2017. Site construction at PNR began in January 2017, and the site was the scene of consistent protests and the widespread arrest of protestors throughout the year (see Short *et al.* 2020 for more detail on protests and policing). Opponents complained of aggressive policing of the protests, condition and permit breaches, and overly accommodating authorities who allowed permit and condition changes and failed to impose serious penalties for breaches (see Hayhurst 2018a). Such permit breaches and variations would continue well into 2019, creating the impression amongst frontline communities of a stark contrast between government rhetoric over world-leading regulations and on-the-ground regulatory practices.

The key political event of the year was the snap general election called by Theresa May which took place in June. The Conservatives retained power but lost the small majority that Cameron had won 2 years prior and were therefore forced to govern as a minority government with a 'confidence-and-supply' arrangement with the Northern Irish Democratic Unionist Party. The political consequences of this result were that, without a majority in the Commons, the government had little leeway to push their domestic policy agenda, especially with Brexit taking up a huge proportion of the government's bandwidth by this point.

In the lead up to the election, the parties' manifestos underlined the disintegration of the party-political consensus over shale that started in 2015. The Conservative manifesto promised to 'develop a shale industry in Britain' (Conservative Party, 2017, p.23). The manifesto also committed to reforming planning law to treat non-fracking drilling as permitted development (PD) and major shale applications as Nationally Significant Infrastructure Projects (NSIP). The Liberal Democrats, the junior coalition partner in the 2010-2015 government that started the UK's policy of pursuing a shale gas industry, committed to 'oppose' fracking "because of its adverse impact on climate change, the energy mix, and the local environment" (Liberal Democrats, 2017, p.49). Labour – as already discussed – went further by unambiguously proposing to ban fracking (Labour Party, 2017, p.23).

Given the government in this period lacked a majority, shale-sceptical Conservative backbench MPs seriously jeopardised any legislative aspirations on shale gas. One of the new MPs after the 2017 general election, the Conservative Lee Rowley, MP for North East Derbyshire in which INEOS' proposed Bramley Moor Lane site is located, opposed exploratory drilling in his constituency. Rowley referred to fracking as "a highly intense, high-impact, large-scale set of activities... [that] will change the nature of our countryside for decades" and the Bramley Moor Lane site specifically as "the wholesale industrialisation of the Derbyshire countryside" (Hansard, 2017: vol 631 column 439WH-443WH).

This period offered a glimmer of hope to the shale industry, with permissions granted for exploratory operations in a number of regions. However, protests rumbled on, Brexit started to monopolise the government's attention and the 2017 general election result handed shale-sceptical Conservative backbenchers an effective veto on any legislative aspirations.

2018-2019: Seismicity, Red Lights and the Disintegration of Conservative Support

Cuadrilla completed drilling the first two horizontal shale gas wells in the UK at PNR in the April and July of 2018 and began the first high volume hydraulic fracturing operation in the UK since 2011 in October. These operations triggered seismicity (see Figure 2) that exceeded the TLS limit of 0.5ML on seven occasions in 2 months as part of a flurry of small seismic events, the largest of which measured 1.5ML (Hayhurst 2018b; see also Clarke *et al.* 2019). Three of these were defined as 'red events' under the TLS, which forced Cuadrilla to pause fracking for 18 hours and assess the integrity of the well (see

Hunter 2020). At the end of October, Cuadrilla's chief executive Francis Egan warned that the nascent shale industry could be "strangled before birth" and called for the limit to be raised to 2ML, pointing to higher limits in North America (quoted in Sheppard and McCormick 2018). The Energy Minister Claire Perry rejected his call to raise the limit, saying that "it would be a very foolish politician who would do things that would be considered to be relaxing regulatory standards when we are trying to reassure people about safety" (quoted in Hayhurst 2018c). No other shale gas sites were fracked in 2018, or indeed up until the time of writing (see Solman and Bradshaw 2020).

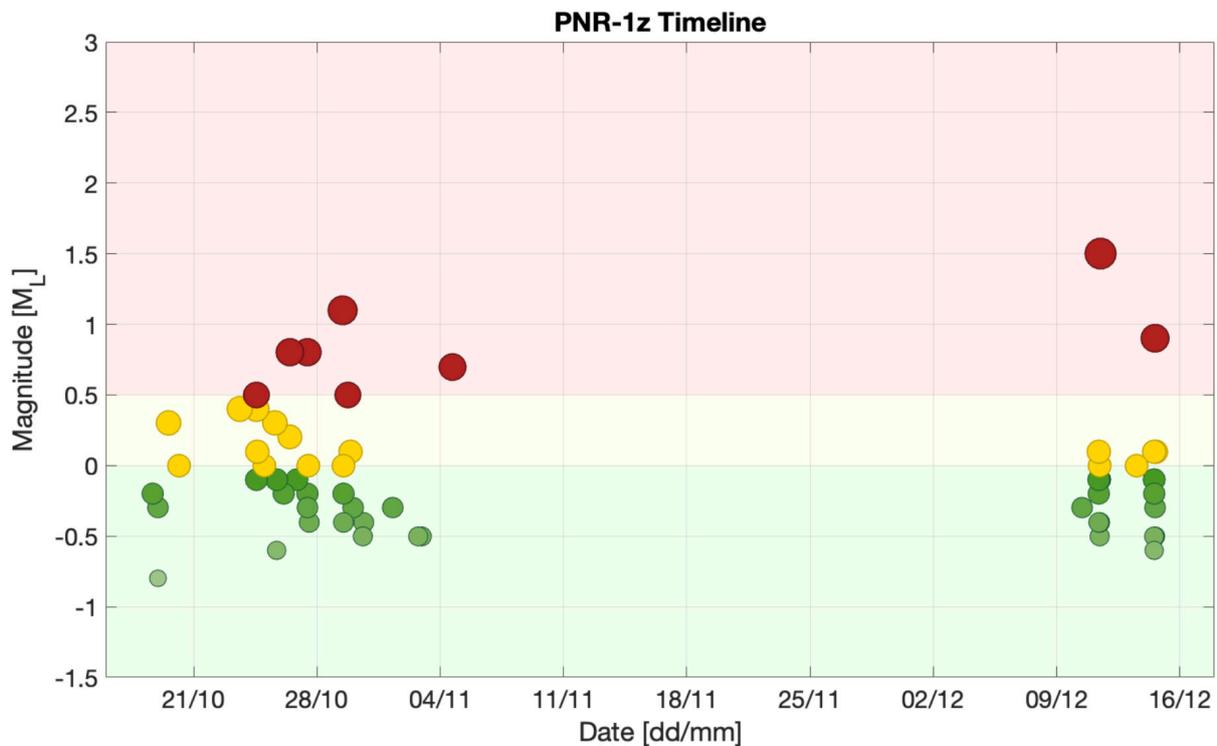


Figure 2: Seismic events detected at Preston New Road during hydraulic fracturing operations in 2018 – colour coding relates to the UK Government's Traffic Light System. Source: Verdon, J.P. based on Clarke et al. (2019)

In a new written ministerial statement in May 2018, the Business Secretary Greg Clark – heading the reorganised Department for Business, Energy and Industrial Strategy – confirmed the government's intention to consult on the PD and NSIP proposals set out in their 2017 manifesto. Clark also put forward the notion of a 'UK model' of shale development which could be exported to other countries – "the world's most environmentally robust onshore shale gas sector", as Clark put it (BEIS, 2018a).

Calls for the TLS limit to be reviewed continued into 2019. In February, a group of 49 geoscientists urged the government to relax the TLS in an open letter to *The Times* newspaper (see Gabbatiss 2019). Ministers, however, continued to resist such requests. This position was one of the key reasons behind the April resignation of the short-lived Commissioner for Shale Gas, Natascha Engel. Engel was appointed in October 2018 to provide a 'direct communication link' between communities, the industry and regulators in order to listen to community concerns and provide them with clear impartial information (BEIS, 2018b). In her resignation letter, Engel accused the government "of effectively putting an end to fracking in the UK" by listening to campaign groups rather than science. Turning to a familiar theme, Engel asserted that the majority of people in areas where exploration was taking place desperately wanted the industrial jobs that a shale industry could bring about, and were "very, very angry that a bunch of campaigners in London, backed it seems by the Government, say they can't have them [the jobs], because of almost undetectable earthquakes" (quoted in Rose 2019). At the time of writing, Engel has not been replaced and it is not clear whether a replacement is being sought.

In July, the Conservative Environment Network published a manifesto that included a proposal to ban fracking (Conservative Environment Network, 2019). The manifesto was endorsed by 41 Conservative MPs. This move highlighted growing opposition within Conservative ranks to their party's shale policy - especially concerning the proposed PD and NSIP planning reforms (Williams and Sovacool, 2020) - and offered a foretaste of what was to come.

Cuadrilla began fracking operations on the second well at PNR in August. This second period of fracking lasted just 11 days and caused more than 130 seismic events (Hayhurst, 2019b). The largest of these measured 2.9ML, the largest seismic event induced by fracking in the UK. People reported feeling this event as far afield as Chorley, approximately 17 miles away as the crow flies, and there were 'several hundred' reports of damage (Hayhurst, 2019b), although it should be noted that Cuadrilla did not accept liability and disputed some of these reports (Hayhurst, 2019c). As a result, the OGA suspended operations at the site and Menzies called for "full cessation of the shale gas industry operating on the Fylde Coast" (quoted in Hayhurst 2019d).

After this second period of seismicity at PNR, the sense of gloom around the shale industry was compounded when the government's long-running public attitude survey recorded record high opposition and record low support in results that were published in November (see Figure 3). This was the first time in 23 surveys stretching back to December 2013 that more people opposed shale extraction than 'neither supported nor opposed' it (see Figure 3). According to this survey, opposition had been greater than support since March 2015 (BEIS, 2019a).

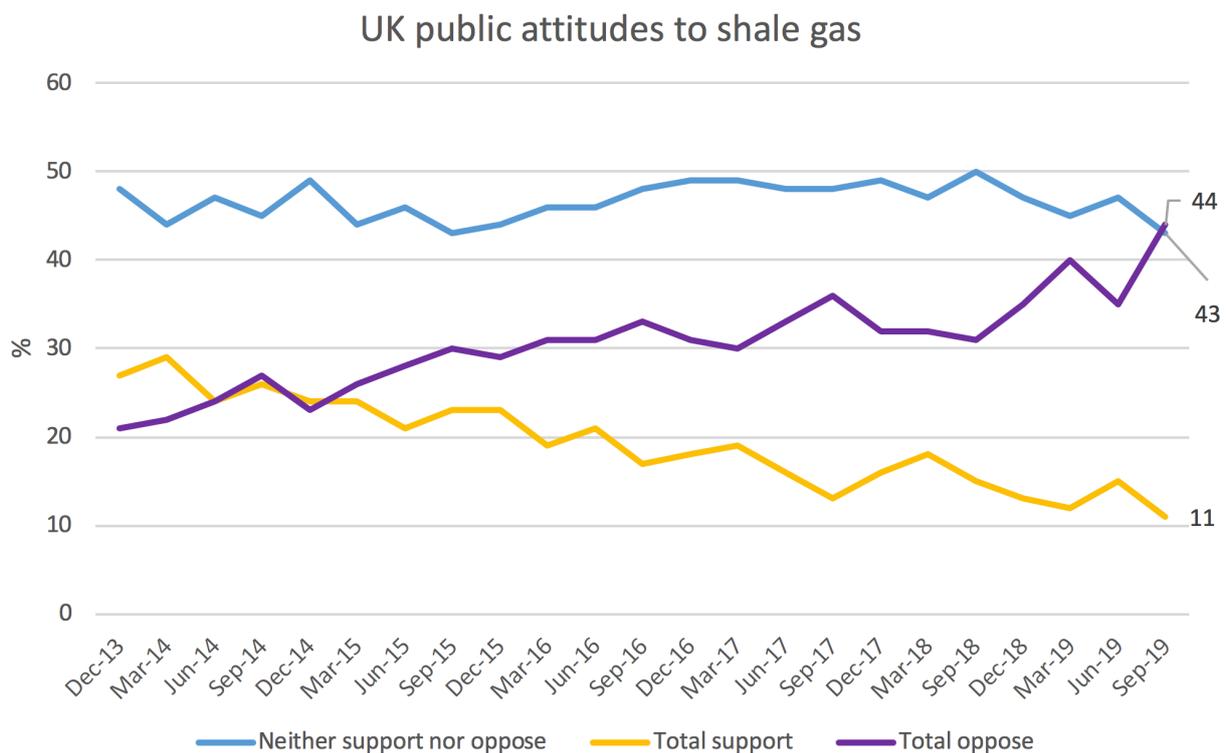


Figure 3: UK public attitudes to 'extracting shale gas to generate the UK's heat and electricity', 2013 to 2019. Source: BEIS 2019a

In November 2019 Boris Johnson's new government withdrew support for shale development as it imposed a moratorium on hydraulic fracturing in England following the seismicity at PNR. The decision was explicitly presented as being science-led, and in particular as being based on an OGA report into the 2018 period of seismicity during the fracking of the first well at PNR. That report concluded that future operations could possibly trigger larger events that could cause unacceptable damage and disturbance, and that existing methods for predicting the probability and magnitude of future seismic events cannot currently be viewed as reliable (OGA, 2019). In the statement announcing the decision, the new Business Secretary Andrea Leadsom described the 2.9ML event as "clearly unacceptable" (BEIS, 2019b, p. 1). She also stated that the 'effective moratorium' would remain in place "until compelling new evidence is provided which addresses the concerns around the prediction and management of induced seismicity" (BEIS, 2019b, p. 1).

Conclusions: Learning Lessons from a Dash for Gas that took a Decade to go Nowhere

Despite a seemingly positive policy context for shale development, the UK's second 'dash for gas' has been a painfully slow endeavour, with only three wells fracked during a 9-year period. These concluding remarks pick out some of the key reasons behind both the push to establish a domestic shale gas industry in the UK and the – for the time being at least – failure to achieve this aim. The stated reason for the recent moratorium is scientific uncertainty over the probability and magnitude of further seismicity, but the reasons for policy failure go beyond putative uncertainty, with the government itself admitting in a confidential 2016 report that low public acceptance was the 'root cause' of the industry's slow progress (Cabinet Office, 2016). We highlight five key lessons that emerge from the brief history above, before turning briefly to the future of shale development in the UK.

1. The importance of 'competitiveness anxiety'

The single most important driver of support for shale development amongst legislators was the growing gas price differential between the US and Europe, and associated 'competitiveness anxiety' and concerns for the fate of manufacturing jobs. By early 2014, government support was bolstered by concerns over both the cost of living generally and the role of energy bills therein and potentially volatile international gas markets amidst geopolitical instability. Technical reports that quantified – no matter how speculatively – the potential benefits of shale development were key to creating, sustaining and justifying enthusiasm amongst legislators and the government (see Nyberg *et al.* 2020).

2. Early risk reassurance failures

In the early years, as shale gas emerged as a matter of concern for a number of legislators and their constituents, a large number of questions were asked of the government relating to a wide range of topics and concerns. The government's response to this questioning exhibited three clear elements: (i) the government relied on the existing regulatory regime for offshore and conventional onshore gas extraction – which was said to be considered 'world-leading' – and considered this existing regime to adequately cover the risks of shale development (see Stokes 2016); (ii) rather than imposing bans on certain scenarios at policy level, an application-by-application risk management approach was adopted in which issues were dealt with by regulators if and when they arose in a particular application and were considered to pose a risk; and (iii) many issues were considered either too uncertain to make a meaningful assessment (e.g. impact on climate change) or unable to be straightforwardly extrapolated from the US experience (e.g. risks to public health and the local environment).

This response failed to satisfy many MPs or their constituents and fuelled suspicions and concerns. Ultimately the government failed in its efforts to frame fracking as a routine development requiring no specific regulatory interventions, leading to a view of the pro-shale government being unduly complacent and accommodating of industry goals. At the same time, it also resulted in a complex regulatory process that did little to convey regulatory stringency while confusing companies and members of the public alike. Nor were suspicions over inadequate regulation helped by the 'red tape bashing' of the Prime Minister in this period, which undermined the credibility of the emerging celebratory discourse over the UK's oil and gas regulation. Whilst the adopted risk management approach may have been justified from a regulatory perspective, from a public perceptions perspective it generated ambiguity about the kinds of activities that would and would not be permitted. Rather than be reassured that these matters were in the hands of the UK's world-class regulators, the absence of definitive limits on activity was interpreted by some MPs and local community members as leaving the door ajar for all manner of questionable activities. This ambiguity was compounded by the issues of uncertainty and the difficulty of extrapolating from the US case, although this was partially addressed by a number of technical reports over the years.

3. Shale politics intersecting with wider political divisions

As part of the desire to see manufacturing jobs saved and economic benefits realised in economically peripheral regions, a series of geography-, class- and identity-based resentments were mobilised in ways that foreshadowed the deep political divides that defined British politics in the second half of the decade.

On the one hand, shale advocates often invoked and mobilised an image of southern, middle-class nimbies and environmentalists whose prosperity rendered them insensitive to the benefits of shale and complacent over the real-world challenges faced by energy policy. They contrasted this with a depiction of northern communities in possession of 'industrial heritage' who desperately needed, wanted and/or understood the importance of domestic shale gas and the employment, energy and industrial benefits it promised.

On the other hand, anti-shale residents in places like Lancashire put forward a quite different version of this divide – one of a remote, powerful government based in London imposing an unwanted industry on local communities, with gas and profits set to largely flow out of the north of England to consumers across Britain and Europe and to investors around the world. The way that place- and class-based identities were mobilised by shale advocates and objectors alike may have broader implications for the relationship between populism and environmental politics in a post-Brexit UK.

4. The influence of key backbench MPs

Conservative MPs with a constituency interest were influential in shaping the government's approach, and helped to start the conversations that led to the creation of OUGO and the proposed 'Sovereign Wealth Fund for the North', for instance. However, the government rarely went far enough to satisfy these MPs and most of them had withdrawn their conditional support by the end of our timeframe. As the number of exploration sites grew so did the number of sceptical Conservative MPs who were active on this issue, and after the 2017 general election these MPs held an effective veto on any legislative ambitions over shale gas.

Progress through the planning system was indeed slow. However, efforts to reform or 'streamline' regulatory and planning processes were politically toxic, and arguably politically impossible after 2017. Such proposals were unpopular with local groups and legislators alike, including many Conservative MPs who saw regulatory streamlining as a betrayal of the government's 'gold standards' rhetoric and planning reform as a betrayal of the principle of localism (see Hawkins 2020 on the contradiction between localism and planning reform on shale).

5. The failure of the 'bridging fuel' argument

The argument over the impact of a domestic shale gas industry on climate change during our time period was complex and unresolved (see Stamford 2020 for an up-to-date assessment). Whilst one set of prominent climate policy figures argued that the UK carbon budget could accommodate a domestic shale gas industry under certain conditions (Committee on Climate Change, 2016), another set framed domestic shale development as incompatible with the fact that a high proportion of global reserves are 'unburnable' (McGlade and Ekins, 2015). Whilst these two positions were not necessarily mutually exclusive, the government failed to clearly articulate why this was the case. This issue was not helped by perceptions of the government's increasing hostility towards renewables in the latter period of Cameron's time as PM (circa late 2013-2016), which fed suspicions that shale policy was being pursued at the expense of renewables. As we have pointed out elsewhere, the 'bridging fuel' argument largely failed to persuade environmentally minded legislators outside of the Conservative party (and increasingly inside by the end of this time period) to support shale gas on climate change grounds (Williams and Sovacool 2019 & 2020).

6. The future of shale development in the UK?

Finally, looking to the future, whilst the government have framed any decision about reversing the moratorium as being about the science of seismicity, in truth political and economic realities will also play an important role. As demonstrated here, concerns over the cost of living and the retention of manufacturing jobs were a key driver of support for shale gas amongst legislators and the government during our timeline, so the looming Covid-19 recession could potentially lead to mounting calls for a rethink on shale (although whether there will be remaining appetite from investors or any surviving UK onshore oil and gas companies is questionable – see Solman and Bradshaw 2020). On the other hand, momentum is building behind the idea of a green recovery from Covid-19, which would presumably not include hydraulic fracturing. Another important factor going forward is the possible emergence of hydrogen as an important low-carbon fuel, and whether a 'gas-for-hydrogen' (with carbon capture) message is more successful in getting environmentally-minded people to see gas as a legitimate part of the low-carbon transition than the 'coal-to-gas' bridging fuel argument has been. The pandemic has also laid bare global supply chain vulnerabilities and the importance of domestic capacity for the production of strategically important goods and resources. As such, if hydrogen is to become an important basis of the economy, pressure will grow for the development of the domestic means to produce it, potentially including onshore gas.

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References

General

- Andrews, I.J. (2013) *The Carboniferous Bowland Shale gas study: geology and resource estimation*. London: British Geological Survey for Department of Energy and Climate Change. Available at: <https://www.gov.uk/government/publications/bowland-shale-gas-study>
- Arup (2014a) *Environmental Statement: Shale Gas Exploration, Roseacre Wood, Lancashire*. London: Arup.
- Arup (2014b) *Environmental Statement: Temporary Shale Gas Exploration, Preston New Road, Lancashire*. London: Arup.
- BEIS (2018a) *Energy Policy: Written statement - HCWS690*. London: BEIS. Available at: <https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2018-05-17/HCWS690>
- BEIS (2018b) *Natascha Engel appointed as Commissioner for Shale Gas [online]*. London: BEIS. Available at: <https://www.gov.uk/government/news/natascha-engel-appointed-as-commissioner-for-shale-gas>
- BEIS (2019a) *BEIS Public Attitudes Tracker: Wave 31 - summary tables*. London: BEIS. Available at: <https://www.gov.uk/government/statistics/beis-public-attitudes-tracker-wave-30>
- BEIS (2019b) *Energy Policy Update: Written statement - HCWS68*. London: BEIS. Available at: <https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2019-11-04/HCWS68/>
- BGS (2013) *Bowland Shale gas [online]*. BGS: Keyworth. Available at: <https://www.bgs.ac.uk/research/energy/shaleGas/bowlandShaleGas.html>.
- Bradshaw, M. and Waite, C. (2017) Learning from Lancashire: Exploring the contours of the shale gas conflict in England. *Global Environmental Change*, 47: 28–36.
- Cabinet Office (2016) *State of the UK shale industry by 2020 and 2025*. London: Cabinet Office. Available at: <https://www.documentcloud.org/documents/6563595-Cabinet-Office-fracking-report.html#document/p1>
- Cameron, D. (2013) *We cannot afford to miss out on shale gas*. The Telegraph. Available at: <https://www.telegraph.co.uk/news/politics/10236664/We-cannot-afford-to-miss-out-on-shale-gas.html>.
- Carrington, D. (2015) *Tories forced into U-turn on fast-track fracking after accepting Labour plans*. The Guardian. Available at: <https://www.theguardian.com/environment/2015/jan/26/conservatives-u-turn-fracking-labour-cuadrilla-drilling-ban%0D>
- Clarke, H. et al. (2019) Real-time imaging, forecasting, and management of human-induced seismicity at Preston new road, Lancashire, England. *Seismological Research Letters*, 90(5):1902–1915.
- Committee on Climate Change (2016) *Onshore Petroleum: The compatibility of UK onshore petroleum with meeting the UK's carbon budgets*. London: CCC. Available at <https://www.theccc.org.uk/publication/onshore-petroleum-the-compatibility-of-uk-onshore-petroleum-with-meeting-carbon-budgets/>
- Conservative Environment Network (2019) *The CEN Manifesto*. London: CEN. Available at: <https://static1.squarespace.com/static/5a3798f32aeba55a92e8d1ee/t/5d1b30a40e0311000158d575/1562063024522/The+CEN+Manifesto+DIGI.pdf>.
- Conservative Party (2017) *Forward, Together: Our Plan for a Stronger Britain and a Prosperous Future*. London: Conservative Party. Available at: <https://general-election-2010.co.uk/2017-general-election-manifestos/conservative-manifesto-2017.pdf>.
- Cotton, M. (2020) *Consensus on banning shale gas? Political convergence and divergence across devolved administrations*. Newcastle: UKUH.
- DCLG (2016) *Decision Letter for appeals LCC/2014/0096, LCC/2014/0097, LCC/2014/0101, LCC/2014/0102*. London: DCLG.
- DECC (2010) *The Unconventional Hydrocarbon Resources of Britain's Onshore Basins - Shale Gas*. London: DECC. Available at: https://www.og.decc.gov.uk/UKpromote/onshore_paper/UK_onshore_shalegas.pdf.
- DECC (2012) *Written Ministerial Statement by Edward Davey: Exploration for shale gas*. London: DECC. Available at: <https://www.gov.uk/government/speeches/written-ministerial-statement-by-edward-davey-exploration-for-shale-gas>
- DECC (2014) *Government Response to the Consultation on Proposal for Underground Access for the Extraction of Gas, Oil or Geothermal Energy*. London: DECC. Available at: <https://www.gov.uk/government/consultations/underground-drilling-access>.
- DECC (2015a) *Amber Rudd's speech on a new direction for UK energy policy*. London: DECC. Available at: <https://www.gov.uk/government/speeches/amber-rudds-speech-on-a-new-direction-for-uk-energy-policy>.
- DECC (2015b) *Shale Gas and Oil Policy: Written statement - HCWS202*. London: DECC. Available at: <https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2015-09-16/HCWS202/>
- Gabbatiss, J. (2019) *Scientists urge government to relax earthquake rules to allow more fracking*. The Independent. Available at: <https://www.independent.co.uk/environment/fracking-earthquakes-scientists-limits-cuadrilla-shale-gas-fossil-fuels-climate-change-a8771641.html>.

Greatrex, T. (2012) *An absolutist position on shale gas is not in our interests*. BusinessGreen. Available at: <https://www.businessgreen.com/opinion/2157329/absolutist-position-shale-gas>

Green, C., Styles, P. and Baptie, B. (2012) *Preese Hall Shale Gas Fracturing: Review and recommendations for induced seismic mitigation*. London: DECC. Available at: <https://www.gov.uk/government/publications/preese-hall-shale-gas-fracturing-review-and-recommendations-for-induced-seismic-mitigation>

Hawkins, J. (2020) *The Shale Gas Legal Landscape*. Newcastle: UKUH.

Hayhurst, R. (2015a) *Two Lancs Tories joined MPs voting for a fracking moratorium*. Drill or Drop? Available at: <https://drillordrop.com/2015/01/26/two-lancs-tories-joined-mps-voting-for-a-fracking-moratorium/>

Hayhurst, R. (2015b) *Infrastructure Bill becomes an Act – what’s finally in it and what do people think about it?* Drill or Drop? Available at: <https://drillordrop.com/2015/02/12/where-are-we-now-with-the-infrastructure-bill/>

Hayhurst, R. (2015c) *New fracking conditions adopted in House of Lords without a vote*. Drill or Drop? Available at: <https://drillordrop.com/2015/02/09/new-fracking-conditions-adopted-in-house-of-lords-without-a-vote/>

Hayhurst, R. (2015d) *New fracking amendments to Infrastructure Bill released*. Drill or Drop? Available at: <https://drillordrop.com/2015/02/11/new-fracking-amendments-to-infrastructure-bill-released/>

Hayhurst, R. (2015e) *Campaigners accuse government of diluting fracking protections*. Drill or Drop? Available at: <https://drillordrop.com/2015/02/06/campaigners-accuse-government-of-diluting-fracking-protections/>

Hayhurst, R. (2015f) *Labour calls for moratorium after fracking vote*. Drill or Drop? Available at: <https://drillordrop.com/2015/12/16/labour-calls-for-moratorium-after-fracking-vote/>

Hayhurst, R. (2018a) *Preston New Road, Lancashire*. Drill or Drop? Available at: <https://drillordrop.com/preston-new-road-lancashire/>

Hayhurst, R. (2018b) *Red-level tremor stops fracking as total seismic events top 50*. Drill or Drop? Available at: <https://drillordrop.com/2018/12/14/red-level-tremor-stops-fracking-as-total-seismic-events-top-50/%0D>

Hayhurst, R. (2018c) *Cuadrilla accepted tough controls on fracking earth tremors six years ago*. Drill or Drop? Available at: <https://drillordrop.com/2018/10/31/cuadrilla-accepted-tough-controls-on-fracking-earth-tremors-six-years-ago/>

Hayhurst, R. (2019a) *What’s happened two years on from Ineos shale gas applications?* Drill or Drop? Available at: <https://drillordrop.com/2019/05/08/whats-happened-two-years-on-from-ineos-shale-gas-applications/>

Hayhurst, R. (2019b) *Review of 2019*. Drill or Drop? Available at: <https://drillordrop.com/2019/12/28/review-of-2019/>

Hayhurst, R. (2019c) *Cuadrilla sent office staff to check property damage from UK’s biggest fracking earth tremor*. Drill or Drop? Available at: <https://drillordrop.com/2019/09/26/cuadrilla-sent-office-staff-to-check-property-damage-from-uks-biggest-fracking-earth-tremor/>

Hayhurst, R. (2019d) *Updated: Fracking suspended after 2.9ML tremor – Conservative MP calls for ban*. Drill or Drop? Available at: <https://drillordrop.com/2019/08/26/fracking-suspended-after-2-9ml-tremor-conservative-mp-calls-for-ban/%0D>

HM Treasury (2012) *Autumn Statement 2012: Chancellor’s statement*. London: HM Treasury. Available at: <https://www.gov.uk/government/speeches/autumn-statement-2012-chancellors-statement>

HM Treasury (2014) *Chancellor George Osborne’s Autumn Statement 2014 speech*. London: HM Treasury. Available at: <https://www.gov.uk/government/speeches/chancellor-george-osbornes-autumn-statement-2014-speech>

HoC Library (2017) *Shale gas and fracking: Briefing Paper*. London: HoC Library.

Hollinger, P. (2016) *Ineos targets British test wells to kick-start shale gas market*. Financial Times. Available at: <https://www.ft.com/content/32d8779a-4c36-11e6-88c5-db83e98a590a>.

Hunter, T. (2020) *UK Shale Gas Regulation: a Gold Standard?* Newcastle: UKUH.

International Energy Agency (2011) *Are We Entering a Golden Age of Gas?* Paris: IEA. Available at: <https://www.iea.org/reports/are-we-entering-a-golden-age>

IoD (2013) *Getting shale gas working*. London: IoD. Available at: <https://www.iod.com/news/news/articles/Getting-Shale-Gas-Working>

Labour Party (2017) *For the many, not the few*. London: Labour Party. Available at: <https://labour.org.uk/wp-content/uploads/2017/10/labour-manifesto-2017.pdf>

Landale, J. (2013) *Ed Miliband: Labour would freeze energy prices*. BBC News. Available at: <https://www.bbc.co.uk/news/uk-politics-24213366>

Liberal Democrats (2017) *Change Britain’s Future: Liberal Democrat Manifesto 2017*. London: Liberal Democrats.

Mackay, D. and Stone, T. (2013) *Potential greenhouse gas emission associated with shale gas extraction and use*. London: DECC. Available at: <https://www.gov.uk/government/publications/potential-greenhouse-gas-emissions-associated-with-shale-gas-production-and-use>

Mason, R. (2013) *David Cameron at centre of “get rid of all the green crap” storm*. The Guardian. Available at: <https://www.theguardian.com/environment/2013/nov/21/david-cameron-green-crap-comments-storm>.

Mazur, A. (2016) How did the fracking controversy emerge in the period 2010-2012? *Public Understanding of Science*, 25(2):207–222.

- McGlade, C. and Ekins, P. (2015) The geographical distribution of fossil fuels unused when limiting global warming to 2°C. *Nature*, 517(7533): 187–190.
- McKay, W. (2016) *Report to the Secretary of State for Communities and Local Government*. Bristol: Planning Inspectorate.
- McWorter, K. (2015) The biggest thing since the arrival of the railway. In: Rodriguez, S. M-S. ed. *Global resistance to fracking: Communities rise up to fight climate crisis and democratic deficit*. Madrid: Ecologists in Action: 85–90. Available at: https://spip.ecologistasenaccion.org/IMG/pdf/fracking_global_resistance.pdf.
- Nyberg, D., Wright, C. and Kirk, J. (2020) Fracking the Future: The Temporal Portability of Frames in Political Contests. *Organization Studies*, 41(2): 175-196.
- O'Hara, S. et al. (2015) *Public Perception of Shale Gas Extraction in the UK: Two Years On From the Balcombe Protests*. Nottingham: University of Nottingham.
- O'Hara, S. et al. (2016) *Public Perception of Shale Gas Development in the UK: From positive to negative*. Nottingham: University of Nottingham.
- OGA (2015) *14th Onshore Licensing Round [online]*. Aberdeen: OGA. Available at: <https://www.ogauthority.co.uk/licensing-consents/licensing-rounds/onshore-licensing-rounds/#tabs%0D>
- OGA (2019) *Interim report of the scientific analysis of data gathered from Cuadrilla's operations at Preston New Road*. Aberdeen: OGA. Available at: <https://www.ogauthority.co.uk/media/6149/summary-of-pnr1z-interim-reports.pdf>
- Pöyry (2014) *UK Shale Gas - where are we now?* Helsinki: Pöyry.
- Press Association (2014) *Fracking "good for the UK", says David Cameron*. The Guardian. Available at: <https://www.theguardian.com/environment/2014/mar/26/fracking-good-for-uk-cameron>.
- Prime Minister's Office (2014) *The Queen's Speech 2014 - briefing notes*. London: Prime Minister's Office. Available at: <https://www.gov.uk/government/publications/queens-speech-2014-background-briefing-notes>
- Rose, D. (2019) *Britain's fracking tsar Natascha Engel reveals her resignation in The Mail On Sunday as she accuses ministers of putting our energy security in peril by caving in to green zealots*. The Mail on Sunday. Available at: <https://www.dailymail.co.uk/news/article-6967503/Britains-fracking-tsar-Natascha-Engel-reveals-resignation-Mail-Sunday.html%0D>.
- Shankleman, J. (2014) *Mark Carney: most fossil fuel reserves can't be burned*. The Guardian. Available at: <https://www.theguardian.com/environment/2014/oct/13/mark-carney-fossil-fuel-reserves-burned-carbon-bubble>.
- Sheppard, D. and McCormick, M. (2018) *Cuadrilla says UK fracking rules risk "strangling" it*. Financial Times. Available at: <https://www.ft.com/content/cb36ad4e-dc5e-11e8-9f04-38d397e6661c>.
- Shipman (2015) *Locals to get veto over wind farms*. The Sunday Times. Available at: <https://www.thetimes.co.uk/article/locals-to-get-veto-over-wind-farms-b5kn890ktpc>.
- Short, D., Stretetsky, P. and Szolucha, A. (2020) *Anti-'fracking' Activism and Local Democracy*. Newcastle: UKUH.
- Solman, N. and Bradshaw, M. (2020) *Shale Gas and UK Energy Security*. Newcastle: UKUH
- Stamford, L. (2020) *Shale Gas and the UK's Low Carbon Transition*. Newcastle: UKUH.
- Stokes, E. (2016) Regulatory Domain and Regulatory Dexterity : Critiquing the UK Governance of "Fracking". *The Modern Law Review*, 79(6): 961–986.
- The Parliamentary Office of Science and Technology (2013) *UK Shale gas potential*. London: POST. Available at: https://www.parliament.uk/documents/post/ShaleGas_POSTbox.pdf
- The Royal Society & Royal Academy of Engineering (2012) *Shale gas extraction in the UK: a review of hydraulic fracturing*. London: Royal Society and Royal Academy of Engineering. Available at: <https://royalsociety.org/topics-policy/projects/shale-gas-extraction/report/>
- UK Government (2014) *Local councils to receive millions in business rates from shale gas developments [online]*. London: UK Gov. Available at: <https://www.gov.uk/government/news/local-councils-to-receive-millions-in-business-rates-from-shale-gas-developments> (Accessed: 20 March 2020).
- UKOOG (2013) *Community Engagement Charter Oil and Gas from Unconventional Reservoirs*. London: UKOOG. Available at: <http://www.ukoog.org.uk/images/ukoog/pdfs/communityengagementcharterversion6.pdf>.
- Vaughan, A. (2016) *Ten years after "hug a husky", what is David Cameron's green legacy?* The Guardian. Available at: <https://www.theguardian.com/environment/blog/2016/apr/20/david-cameron-hug-a-husky-green-legacy-10-years>.
- Williams, L. (2018) *Channelling sensitivity: the production of justification for shale gas development through the English planning system*. Brighton: University of Sussex. Available at: <sro.sussex.ac.uk/id/eprint/83391/%0D>.
- Williams, L. and Sovacool, B. K. (2019) The discursive politics of "fracking": Frames, storylines, and the anticipatory contestation of shale gas development in the United Kingdom. *Global Environmental Change*, 58: 1-17.
- Williams, L. and Sovacool, B. K. (2020) Energy democracy, dissent and discourse in the party politics of shale gas in the United Kingdom. *Environmental Politics*, 1–25.
- Wood, J. (2012) *The Global Anti-Fracking Movement: What it wants, how it operates and what's next*. London: Control Risks.

Hansard

- Hansard. 2009. H.C. Vol 502. col. 327W Oil (December 2009).*
- Hansard. 2010. H.L. Vol 718. col. 919 Energy Bill – Second Reading (March 2010).*
- Hansard. 2010. H.C. Vol 513. col. 158WH Energy Security (July 2010).*
- Hansard. 2010. H.C. Vol 519. col. 809W Natural Gas (December 2010).*
- Hansard. 2010. H.C. Vol 520. col. 14W Natural Gas (December 2010).*
- Hansard. 2010. H.C. Vol 520. col. 744W Hydraulic Fracturing (December 2010).*
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- Hansard. 2013. H.C. Vol 566. cols. 307WH-318WH and 340WH UK Shale Gas (July 2013).*
- Hansard. 2013. H.L. Vol 746. col. 175 Energy Bill – Second Reading (June 2013).*
- Hansard. 2013. H.L. Vol 747. col. 1641 Energy: Fracking (July 2013).*
- Hansard. 2013. H.L. Vol 748. col. 1334 Energy Bill – Report (1st day) (October 2013).*
- Hansard. 2013. H.L. Vol 749. col. 39 Energy Bill – Report (2nd day) (November 2013).*
- Hansard. 2014. H.C. Vol 588. cols. 206WH, 210WH and 213WH Fracking (November 2014).*
- Hansard. 2014. H.L. Vol 756. col. 1594 Shale Gas and Oil (EAC Report) (November 2014).*
- Hansard. 2015. H.C. Vol 591. col. 577 Infrastructure Bill (January 2015).*
- Hansard. 2015. H.L. Vol 759. cols. 1065-1068 Infrastructure Bill (February 2015).*
- Hansard. 2015. H.C. Vol 592. col. 906 Infrastructure Bill [Lords] (February 2015).*
- Hansard. 2016. H.C. Vol 605. col. 45WH Onshore Oil and Gas (January 2016).*
- Hansard. 2017. H.C. Vol 631. cols. 439WH-443WH Hydraulic Fracturing: North East Derbyshire (November 2017).*



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