

DEI Briefing Note: March 2015

From national to fracktional: will fracking come to Britain's National Parks?

Dr Liam Herringshaw, Department of Earth Sciences, Durham University

In early 2015, public concern arose over whether fracking for oil or gas would be allowed in Britain's national parks. The varied geology of the national parks, however, means that fracking companies are likely to turn their attention only to some of them. Dr Liam Herringshaw identifies which of Britain's national parks may be of interest to fracking companies, and those in which an understanding of the geology means that fracking can be ruled out.

On 26 January 2015, in response to public concerns, the UK government announced 'an outright ban on fracking in national parks'¹. This statement was then amended on 11 February 2015, such that, 'in the case of areas of outstanding natural beauty and national parks, given their size and dispersion, it might not be practical to guarantee that fracking will not take place under them'². The Infrastructure Act 2015 was enacted on 12 February³. However its implications are presently unclear and Government is required by law to define "protected areas" in secondary legislation no later than 31 July. Celtique Energie recently cited this uncertainty as a key factor in its decision to withdraw plans to test drill in the South Downs National Park⁴.

In the midst of the furore, little attention has been paid to the fact that the geology of Britain's 15 national parks is very varied. Many do not have the right rocks underneath them to be of interest to fracking companies.

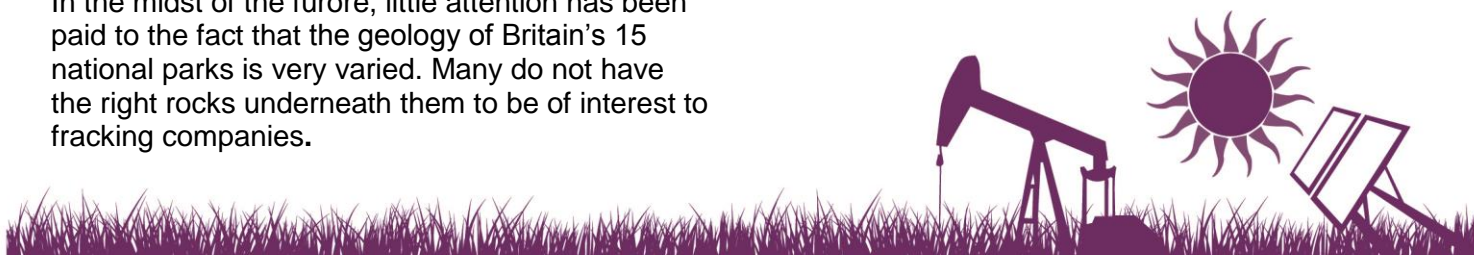
In which of the national parks might fracking be of interest?

This research has found that, of the 15 national parks in Britain, there are:

- **4 (North Yorks Moors, Peak District, South Downs, and Yorkshire Dales) with rocks of possible interest to companies looking to frack for shale gas, shale oil, or coalbed methane.**

These interests will become clearer once the results of the 14th Landward Licensing Round⁵ are announced by the UK government.

- **4 (Brecon Beacons, Exmoor, New Forest, Northumberland) with shales or coals present, but where other aspects of the geology make fracking unlikely.**
- **7 (Broads, Cairngorms, Dartmoor, Lake District, Loch Lomond & The Trossachs, Pembrokeshire Coast, Snowdonia) with geology which rules out fracking for shale gas, shale oil, or coalbed methane.**





Identifying potential fracking sites

Fracking is the injection of high-pressure fluids into low permeability rocks to create fracture networks. In fine-grained sedimentary rocks, such as shales, fracking is used to extract hydrocarbons (oil and gas). A vertical well is drilled to a depth of 1–3 kilometres below the surface and then deviated to create a horizontal well that penetrates the target rock horizon (Figure 1). The horizontal well is then perforated with small explosives and high-pressure fluids are pumped through the perforations. This creates fracture networks through which hydrocarbons can flow out of the rock, into the well, and back up to the surface.

The geology of the UK is well-known, so we can examine which national parks are potential targets for fracking, and which national parks can be ruled out. Some national parks have no shales or coal within them or adjacent to them, so are of no interest to fracking companies. Many other national parks do contain shales or coal, but their nature means that they are unlikely to yield economic quantities of oil or gas.

Classifying the frackability of National Parks

Exploration will only happen where the right rocks occur. By reviewing the geology, we can provide a sensible appraisal of the likelihood of fracking in, or adjacent to, Britain’s national parks. This is summarized in Figure 2 using the following colour scheme. National parks in which fracking will not happen are shown in green, those in which it is very unlikely to happen are shown in orange, and those where the likelihood of fracking is highest are shown in red.

Firstly, we need to recognize that there are three types of hydrocarbon-bearing rocks targeted by fracking companies: gas-bearing shales, oil-bearing shales, and gas-bearing coals. All three are fine-grained sedimentary rocks in which hydraulic fracturing might be used to extract the hydrocarbons (shale gas, shale oil, or coal bed methane) trapped within them.

A brief explanation of how the national parks have been classified is provided below.

It should be noted that, even where the geology might be suitable, the use of fracking would also depend on a number of other factors including investment, local planning consent, landowner access and environmental and health and safety permissions.

No Fracking (Green)

The Broads National Park

Geologically very young, and though there are some old rocks beneath them at depth, these show no evidence of containing oil or gas.

The Cairngorms National Park

(Geology: <http://bit.ly/1DPXRHW>)

Made almost wholly of very old igneous and metamorphic rocks, which do not contain hydrocarbons. There are no shales or coal adjacent to the national park either.

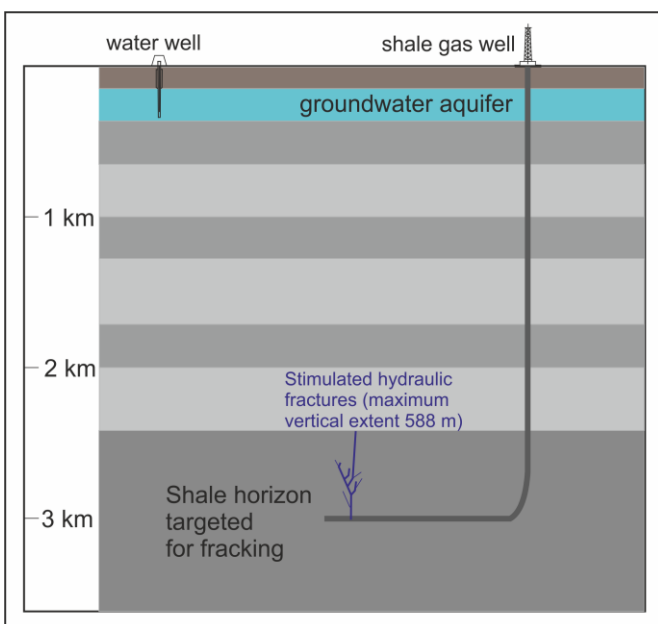


Figure 1. Schematic diagram showing depth and structure of hydrocarbon well drilled into bedrock to hydraulically fracture shales for oil or gas.





Dartmoor National Park

(Geology: <http://bit.ly/1Fe7IjL>)

Mostly made of granite, an igneous rock. There are some shales in the region, but these are old, have been cooked by the intrusion of the granite and are not prospective for oil or gas.

Lake District National Park

(Geology: <http://bit.ly/1Ks9zSb>)

A mixture of old, mostly sedimentary and volcanic rocks. It does include shales, but these have been compressed, over-heated, deformed and fractured, such that they have no oil or gas potential.

Loch Lomond & The Trossachs National Park

(Geology: <http://bit.ly/1NI3mpV>)

Dominated by old metamorphic rocks that do not contain hydrocarbons, and cut by the Highland Boundary Fault, a major, ancient fracture zone in the Earth's crust. There are old sedimentary rocks in the south-eastern part of the national park, but these do not include hydrocarbon-rich shales or coals.

Pembrokeshire Coast National Park

(Geology: <http://bit.ly/1w7e2mC>)

Famous for its diversity of rock types and structures, the national park does contain shales and coals. However they are too thin, too low in oil or gas, and their structure is too geologically complex for them to be of interest to fracking companies.

Snowdonia National Park

(Geology: <http://bit.ly/1BLoJw4>)

A tectonically altered region of old, sedimentary, metamorphic and volcanic rocks. The rocks do include some shales, but these have been folded, faulted and over-heated such that they have no oil or gas potential.

Fracking Unlikely (Amber)

Brecon Beacons National Park

(Geology: <http://bit.ly/1NI3Yfk>)

The rocks are old, sedimentary, and include some shales. Most of these shales have low oil or gas potential, as they are old, not particularly thick, contain little organic matter, and have been deformed by tectonic activity. The national park is situated just north of the South Wales Coalfield, however, where coals and shales with some gas potential are found.

Exmoor National Park

(Geology: <http://bit.ly/1H02Rx5>)

Mostly consists of old sedimentary rocks. The shales that were present have been folded and compressed into slates, which have no hydrocarbon potential. There are some younger rocks to the east of Exmoor, but they are not thought to contain economic amounts of oil or gas.

New Forest National Park

(Geology: <http://bit.ly/1zPvEi0>)

A relatively young geology and the rocks close to the surface have no shale gas, shale oil, or coal bed methane potential. Oil and gas have been found in rocks beneath areas close to the New Forest, and there has been exploration in the national park, but there is no evidence of any oil- or gas-bearing shales that would be of interest to fracking companies.

Northumberland National Park

(Geology: <http://bit.ly/1Ej8dW6>)

A mixture of old igneous and sedimentary rocks, including some shales. These shales have been compressed and deformed, and many have been over-heated by the igneous activity. They have low hydrocarbon potential.



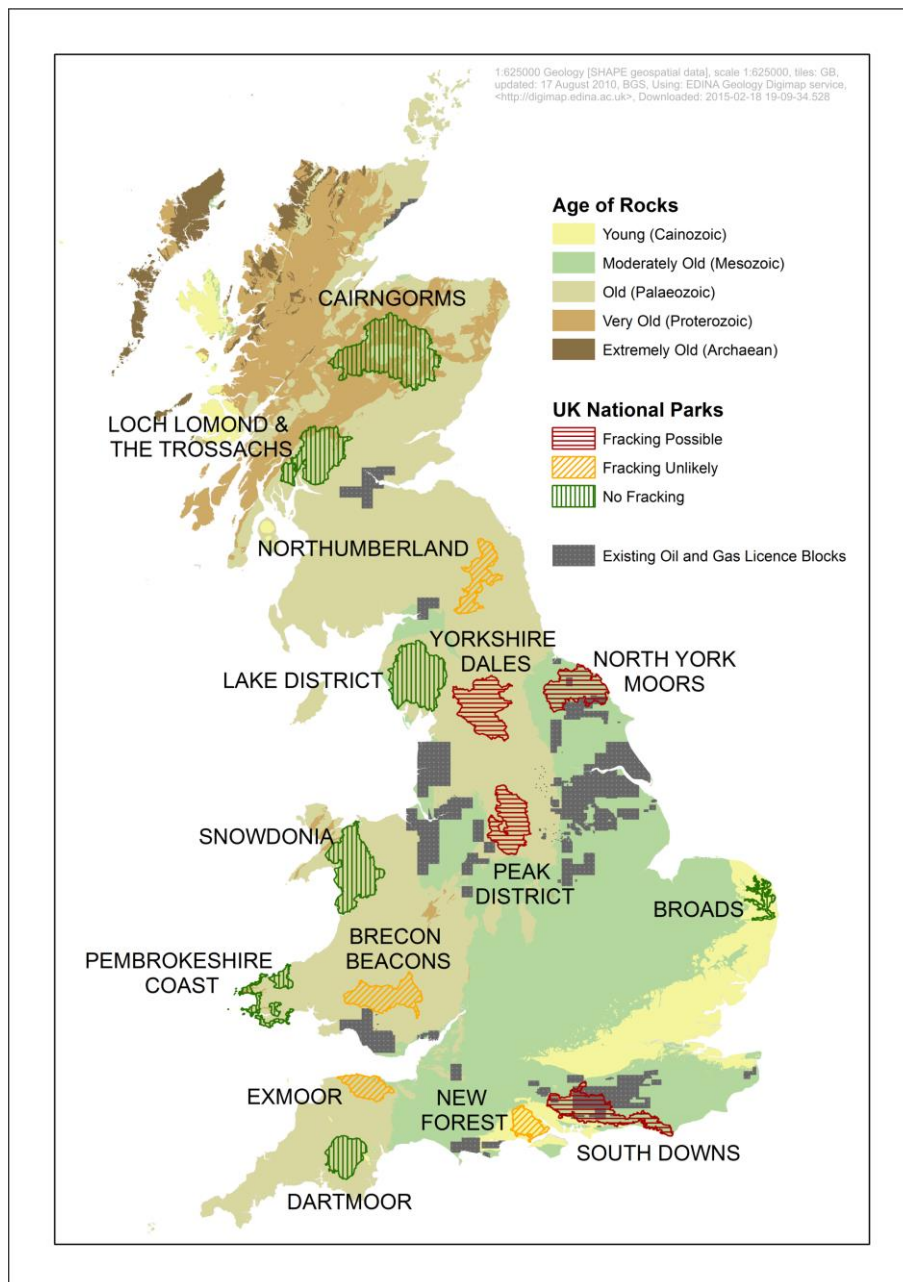


Figure 2. Map of Great Britain, showing simplified bedrock geology (oldest rocks in NW Scotland, youngest in SE England), locations of existing onshore oil and gas licence blocks, and locations of national parks. National parks coloured and ornamented to show likelihood of fracking for hydrocarbons.

The map contains OS data © Crown Copyright [and database right] (2015), British Geological Survey materials © NERC [2015], and public sector information from the Department of Energy and Climate Change, licensed under the Open Government Licence v3.0.



Fracking Possible (Red)

North York Moors National Park

(Geology: <http://bit.ly/1aN2NX1>)

The rocks include hydrocarbon-bearing shales at depth, and there are already a number of oil and gas production sites in and around the area. There has, as yet, been no fracking for shale oil or shale gas, but the region is certainly of interest to fracking companies.

Peak District National Park

(Geology: <http://bit.ly/1GnS1Ue>)

The Peak District has long been an area of hydrocarbon exploration. The oldest onshore oil well in the UK was drilled in Tibshelf, Derbyshire, in 1919. There are many hydrocarbon-bearing shales and coals in the region that might be of interest to fracking companies.

South Downs National Park

(Geology: <http://bit.ly/1H08fjJ>)

There are already a number of oil and gas production sites around the South Downs. A recent study by the British Geological Survey indicated that there is little shale gas potential in the region, but that there is a possibility that fracking for shale oil could take place.

Yorkshire Dales National Park

(Geology: <http://bit.ly/1BUle88>)

Formed almost entirely of old sedimentary rocks, but these are mostly limestones and sandstones which are not of interest to fracking companies. Shales and coals are found to the south of the national park, however, and research by the British Geological Survey (<http://bit.ly/1GnSlqm>) suggests some of these may be prospective for gas.

Putting evidence into the fracking debate

In the UK fracking debate, political, economic and environmental issues are important. However, in the end, everything is dictated by the geology. If the right rocks aren't there, nothing else matters, and it is vital that more decision-makers understand this. Put simply, we need facts before fracks.

Research into shales, fracking and related topics is being carried out by the jointly run Durham and Newcastle University-led projects:

ReFINE (Researching Fracking In Europe: www.refine.org.uk). The consortium is funded by the Natural Environment Research Council, and the energy companies Shell and Chevron

JARR (Jurassic Analogues: Resources to Reserves: www.dur.ac.uk/earth.sciences/research/projects/jarr/). The JARR project is funded by the Natural Environment Research Council.

References

1. Daily Hansard – Debate: 26 January 2015
www.publications.parliament.uk/pa/cm201415/cmhasnsrd/cm150126/debtext/150126-0002.htm#column_586
2. Daily Hansard – Debate: 11 February 2015
www.publications.parliament.uk/pa/cm201415/cmhasnsrd/cm150211/debtext/150211-0004.htm#150211100002395
3. Infrastructure Act 2015: 2015 Chapter 7
<http://www.legislation.gov.uk/ukpga/2015/7/enacted>
4. West Sussex shale exploration plans axed.
Guardian 12 March
5. 14th Landward Licensing Round
www.gov.uk/government/news/new-onshore-licensing-round-opens

