



Department
of Energy &
Climate Change

Underground Drilling Access

Consultation on Proposal for Underground Access
for the Extraction of Gas, Oil or Geothermal Energy

URN 14D/099

May 2014

Department of Energy and Climate Change

3 Whitehall Place

London

SW1A 2AW

Telephone: 0300 068 4000

Website: www.decc.gov.uk

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For further information on this consultation, contact:

The Office of Unconventional Gas and Oil and The Heat Strategy and Policy Team

Department of Energy and Climate Change

3 Whitehall Place

London

SW1A 2AW

Telephone: 0300 068 5289

Email: underground.access@decc.gsi.gov.uk

The consultation can be found on DECC's website:

<https://econsultation.decc.gov.uk/decc-policy/consultation-on-underground-drilling-access>

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Introduction

The Office of Unconventional Gas and Oil

The Office of Unconventional Gas and Oil (OUGO) is part of the Energy Development Unit in the Department of Energy and Climate Change. OUGO aims to promote the safe, responsible, and environmentally sound recovery of the UK's unconventional reserves of gas and oil.

The Energy Development Unit is responsible for encouraging and overseeing energy development in the UK, including licensing oil and gas exploration and production to ensure we make the best use of our available natural resources.

The Heat Strategy and Policy Team

The Heat Strategy and Policy team is taking forward the actions in the DECC publication “The Future of Heating: Meeting the challenge”. This sets out how we supply and use heat today and describes how the heat system will need to evolve over time to meet our renewable and emissions reductions targets. It focuses on four different aspects of the heat challenge – industrial heat, networked heat, heat in buildings, and grids and infrastructure. Deep geothermal policy sits within networked heat.

The Purpose of this Consultation

This consultation concerns the advancement of two industries that are at an early stage of development in the UK. The Government believes that shale gas and oil may have the potential to provide the UK with greater energy security, growth and jobs. Successful exploration of unconventional resources in other countries, notably the United States, has proved an important source of energy. We know that there are, for example, large shale resources in the UK but we do not yet know how much of the unconventional gas and oil in the UK is technically and economically recoverable.

Ultimately the question of whether recovery of these resources is economically viable is one for industry, but the Government wants to ensure the right framework is in place to support industry and local areas as this exploration and, in some cases, production, moves forward. Safeguarding the environment and public safety is a vital part of this process.

The proposals set out here would apply to any underground drilling for the extraction of petroleum, which covers all oil and gas *including* conventional oil and gas. However, the issue of access rights is not as significant for conventional drilling projects, as operators will not usually require extensive horizontal drilling at depth (although this may occasionally be used). As such, this consultation refers mainly to shale gas and oil for ease of understanding. Where ‘petroleum’ is used, this has the same meaning as defined in the Petroleum Act 1998, which includes all oil and gas. These proposals are not intended to apply to Coal Bed Methane (CBM) or Underground Coal Gasification (UCG) development. These operators will already be able to obtain underground access under the terms of the Coal Industry Act 1994.

Government and local authorities have also put their support behind geothermal district heating networks as part of the transition to low carbon heating. We are encouraging safe and environmentally sound development of these industries in order to determine their potential.

Given the potential benefits for energy security, decarbonisation and economic growth, enabling these industries to proceed with exploration is in the national interest.

For both industries, we strive to ensure the regulatory regime is fit for purpose. This consultation examines one aspect of the existing regulatory framework where there is scope for change to make the regime more effective: access to underground land. We assess the challenges and implications of the existing regulatory framework for access, and set out our proposed solution. This solution would be implemented in legislation, which we intend to present when parliamentary time allows.

The solution we have proposed is not novel – Section 3(2) of the Mines (Working Facilities and Support) Act 1966 addresses the same issue for mineral developers, including oil and gas operators, and allows them to gain access via a court order where appropriate. However, as we explain in this document, this procedure is lengthy and costly and we do not consider it to be the best option in relation to access for horizontal drilling deep underground.

This document explains how we have developed our proposed solution and requests feedback on the three key areas of the proposal. It does not seek views on the broader policy of whether or not to develop either the petroleum or geothermal industries in the UK, nor the potential risks and issues associated with surface works, because no change is proposed to the relevant legal and regulatory frameworks.

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General information

Purpose of this consultation:

The Government is seeking views on proposed legislation that will cover the process by which shale gas, oil and geothermal companies gain access to underground land.

Issued: 23 May 2014

Respond by: 15 August 2014

Enquiries to:

The Office of Unconventional Gas and Oil and The Heat and Strategy Policy Team
Department of Energy & Climate Change,
3rd Floor Area A,
3 Whitehall Place,
London, SW1A 2AW
Tel: 0300 068 5289

Email: underground.access@decc.gsi.gov.uk

Consultation reference: URN 14D/099 –Underground Drilling Access

Territorial extent:

We intend the proposals outlined in this consultation to apply to England, Wales and Scotland in respect of petroleum (i.e. gas and oil). In respect of deep geothermal energy, the consultation also covers England, Wales and Scotland. However, the application of proposals on deep geothermal energy in Scotland and Wales will be the subject of consultation with the respective administrations. Both petroleum and deep geothermal energy are transferred matters in Northern Ireland but we are in discussion with Northern Ireland on whether the proposals could be extended there.

How to respond:

You can respond to this consultation in the following ways:

By email to: underground.access@decc.gsi.gov.uk

By post to:

The Office of Unconventional Gas and Oil and The Heat and Strategy Policy Team
Department of Energy & Climate Change,
3rd Floor Area A,
3 Whitehall Place,
London, SW1A 2AW

Via our electronic consultation portal:

<https://econsultation.decc.gov.uk/decc-policy/consultation-on-underground-drilling-access>

Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

It would be helpful if in your reply you noted whether you are referring to oil and gas or deep geothermal projects, or both. Please provide supporting evidence wherever possible.

Additional copies:

You may make copies of this document without seeking permission. An electronic version can be found at:

<https://econsultation.decc.gov.uk/decc-policy/consultation-on-underground-drilling-access>.

Confidentiality and data protection:

Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information legislation (primarily the Freedom of Information Act 2000, the Data Protection Act 1998 and the Environmental Information Regulations 2004).

If you want information that you provide to be treated as confidential please say so clearly in writing when you send your response to the consultation. It would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded by us as a confidentiality request.

We will summarise all responses and place this summary on our website at www.decc.gov.uk/en/content/cms/consultations/. This summary will include a list of names or organisations that responded but not people's personal names, addresses or other contact details.

Quality assurance:

This consultation has been carried out in accordance with the Government's Consultation Principles, which can be found here:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/255180/Consultation-Principles-Oct-2013.pdf

If you have any complaints about the consultation process (as opposed to comments about the issues which are the subject of the consultation) please address them to:

DECC Consultation Co-ordinator
3 Whitehall Place
London SW1A 2AW
Email: consultation.coordinator@decc.gsi.gov.uk

Underground Drilling

This section looks at the types of drilling to be covered by the proposed legislation on underground access, and the associated risks and regulatory regimes.

Shale Gas and Oil

Conventional oil and gas deposits (such as those exploited in the North Sea) are contained in permeable rocks, such as sandstone. In the UK, “conventional” onshore oil and gas exploration and production has to date mostly involved vertical or near-vertical drilling from one spot at the surface. A drilling rig is established at the surface, and a well drilled towards the oil or gas deposits. To drill that well, the company that intends to drill must have obtained a right of access from the owner of the land through which the drill passes. Because of the simple drill route typically used for conventional onshore oil and gas drilling in the UK, operators have had to negotiate with relatively few landowners for each project.

Shale gas is essentially the same substance as North Sea gas (i.e. mostly methane) but is so called because the gas is trapped in impermeable shale rock.

A well for shale gas will usually run vertically down to the shale layer (usually over a mile down) and then extend horizontally for some distance – US experience suggests this could be as much as 2 miles, and perhaps more. There may be a number of these horizontal extensions used to access the gas trapped in shales over a large surface area (see Figure 1 below). Instead of drilling numerous vertical wells from different points on the surface (which would all require a drilling rig and well site), the operator can access large areas of shale with wells drilled from a single pad of a hectare or so. So horizontal drilling reduces the impact and disruption on the surface.

Like other oil and gas exploration or production, a well is drilled and several stages of concentric metal tubes (“casing”) are set in concrete within the borehole, to contain the hydrocarbons and drilling fluids, and prevent contamination of surrounding groundwater. The well diameter, over much of the length of the well, is typically around 6 inches.

Once the wells have been drilled, the operator can enlarge or create fractures in the rock by hydraulic fracturing (or ‘fracking’) with fluid at high pressure, which enables shale gas to flow out. This is an established technique for conventional oil and gas in the UK, but used more intensively for shale. For shale oil and gas, the fluid is largely water, with a small proportion of small particles (usually sand) which, once wedged in the fractures, keep them open when the pressure is released, so that gas or oil can flow into the well. 98-99% of the material used for fracking shale is water and sand. Small quantities of chemicals are normally added to improve efficiency, normally by reducing friction.

The gas or oil can then flow through the well to surface operations which separate and process them. Over 2 million wells have been hydraulically fractured worldwide, mostly in North America.

Horizontal drilling and fracturing covers a much larger underground area than conventional drilling, as illustrated in Figures 1 and 2 below. (Note however that there is no experience to date of what type of layout may prove efficient in UK shales.)

Horizontal drilling and hydraulic fracturing have been used at a lower intensity by the oil and gas industry for over fifty years, but it is only relatively recently that improvements in technology have made the extraction of ‘unconventional’ resource (such as shale gas) economically viable. The shale gas industry has taken off in the US, but is still at an early stage of development in the UK. British Geological Survey (BGS) studies suggest the areas with most potential for shale gas exploration are where existing conventional gas has been found. Significant parts of the UK have no prospective shale rock.

In July 2013, the BGS published a study of the Bowland Shale of the Pennine Basin in the North of England, which estimated the “gas in place” of that area alone as 1,300 trillion cubic feet. Other areas with relevant shale rock include the Kimmeridge Clay of the Weald Basin in Surrey and Sussex, and the Oil-Shale Group of the Midland Valley, or central belt, of Scotland.

Little drilling or testing has taken place in Britain’s shale deposits, so it is not yet possible to estimate how much shale gas or oil may be practically and commercially recoverable.

The Government has committed to developing shale gas and oil exploration due to its potential for improving energy security and boosting economic growth. A third of UK energy demand is met by gas. The majority of gas is used for heating buildings and for industrial processes, with the remainder used in power stations to generate electricity. As we use less coal in the next 10-15 years for electricity generation, gas will help fill the gap alongside renewable and nuclear electricity, helping the UK reduce carbon emissions. We forecast that in 2030, the UK’s gas consumption will be around the same level as it is today. We will continue to need gas for many years and development of a UK shale industry could help to meet this demand.

Shale development could also support the economy. The Institute of Directors¹ estimated that UK shale gas production would be a net benefit to public finances, could attract annual investment of £3.7 billion and support up to 74,000 jobs directly, indirectly and through broader economic stimulus.

The proposals set out in this consultation would apply to both conventional and unconventional gas and oil projects (i.e. shale gas and oil). Given that unconventional oil and gas tends to require more extensive underground drilling than conventional oil and gas projects, we will refer mostly to shale gas and oil for ease of use. These proposals are not intended to apply to Coal Bed Methane (CBM) or Underground Coal Gasification (UCG) development. These operators will already be able to obtain underground access under the terms of the Coal Industry Act 1994.

Geothermal

Geothermal energy is the energy stored in the form of heat beneath the earth's surface. There are two types of geothermal technology:

Deep geothermal for direct heat use – this tends to be sourced from hot water aquifers which are rock layers containing groundwater at depths of around a mile down where temperatures are considerably hotter than the surface. This water can be extracted and will naturally replenish. At temperatures of over 60 degrees centigrade the heat can be used for local heat networks or for cooling through the use of absorption chillers.

¹ *Getting Shale Gas Working*, IoD, May 2013

Deep geothermal power – In non-volcanic regions, generating power from deep geothermal resource has typically centred on binary systems at lower temperatures or the development of Enhanced Geothermal System technologies (EGS) at higher temperatures. EGS involves deeper drilling of typically two or three miles down to access higher temperatures, and is generally associated with stimulation of the rocks (hydraulic or chemical fracturing can be used) in order to enhance the permeability of the typically crystalline rocks. This process is required in areas of low heat resource such as the UK and much of continental Europe.

Deep geothermal energy is renewable and low carbon. It is a particularly attractive renewable technology because geothermal plants have little visual, noise or air quality impact, aside from the initial drilling. And, unlike renewable technologies such as wind, hydro and solar that are affected by changes in the weather, geothermal plants can run almost continuously. For power plants, this would provide baseload electricity. For heat, this means a reliable source of renewable heat all year round.

However, the UK is not necessarily the right location for extensive geothermal power plants. In some locations (mainly in volcanic regions, for example in Iceland and New Zealand) high temperatures are found at shallow depths or at the surface. It is these regions that have the vast majority of geothermal plants.

The UK does not have the resource potential of these volcanic regions. However, in some locations, underground temperatures have the potential for deep geothermal projects, at depths of:

- over 1 mile for heat only projects (with potential sites spread fairly extensively across the country)
- 2-3 miles for power projects (with potential sites limited to very specific areas for reasons of local geology)

There is only one existing deep geothermal scheme in the UK, at Southampton, which forms part of the city centre district heating system drawing warm (76 °C) water from the Wessex Basin Hot Sedimentary Aquifer at 1,800 metres depth. There are no deep geothermal power schemes yet in the UK, though some are being explored (see below). A DECC-commissioned report by Atkins on the potential of deep geothermal power in the UK was published last October.²

The Government is prioritising the development of heat-only deep geothermal projects. Some of the most promising geothermal resource is found in hot sedimentary aquifers under large urban areas at economically drillable depths. In the Government's strategic framework for heat, we identified the development of district heating networks, as an important part of the transition to low carbon heating, and deep geothermal as a potential heat source for those networks. A number of deep geothermal heat projects are already making progress or are planned. These are being supported through the Renewable Heat Incentive. The Government is providing practical support and funding to encourage the deployment of heat networks, including through the work and funding of the Heat Networks Delivery Unit.

Heat projects are proposed at Manchester, North Tyneside, Newcastle, Crewe and Stoke. Two power projects are proposed in Cornwall and one in County Durham.

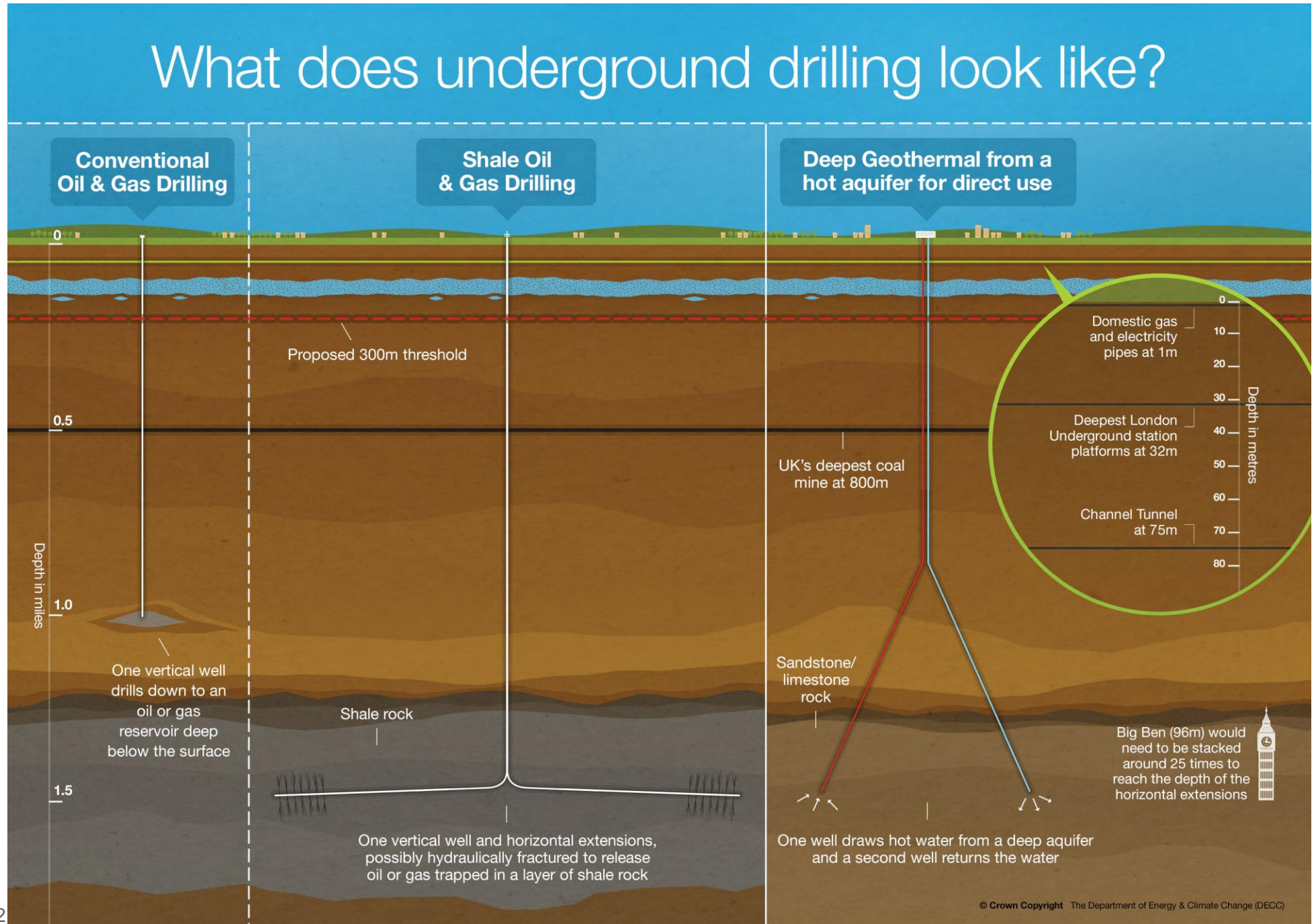
Geothermal heat schemes utilising hot sedimentary aquifers require well separation distances of up to 2km. Directional drilling is required to locate the best point from which to withdraw the water and to ensure sufficient separation between this point and the reinjection of the colder

² <https://www.gov.uk/government/publications/deep-geothermal-review-study>

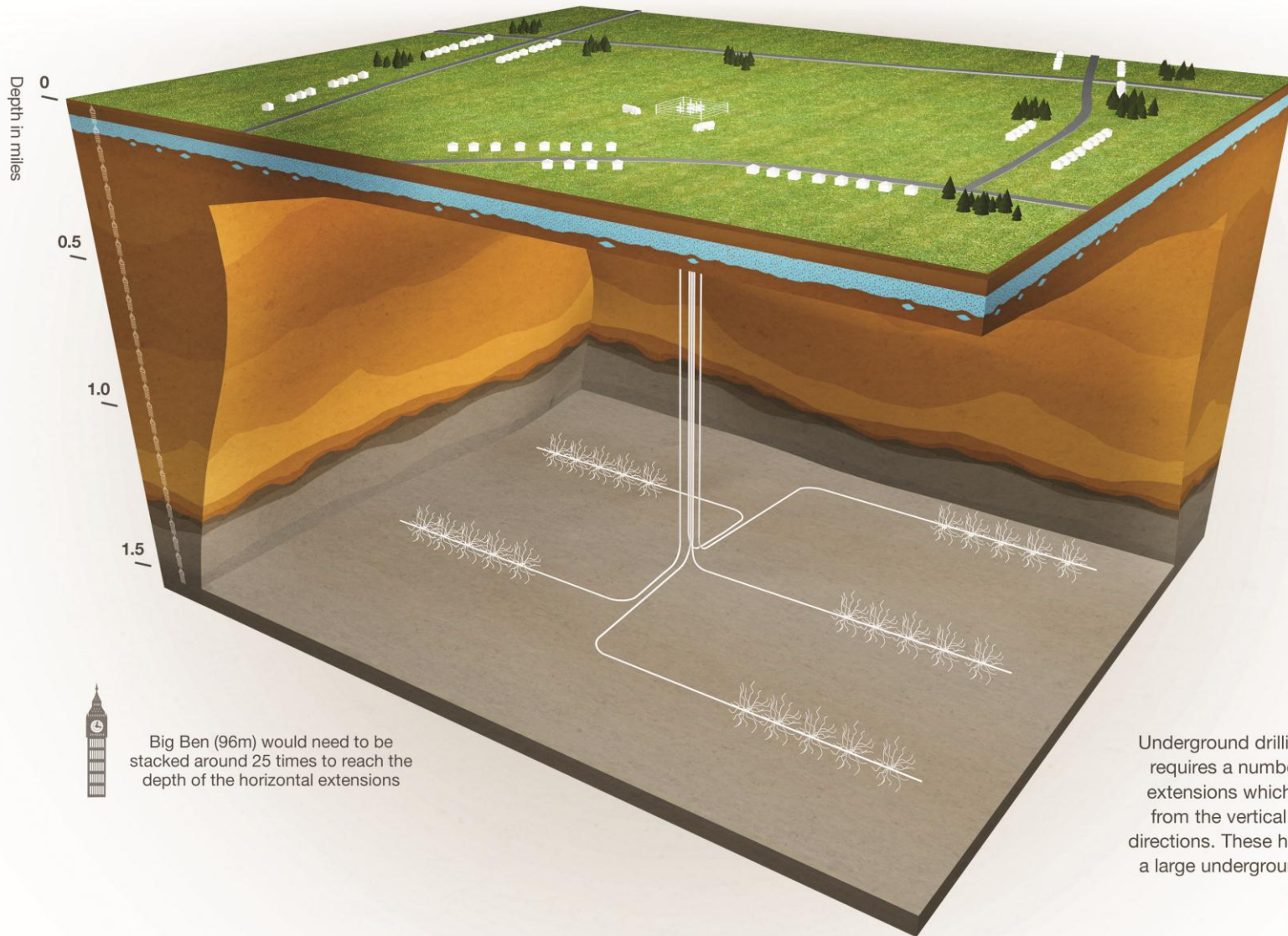
returning water. Geothermal schemes that link with district heating networks need to be sited near areas with a high demand for heat, such as cities, given the cost of transporting heat over more than short distances.

Note: The figures below are for illustrative purposes only – real underground drilling may deviate from these diagrams.

Figure 1



What might underground drilling for shale gas look like?



Underground drilling for shale gas requires a number of horizontal extensions which extend far out from the vertical well in various directions. These horizontals access a large underground surface area.

How do companies get permission to drill?

1. **Initial Licence** – There are currently around 176 licences issued by DECC for onshore oil and gas in the UK. Geothermal does not have an equivalent licensing regime. However, in the case of geothermal heat schemes a Groundwater Investigation Consent (GIC) and an abstraction licence will be required from the Environment Agency.
2. **Landowner(s) agreement to access the land for drilling** – Companies need to obtain a right of access from landowners for both surface and underground land. *Underground land is the sole subject of this consultation, so even if the existing regime is amended, all other requirements will remain unchanged: companies will still need to seek the permission of landowners to gain access at the surface.*
3. **Planning permission from the local authority** – A key part of this permission is consultation with the local community, where landowners will retain the right to oppose activity. This takes place at a formative stage before any activity has been permitted. There is provision for landowners whose underground land may be relevant to be notified through public notices. The planning authority may also require an Environmental Impact Assessment (EIA), in which case this will be part of the public consultation. The shale industry, through its trade body, has committed to carrying out EIAs where hydraulic fracturing is involved in the exploration stage.
4. **Permits from the relevant environmental regulator**. In the case of shale gas, once an application for an environmental permit is made, the environmental regulator will publish details and publicise them on their website for public consultation³. The regulator will not grant a permit if it believes the risks to be insufficiently mitigated or too great – and will take individual comments into account when deciding this.
5. **Well plans examined by the Health and Safety Executive**. In the UK all offshore and onshore wells must be designed and constructed in accordance with government regulations. Inspectors from the Health and Safety Executive (HSE) and an independent well examiner check that the operators are following the regulations. They review the well design and monitor its construction to ensure it matches the design. When construction is complete, they continue to monitor its maintenance. This will ensure well integrity and minimise the risk of leaks. Deep geothermal developers are expected to abide by current HSE standards.
6. **Consent for drilling or production**. For any well which includes proposed fracking, DECC will consider the seismic risk before granting consent to drill; it will also require a copy of the planning permission, and that HSE and the environmental regulator are content for the activities to proceed, before consent is given. For geothermal, final consents and a seismic hazard assessment are administered through local planning.

Once companies have permission to drill, regulators will continue to monitor the activity and can stop the activity if they consider that there are imminent threats to safety or the environment.

³ The EA is currently consulting on a number of standard rules permits: https://consult.environment-agency.gov.uk/portal/ho/ep/src/no10/standard_rules_no10

What are the risks involved?

As with most industrial activity, there are some risks associated with the extraction of shale gas and oil, and geothermal energy, if the processes are not regulated and managed correctly. It is important to have an understanding of the magnitude of risks and mitigations when considering the realistic impact of the proposals outlined in this document. These risks, and their potential impact on the whole area, are assessed during the planning and permitting process summarised above.

In this document, we only outline the main risks that could have any perceived impact on landowners and others living above *horizontal underground* drilling. Other issues that could be associated with shale gas or geothermal extraction e.g. air pollution or emissions, and impacts on climate change, are extremely unlikely to occur anywhere other than at the surface point of entry. This consultation does not set out a detailed assessment of these other issues and how they are managed because our proposal does not suggest any changes to the rights or regulations concerning access at or near the surface.

Groundwater Contamination

There are concerns that groundwater could be contaminated by fracking fluid or methane as a result of a fracture extending into an aquifer, or inadequate well cementing.

Shale: Where groundwater contamination has happened in the US, it has been generally due to faulty well construction or cementing on the *vertical* well. There is no evidence of any case of contamination emanating from the hydraulic fracturing affecting an aquifer or drinking water supplies. Extraction and fracturing takes place well below the aquifers that provide drinking water, and in the UK it is usually under layers of impermeable rock. Consequently, the Royal Society and Royal Academy of Engineering concluded if a well is designed, built and constructed properly, there is negligible risk of water contamination of actual or potential water supplies. Well integrity in the UK is tightly regulated by HSE.

Deep geothermal: Heat projects that access sedimentary aquifers circulate the same water from the point of abstraction to re-injection within the same aquifer. The risk of water contamination from deep geothermal EGS projects is considered to be low. Generally water is extracted in situ and no waste water is produced as the fluids are re-circulated in the reservoir. Where additional fluids are introduced in EGS projects they are in relatively small amounts solely for chemical stimulation of the reservoir during the development phase or for the removal of drilling fluids.

Seismic Activity

There have been seismic events connected to both shale gas drilling and fracturing, and Enhanced Geothermal Systems, including the magnitude 2.3 tremor in Blackpool in 2011.

Shale: Following the events near Blackpool in 2011 DECC introduced new controls for fracking operations aimed at shale gas or oil to mitigate seismic risks. Operators have to assess the proximity of relevant faults before fracking, monitor seismic activity before during and after the frack, and halt operations if seismic activity exceeds a predefined level. The defined level has initially been set at a magnitude of 0.5 on the Richter scale, a level which can only be detected by sensitive equipment. Expert advice is that the largest seismic event which might be triggered by fracking in most areas of the UK is of a magnitude of about 3, a level which is not expected to cause structural damage to properties or infrastructure. The lowest level of seismic activity at which property damage might be expected to emerge is magnitude 4, which has over 100,000 times the energy of an earthquake at the adopted action level of 0.5.

Deep geothermal: It is very unlikely that micro-seismic events resulting from deep geothermal schemes would cause any damage. For deep geothermal EGS projects, where there is a need to enhance permeability, micro-seismic events can be produced during reservoir stimulation (which is only short term). This was the case during the Rosemanowes deep geothermal research project in Cornwall which caused thousands of micro-seismic events - but only two were felt, and no damage was caused. However, there have been notable exceptions such as in Basel, Switzerland in 2006 where a deep geothermal project in a seismically active area resulted in minor damage to buildings. Although the project was stopped, by developing an inclusive policy and involving the local population, a number of new deep geothermal projects are now being developed. Deep geothermal projects utilising hot sedimentary aquifers are believed to be very unlikely to create seismicity as stimulation is typically not required.

Subsidence

Subsidence here refers to the movement of the earth's surface as a consequence of underground works.

Shale: Drilling takes place deep below the surface, with a typical well diameter of 6 inches. Fractures in the rocks are only a few millimetres wide, and are all contained beneath many layers of solid rock. There are no documented cases of shale gas operations, whether exploration or production, causing subsidence large enough to cause damage at the surface. Shale gas production does not remove large quantities of rock from underground (by comparison with coal mining where subsidence does occur). In some circumstances, the conventional extraction of oil or gas from a reservoir rock can result in compression of the reservoir layer, which can result in lowering of the land surface above it. However, this does not occur with shale rocks, which are not compressible.

Deep geothermal: Re-injection of extracted water is an integral part of deep geothermal heat projects utilising hot sedimentary aquifers. This counteracts the reduction in pressure through removal of water and mitigates against the risk of subsidence. Deep geothermal heat schemes in Paris have been operating on this basis since 1969 where there are now 39 sites operating in this urban environment. The Southampton geothermal scheme has been in operation since 1982.

We believe that underground horizontal drilling at the depths relevant for shale or geothermal would not have any negative impacts on the landowner's use of the land. We consider that the planning system and the environmental and health and safety regulatory regimes provide the necessary protection for individuals, not the existing law related to underground access rights concerned here (and explained below). These regimes consider all aspects of the operation, not just those associated with underground or surface drilling impacts.

For risks associated with shale gas and oil in particular, it is worth noting that the UK has over 50 years of experience of regulating the onshore oil and gas industry nationally. More than 2,000 wells have been drilled onshore during that time.

The Royal Society and the Royal Academy of Engineering concluded in a 2012 review⁴:

"... the health, safety and environmental risks associated with hydraulic fracturing (often termed 'fracking') as a means to extract shale gas can be managed effectively in the UK as long as operational best practices are implemented and enforced through regulation."

⁴ Shale gas extraction in the UK: a review of hydraulic fracturing, The Royal Society, June 2012
http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/projects/shale-gas/2012-06-28-Shale-gas.pdf

The Existing Framework for Access

This section sets out the existing processes that companies must go through in order to obtain a right of access for underground drilling, and the problems associated with this.

Introduction

In the UK, the starting principle of land ownership is that freehold land entitles the owner to rights at the surface and down to the centre of the earth. In practice, this right extends down to any land that is useable by anyone, as there are extreme depths at which ownership would be illogical. Land at the depths that are the subject of this consultation can be used to exploit energy from oil, gas, and geothermal heat, and the landowner still has the rights to this land. Consequently, a company wishing to carry out underground operations might have to pass through land belonging to a number of owners. In order to pass through the land, they must obtain the landowner's permission to do so. If the operator does not acquire these rights, or has not obtained a court order granting the rights, and proceeds regardless, they will have committed a trespass (even if there is no damage to the property). This was established by a 2010 decision of the Supreme Court in *Bocardo SA v Star Energy [2010] UKSC 35*.

Currently, operators must negotiate these rights of access with every landowner living above underground drilling, even though those works occur far beneath the surface level – typically more than a mile down in the case of shale gas and oil or geothermal energy - and will not cause any inconvenience to the landowner. Shale and geothermal wells tend to be about 6 inches in diameter for much of the length of the well. The landowner is very unlikely to make use of the land at that depth, and the drilling activity itself is so far down that it will have no negative effect at the surface. Given that a large area of underground land may be accessed in shale or geothermal operations, companies may need to negotiate access rights with hundreds or possibly even thousands of land owners whose land is above that area.

In Great Britain, the Crown owns the mineral rights to petroleum (oil and gas). The Government can grant licences that confer exclusive rights to 'search and bore for and get' petroleum to operators⁵. Each licence applies to a defined area and for a defined period. In order for the operator to reach the oil and gas and extract it, they may need to negotiate underground access with many landowners, even though the landowners have no claim to the oil and gas itself and the drilling and use of underground wells does not affect the enjoyment by those landowners of their land.

Geothermal drilling that aims to reach an underground aquifer in order to extract the naturally present heat will also involve passing through underground land which may have many owners. In the case of district heating schemes, these need to be located close to customers (i.e. in urban areas), and could have thousands of landowners living above the wells. Heat is not covered under laws on mineral rights, but the laws of trespass governing access to the heat and hot water underground are the same as those described above governing access to minerals and petroleum.

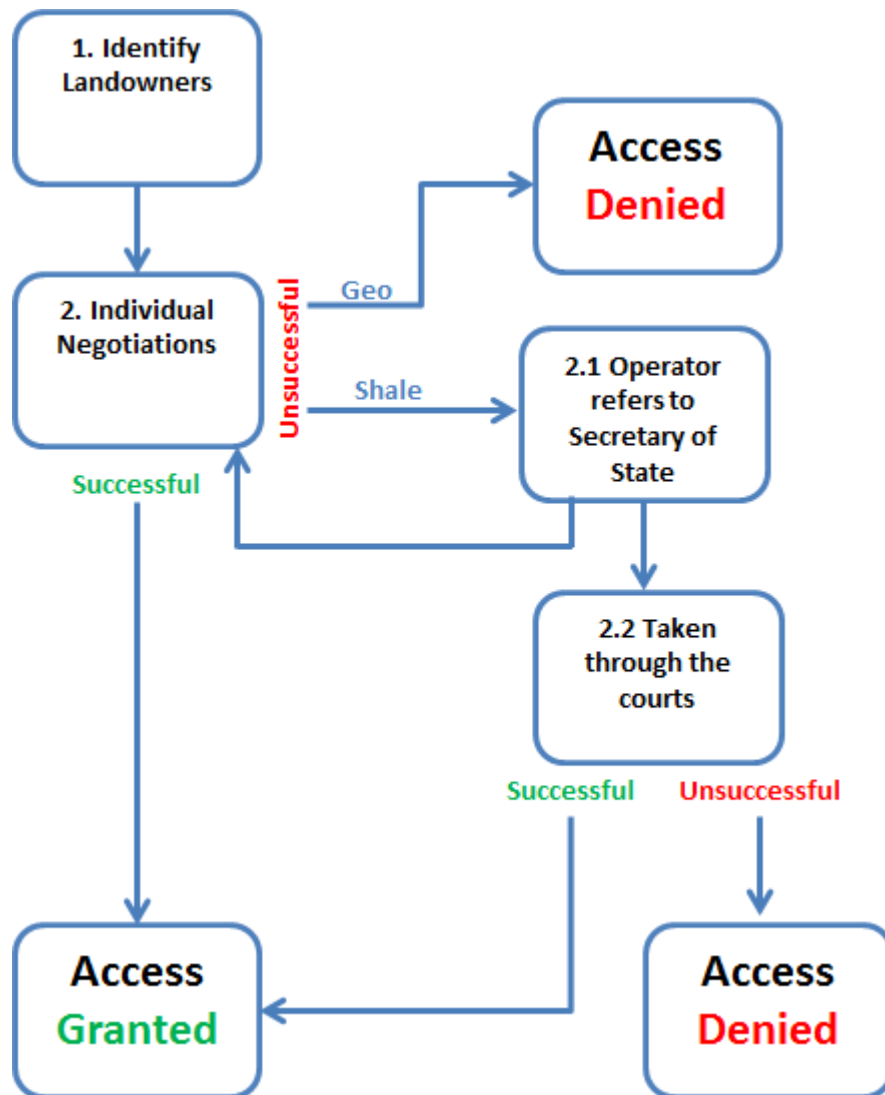
⁵ Section 3, Petroleum Act 1998.

Before any projects are given the approval to go ahead, members of the public can take advantage of pre-application engagement opportunities offered by the project developer, engage in the local planning consultation and express concerns to local authorities, and respond to the environmental regulator’s publication of the permit application. More generally, the public can express concerns by: approaching their local authority, their Member of Parliament or the company proposing the activity.

Current process for granting access rights

Companies currently approach individual landowners to negotiate for access to land – both at the surface and underground. The existing process for both geothermal and shale gas developments is set out in Figure 3 below, along with a description of each stage.

Figure 3



Stage 1: Identify Landowners

The shale gas or geothermal company must determine which landowners they need to negotiate with. This requires looking at the expected underground drilling path and matching

the co-ordinates with land ownership – this can be achieved via a number of methods, including a land registry search. Some landowners may not be identifiable from the land registry (around 20% of land is unregistered⁶), in which case the identification of these owners can require significant time and resources.

Stage 2: Individual Negotiations

Once landowners have been identified, the company will approach them to begin negotiations for access to their land. At present, there is no standardised approach to this, and the terms of the agreement will be negotiated between the landowner and the company. If a deal can be agreed, the company will make some kind of payment in return for the access.

However, some negotiations may not end in agreement, or some landowners may refuse to negotiate at all. In this case, oil and gas operators who still want to proceed can make an application for the case to be referred to the courts via the Secretary of State (points 2.1 – 2.2).

If negotiations between any one landowner and a *geothermal* company fail, there is no appeals process available, and the company will not be able to access that underground land at all. In this case, they could divert the drilling path to avoid the land concerned, or will have to abandon the project if no alternative path can be found.

Stage 2.1: Operator Refers to Secretary of State

The Secretary of State will consider the case, consult with the landowner if necessary and decide whether, on the face of it, the criteria set out in the statute ((the Mines (Working Facilities and Support) Act 1966 as applied by section 7 of the Petroleum Act 1998)) have been met. These criteria state that a right may only be granted if negotiations are not feasible due to *any* of the following criteria: the persons with the power to grant the right are numerous or have conflicting interests; the persons cannot be identified; the persons do not have the necessary powers of disposition; the persons unreasonably refuse to grant access or demand unreasonable terms or the grant of the right is in the national interest. The Secretary of State may ask for further information, but if satisfied, will give permission for the company to apply to the courts.

Stage 2.2: Taken through the courts

The case will then be considered by the Courts. This procedure has rarely been used in respect of petroleum and there is no shale gas-specific precedent due to the nascent stage of the shale industry. The available precedent relates to conventional drilling, but suggests that the procedure can be time-consuming and costly for all parties. In the case of *BP Petroleum Developments Ltd v Ryder and Others*, it took the parties 2 years to reach a final position from the point that BP applied to the Secretary of State. In practice, we expect a court is always likely to grant access because granting access to enable these projects to take place would be expedient in the national interest.

Implications of the existing framework

If we did nothing to address this issue, the commercial exploitation of shale gas and oil in Great Britain is unlikely to develop to a significant scale, in a timely manner, or at all, and the deep geothermal industry is extremely unlikely to develop.

⁶ Land Registry, <http://www.landregistry.gov.uk/public/faqs/is-all-land-registered>

The fundamental issue with the present system is that it gives a single landowner the power to significantly delay a development regardless of how others in their community feel about it (including other landowners), and even though the drilling and use of underground wells does not affect their enjoyment of their land. For geothermal extraction in urban areas (which is where we expect most operations to take place), this could be a single landowner blocking a project that thousands of other landowners and residents are supporting.

Shale Gas and Oil

While we believe the shale gas and oil industry can proceed with some shale exploration wells for now (by locating them largely in rural areas with few landowners), these will be a small minority of anticipated exploration projects and the existing legal framework will provide a considerable deterrent to moving ahead with larger scale shale development and production unless this situation is rectified.

Under the present access rules, we expect the industry would enter into a number of court cases (stages 2.1 – 2.2 above) and seek to establish a precedent. This court process carries great uncertainty – both in the time delay and potential costs. Each time a landowner refuses to negotiate, or cannot come to an agreement, the operator can refer the matter to the Department of Energy and Climate Change for consideration by the courts. In practice, a court is always likely to grant access because it would be expedient in the national interest. However, this process is time-consuming due to the potentially lengthy appeals process – and costly in terms of legal services (estimated at hundreds of thousands of pounds) for both the operator and the individual, in addition to costs associated with delays to development.

The amount of compensation that might be made if a court order was granted is a matter for the courts to decide. Based on case law, the level of compensation would be low and of little benefit to landowners, but the process creates uncertainty for companies, which hinders the development of the industry. Further, some landowners are likely to want to use this process to delay shale development in their local area, despite the fact that the community as a whole may be supportive. This method of delaying development has already been proposed by groups opposed to fracking: in 2013, they suggested the idea of buying up “ransom strips” in an attempt to use these to refuse to grant access rights underneath the drilling route.

Geothermal

The deep geothermal industry is facing similar access issues and is also at a pivotal point in development with a number of new schemes proposed. The industry also needs to acquire rights of access from landowners but, unlike for petroleum development, the Mines (Working Facilities and Support) Act 1966 does not apply so there is no alternative route by which geothermal developers can obtain access rights if landowners do not wish to negotiate.

The effect of this is that projects, particularly in urban areas, will not proceed given the risk to investment. Schemes that link with district heating networks need to be sited near areas with a high demand for heat, given the cost and wastefulness of transporting heat over more than short distances, geothermal schemes will therefore invariably be located in or near heavily populated areas. Therefore companies would need to negotiate with a large number of individual landowners (potentially totalling thousands). It is expected that if nothing changes, the exploitation of deep geothermal energy will be unworkable and few if any of the currently proposed schemes will take place.

Alternative methods of granting access

In order to gain a better understanding of this issue, we also assessed how other industries negotiate a right of access where needed. A brief summary of similar (but not identical) schemes are outlined in the table below.

How do other industries obtain access?		
Industry	Features	Access
Oil and Gas (Pipelines)	In order to transport oil or gas around the UK, companies install pipelines, usually underground. These can be installed by either National Grid or another private company.	<p>Companies looking to develop pipelines often rely on a system of compulsory wayleave – where they can rent the underground land without permission from the owner.</p> <p>For National Grid, there is a compensation code covering gas and oil pipelines and all compensation payable under compulsory acquisition of land.</p> <p>For other companies, they must negotiate with owners before seeking compulsory powers to enter land and agree some kind of payment. Commercial pipeline operators (both oil and gas) are governed by the Pipelines Act 1962.</p>
Coal	Coal seams can run for miles beneath the ground, and can be quite shallow (and extracted by open-cast mining) or deep (up to 800 metres down) and accessed by one point at the surface.	<p>Section 51 of the Coal Industry Act 1994 gave licensed coal operators the right of access to underground land for the purpose of coal mining operations. No compensation is provided in return.</p> <p>This Act repealed several previous Acts⁷ that included provisions for access. Given that deep coal mining has a number of similarities to the extraction of shale gas and deep geothermal energy, we have considered this in detail. This is outlined in section 4.</p>

⁷ Prior to section 51, there were similar provisions provided for under section 15 of the Coal Act 1938, section 8 of the Coal Industry Nationalisation Act 1948 and section 25 of the Control of Pollution Act 1974. All three of these historical legislative provisions were subsequently repealed by the Coal Industry Act 1994.

How do other industries obtain access?

Water and Sewage (Pipelines)	Water and sewage pipelines often need to be installed underground.	The water industry and Environment Agency have compulsory powers to lay new water pipes and sewerage. They can also be laid through agreement with the landowner. The statutory regime covering public water and sewerage pipes and drainage is laid out in the Water Industry Act 1991 and the Water Resources Act 1991.
Transport	Train operators, in particular, often need to build tunnels underground (e.g. London Underground, Crossrail, Channel Tunnel)	Most large infrastructure projects (such as Crossrail) have their own Act, which sets out the procedure for gaining access rights. In the case of Crossrail, this is acquired by compulsory purchase of the land and property and set out in the Crossrail Act 2008.
Airspace	Traditionally, landowners also owned airspace to an undefined height. Aeroplanes flying over land would be travelling through space owned by multiple landowners on the surface.	The 1982 Civil Aviation Act separated airspace into lower and higher strata, and ruled that the space beyond an altitude of 500-1000 feet is not in use by the landowner and therefore they should have no rights over it. This is a similar position to deep underground drilling, given that land hundreds of metres or even miles below the surface is not in use by the landowner.
Telecommunications	Telecommunications companies need to lay underground cables in order to connect phone lines	Utility companies agree a set of standard terms on wayleaves (regular payments) and easements (one-off payments) which are paid to the landowner through individual negotiations and not compulsory.
Electricity	National Grid lays both over ground and underground electricity cabling. There are different features for underground cabling as these are less intrusive.	National Grid will exchange a Deed of Grant of Easement with the landowner for a capital sum which is based on twenty times the yearly wayleave payment. These are negotiated with each landowner and not compulsory. The statutory framework covering electricity wayleaves is contained in the Electricity Act 1989.

Potential Options

Government considered a number of options to address this issue, which are outlined in this section.

Do nothing

This is always an option in policy development. We considered the impact on both industry and the public of doing nothing at all, and letting the situation persist. We concluded that the difficulties associated with the existing framework mean that neither the shale gas nor deep geothermal industries will be able to fully explore their potential in the UK.

However, the existing framework does provide a protection for landowners who may be opposed to development under their land. We had to consider carefully whether it would be best to leave the framework in place and ensure that landowners retain their current powers.

We believe that, so far as underground development goes, the existing system does not strike the right balance between the legitimate interests and concerns of landowners, and the benefits to the community and nation at large of permitting development, where the development is otherwise acceptable in planning and environmental terms. Since the impact on the landowner from underground drilling is negligible, and broader issues of concern about the environmental and other impacts of the proposed activities are fully addressed through planning and other regulatory frameworks, there is a case for changing the statutory framework to provide for underground access without the complexity and expense of the existing procedure.

Refine existing framework

We also considered whether we could leave the existing framework in place, but refine it in some way to make it more efficient. At our stakeholder workshops in February and March 2014, we asked participants to consider ways to improve the system. A few of the options discussed and considered are detailed below.

Group negotiations

This would involve requiring the company to negotiate access with a large group all in one go. This would reduce some of the administrative costs associated with contacting and negotiating with each landowner. However, this would not bind any member of the group who disagreed, and therefore does not remove the fundamental problem: that the ability of individual landowners to obstruct the project is disproportionate to any impact it might have on them.

Defining and capping the existing system of individual negotiations

Currently, companies negotiate with every individual landowner and agree a balance between access rights granted by that landowner and a payment for those rights. If this process was standardised and a minimum and/or cap set on the level of compensation, it would give industry certainty when they deal with landowners, as they would be able to predict how long each process might take and how much it would cost. However, this is subject to the same problem as the group negotiation in that any landowner could refuse the payment. Also, the

subsequent court process (for gas and oil) cannot be standardised or prescribed in such a way.

Compulsory rights

Another option considered was enabling companies to apply for compulsory rights orders under an Acquisition of Land Act 1981 procedure. This route requires express applications to be made for land or rights, and a lengthy compulsory purchase-style inquiry procedure to be gone through under the Act. We do not consider it necessary or appropriate for a lengthy application procedure to apply where all that is needed is use of deep underground land.

There would therefore be no advantage (to either land owners or exploration companies) in legislation being enacted which replicated these sorts of compulsory purchase provisions. Exploration companies do not require land or rights to be transferred to their ownership. A statutory right of access is sufficient, and would have the merit of not dispossessing land owners of any substantial property rights.

Planning Act 2008

Similarly, we considered bringing the technologies within the Planning Act 2008 regime. The Planning Act 2008 is a mandatory consent regime which applies to projects deemed "nationally significant infrastructure projects." The necessary land rights could be applied for as part of the development consent application. However, the process of obtaining a development consent order is extremely lengthy (a minimum of 15 months from application to consent, plus approximately a year's pre-application consultation). To be obliged to undertake this expensive and time-consuming process multiple times to drill a series of exploratory wells is not a workable option for the industries involved, at such an early stage of development.

Community ownership schemes

These were also considered as an option during the stakeholder workshops. This would allow local people to take a financial stake in a project (and therefore a share in the profits), making them more likely to approve of that project. However, we do not believe that this would sufficiently address the fundamental problem that any individual could be unable or unwilling to participate.

Conclusion

We did not feel that any of these options could address the fundamental problem of a small number of landowners holding up the entire process regardless of how many others are in favour. We also considered the fact that the drilling and use of underground wells does not affect their enjoyment of their land. To this end, we have developed the solution in the following section.

Proposed Solution

Our proposal consists of three different elements, each designed to address specific issues which are outlined in this section.

To develop this proposal, we looked closely at s51 of the Coal Industry Act 1994, given the parallels with shale and geothermal energy. Just as deep underground mining of coal can involve works extending over a large underground geographic area, shale gas and oil and geothermal energy must be extracted across a large geographic area (although shale and geothermal operations are mostly at much greater depths than coal, and the workings are far smaller and less intrusive for drilling than for coal excavation, with none of the attendant risks of subsidence etc.) Coal and shale gas cannot be tapped into simply by accessing a reservoir at a single point. They require both: (i) access from one point on the surface and (ii) underground working of land which extend away from that point.

The two statutory provisions which facilitate rights of access to coal are:

- Section 1 of the 1966 Act ("Grant of working facilities") which allows the acquisition of 'ancillary rights'; and
- Section 51 of the Coal Industry Act 1994 ("Additional rights in relation to underground land")

The former provides a procedure aimed at securing use of or access from the surface of land (this also applies to petroleum and is outlined in the previous section on the existing framework) and the latter gives the licensee an immediate statutory right to use underground land.

We also looked closely at the provisions for airspace, as we believe this to be a similar issue. Given that the landowner has no use of the space above a certain height, the 1982 Civil Aviation Act removed individual ownership of this space. This is similar given that landowners do not typically use the land deep below their property. However, there is no need to remove ownership altogether in the case of shale or geothermal drilling, as a right of access should be sufficient, given the temporary nature of underground drilling operations. We believe it would be disproportionate to completely remove landownership below a certain depth.

Given the similarities between airspace, coal, shale and geothermal energy, we concluded that a statutory right of access would be an appropriate solution to allow companies to access underground land for the purpose of extracting petroleum or geothermal energy. The three elements of the proposed solution are set out below.

1. A right of underground access

This first element draws on the existing statutory right of access offered to coal operators. Our proposal would grant underground access rights to companies extracting petroleum (as defined under the Petroleum Act 1998 – including gas or oil) or geothermal energy in land at least 300 metres below the surface. Geothermal energy here refers to naturally-occurring heat anywhere beneath the surface of the earth.

This underground access would only apply to companies seeking to extract energy (in the form of petroleum or naturally-occurring heat) from land below 300m. It is important to note that fracturing would not take place at 300m; it would be much deeper – usually over a mile down. 300 metres has been chosen as the landowner is very unlikely to have any use of the land below this level and below this depth the vertical drill may need to start changing direction.

The company looking to develop shale gas and oil or geothermal energy would still need to obtain all the necessary permissions (environmental, planning etc.) in order to commence drilling lawfully. However, we would not expect for the right of access to be dependent on these conditions. The right of access would exist independently of these necessary permissions; effectively removing the issue of trespass at these depths for these purposes.

2. A payment in return for the right of access

At present, landowners tend to receive some kind of payment in return for the right of access. This is negotiated privately between the company who wants to access the land, and the individual. There is no standard payment level, and landowners could request any amount of money (or none at all).

We believe that people living above underground drilling should continue to receive some kind of payment from the operator in return for the right of access. This view is in line with other schemes that grant access rights such as underground cables and tunnels. However, the land at depths below 300 metres is of little to no use to the landowner. As such, we expect any payment to be based on a nominal value.

The shale and geothermal industries have put forward a voluntary offer for a payment system. This will involve a £20,000 one-off payment for each unique lateral (horizontal) well that extends by more than 200 metres laterally. Where lateral drilling vertically coincide payment will be made only once. Our preference is for this payment to be made to a relevant community body (as agreed between the operator and the community itself), and not split between individual landowners. Government supports industry's voluntary payment offer. We expect industry will come forward with details of this payment offer during the consultation period.

We believe a voluntary payment system is preferable to one set out in statute. A voluntary scheme can be adapted to suit any location or situation that might arise, reflecting the different characteristics of each site and community. In contrast, if we included a payment in statute, it would be much less flexible and we would need to determine much of the detail in advance (such as defining what constitutes a 'community' in such a way that it proves suitable for all possible sites in the country), making it less likely to be effective and more prone to error.

Alongside this scheme, we propose to take a reserve power in the legislation to enforce payment through regulations if the industry voluntary scheme is not honoured. If the reserve power were used, such regulations would be subject to a separate consultation.

The reason for favouring a community payment over an individual landowner payment is due to both the administrative burden of individual payments and the actual sum of the payment. As mentioned, any individual payment is likely to be nominal (e.g. around £50 as per the *Bocado vs. Star Energy* case). We believe it is much more meaningful to provide a payment which can be spent on projects to benefit the community. A challenge with this approach will be to try to ensure that the relevant landowners are among those wider beneficiaries of the

community payment. In some cases, such as where the landowner does not reside locally, this may not always be possible.

Whilst this does not directly compensate the individual landowner, it will typically compensate them indirectly. We believe this is a more practical approach and one which will deliver more benefits overall to the community. Furthermore, the intention of these proposals is to improve on the existing system for access. Whilst a pre-determined individual payment might be an improvement on the existing system, it is still considerably more burdensome to distribute than a community payment, as the company would still have to identify, notify and arrange payment with every relevant landowner. This approach would therefore undermine some of the benefit of this legislation.

3. A notification system for the community

This option would include a proposal for a public notification system, under which the company would outline matters such as the relevant area of underground land, coupled with details on the payment that will be made in return for the access.

We propose that this public notification system is delivered through the same industry voluntary agreement as the payment, rather than set out in statute. This recognises that an important function of the notification is related to the payment and treats these two elements consistently.

This notification would not be a mechanism for an individual or community to object to the project. Such objections are more appropriate as part of the planning or environmental regulatory processes.

Conclusion

This proposal will allow industry to drill below people's land in order to access energy resources without first negotiating a right of access, providing this is at depths of 300 metres or more. Any works above 300 metres will continue to require agreement with the individual landowner, or for the Court to make an order granting access rights, as is currently the case for all oil and gas developments.

In order to exercise the access rights below 300 metres, the companies must have all the necessary permissions from the regulators, and can only do so for the purpose of extracting energy in the form of petroleum or natural heat. If the company chooses to access land, they should arrange a payment in line with the industry commitment in return for the right of access, and issue a public notice to ensure people are aware of the activity. In the event that industry retracts their voluntary payment approach, the Government will have the ability to establish a statutory scheme through secondary legislation.

Expected Impact of Proposed Solution

Our proposal will only affect one particular area of the current framework for developing shale gas and oil and geothermal energy. Here, we set out the expected impact of our proposal and the protections that remain in place.

We expect that this proposal will allow both the shale and geothermal industries to develop in the UK, under a safe and responsible regulatory system. Whilst both of these technologies are at an early stage of development, if commercial production proves viable, they both represent a huge potential for the UK to develop its own natural resources and create local jobs and growth. The issue of access rights is holding up the development of both industries, and we believe that this proposal will enable them to explore their potential.

This proposal will not enable any individual or company to drill underneath private land in an irresponsible manner. All existing regulations and safety measures will remain in place, and local people will still be able to make their concerns heard and engage with local developments.

What regulations would still apply to companies?

The Government will continue to administer a robust regulatory system to ensure that the public is protected as far as possible against risks, and have a right to voice concerns. The following conditions will still apply to any individual or company who would like to obtain an underground right of access:

1. Initial Licence. This would be either a petroleum licence issued by DECC for onshore oil and gas in the UK or a Groundwater Investigation Consent (GIC) and an abstraction licence in the case of geothermal heat schemes.
2. Planning permission from the relevant planning authority.
3. Permits from the relevant environmental regulator.
4. Plans examined and approved by the Health and Safety Executive. Deep geothermal developers are expected to abide by current HSE standards.
5. Drilling consent for drilling or production. For geothermal, drilling consents and seismic monitoring are administered through local planning and the environmental regulator.

Once drilling has commenced, there is a further system for monitoring and regulating risk:

1. Well operators have a legal duty to manage and control the risks to people. The Health and Safety Executive monitors well operations to check these legal duties are met. Its specialists will review the weekly operations reports it receives from the well operator, to check construction matches the design. HSE and the Environment Agency will be jointly inspecting and sharing information on sites where hydraulic fracturing is taking place.
2. The relevant environmental regulator will monitor the environmental impacts through monitoring and inspections of the operator's reports. The greater the potential risk, the

greater the scrutiny by environmental regulators. Conditions attached to permits will give the minimum level of site-based monitoring and reporting.

3. Planning authorities are responsible for enforcing any conditions attached to the planning permission. For example, this may include limiting of noise or dust levels, as well as site remediation after production or exploration.

The different UK jurisdictions will continue to regulate shale gas and oil or geothermal developments according to their existing regulatory frameworks.

What opportunities will people have to engage on developments

People who wish to engage on shale or geothermal developments in their local area still have a number of ways to do this

Before any projects are given the approval to go ahead, members of the public can:

- Take advantage of pre-application engagement opportunities offered by the project developer.
- Engage in the local planning consultation and express concerns to local authorities
- Respond to the environmental regulator's publication of the project application

More generally, the public can also engage by: approaching their local authority, their Member of Parliament or the company proposing the activity, and; if they believe underground drilling has caused any damage to their property, they could bring a claim against the operator (although, as set out above, we consider such damage highly unlikely).

It is important to note that the current system for obtaining access is only relevant for landowners. As the law currently stands, local residents who do not have underground land rights but are living above the drilling – such as those who own certain leasehold property or are renting their property (or rent the land for farming and other uses) – have no ability to refuse permission for access to companies because they do not own the land beneath the surface.

Conclusions

We have decided to address the issue of access for the following reasons:

- Shale gas and oil, and geothermal energy have the potential to improve energy security and boost growth, and this potential cannot be overlooked. The Government has committed to developing these UK resources in a responsible and safe manner.
- The shale gas and geothermal industries are at an early stage of development in the UK and require a workable and proportionate regulatory system in order to attract investment.
- The current system for gaining access rights presents a barrier for the UK shale and geothermal industries. We believe it does not strike the right balance between the legitimate interests and concerns of landowners, and the benefits to the community and nation at large of permitting development.

- For shale gas and oil in particular, the court procedure is not appropriate for underground access. In practice, a court is always likely to grant access because it would be expedient in the national interest, but must consider each case, which is likely to be a lengthy and costly process for all parties. Hence, it is practical to make this right of access less burdensome to obtain.
- We intend to change this system by making it less burdensome for companies to gain underground access rights. This proposal would apply to oil and gas operators (using both conventional and unconventional drilling methods) and deep geothermal companies.
- In return, the community will receive a payment for an activity that has a negligible impact at the surface.
- Landowners and other members of the community will still be protected by the planning and regulatory system, and able to express any concerns using the usual routes.

We believe that this policy represents the best way to ensure these potentially important industries can proceed in the UK to develop their full potential, paying a significant sum to communities in return for these nominal rights, while ensuring that landowners and other residents remain well protected by the strong regulatory system already in place. We would welcome comments on these proposals as set out in the questions in the next section.

Consultation questions

1.	Should the Government legislate to provide underground access to gas, oil and geothermal developers below 300 metres?
2.	If you do not believe the Government should legislate for underground access, do you have a preferred alternative solution?
3.	Should a payment and notification for access be administered through the voluntary scheme proposed by industry?

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Department of Energy & Climate Change
3 Whitehall Place
London SW1A 2HD
www.decc.gov.uk
URN 14D/099