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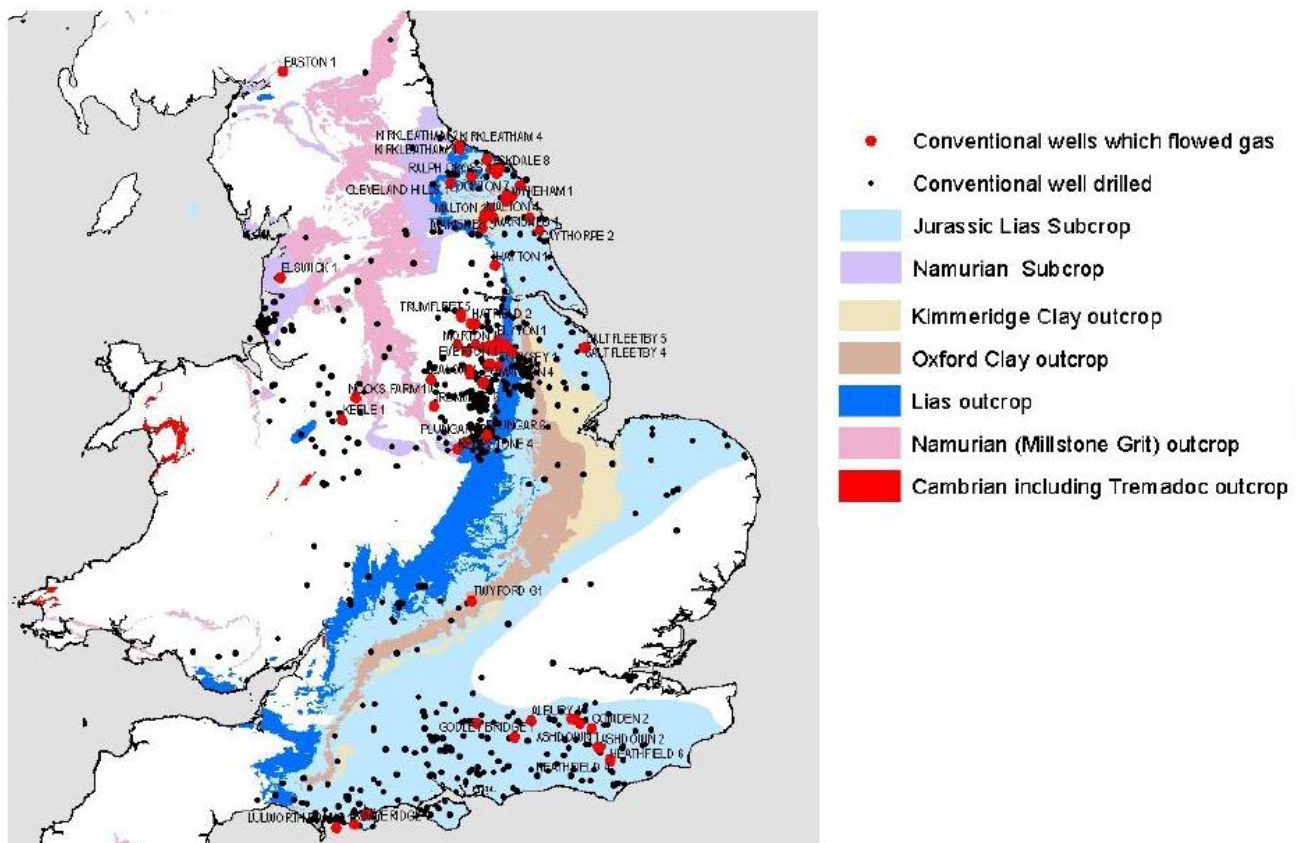
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Fracking

An independent geological report has found that it is "highly probable" a controversial technique to extract gas from shale rock, known as fracking, triggered two minor earthquakes on the Lancashire coast last year. The energy company Cuadrilla - which suspended its fracking test operations in June following the tremors - said the conditions that caused the earthquakes are unlikely to occur again. The Department of Energy and Climate Change (DECC) are considering the report before deciding whether to allow Cuadrilla use this technique again, and are expected to announce their decision imminently.

Their decision will not only affect explorations in Lancashire but other prospective shale formation locations throughout Britain, as shown in the diagram below.

Main areas of prospective UK shale formations



Source: DECC 2011 *The unconventional hydrocarbon resources of Britain's onshore basins- Shale gas*

But there are other concerns over the practice which members need to be aware of in order to make informed decisions about allowing potential frackers access to their land.

The voice of British farming

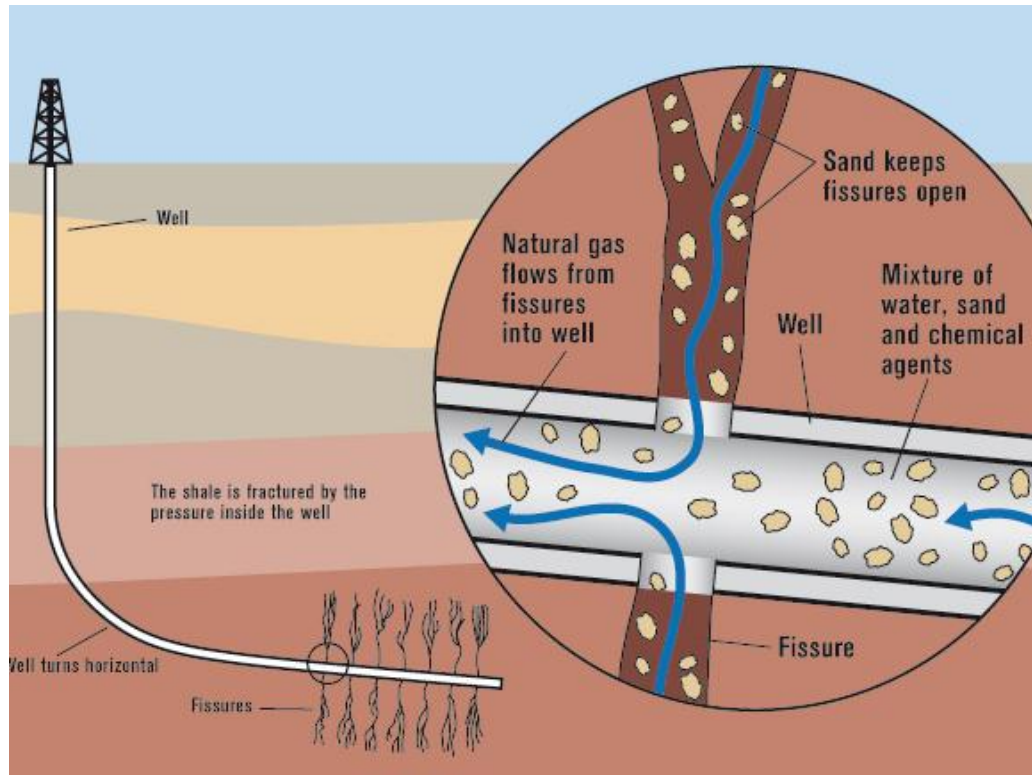
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What is fracking?

Fracking, or hydraulic fracturing is the process of creating tiny explosions to shatter and crack shale rock to release trapped shale gas, or oil, inside. In shale rock, this is achieved by drilling down and then horizontally. Water, sand and chemicals are injected at high pressure opening fissures to allow the gas to flow out to the well head. Fracking was first used in 1947 and has been used in the UK since the 1970s.

The fracking process



Source: *Prospect* 169, 2010

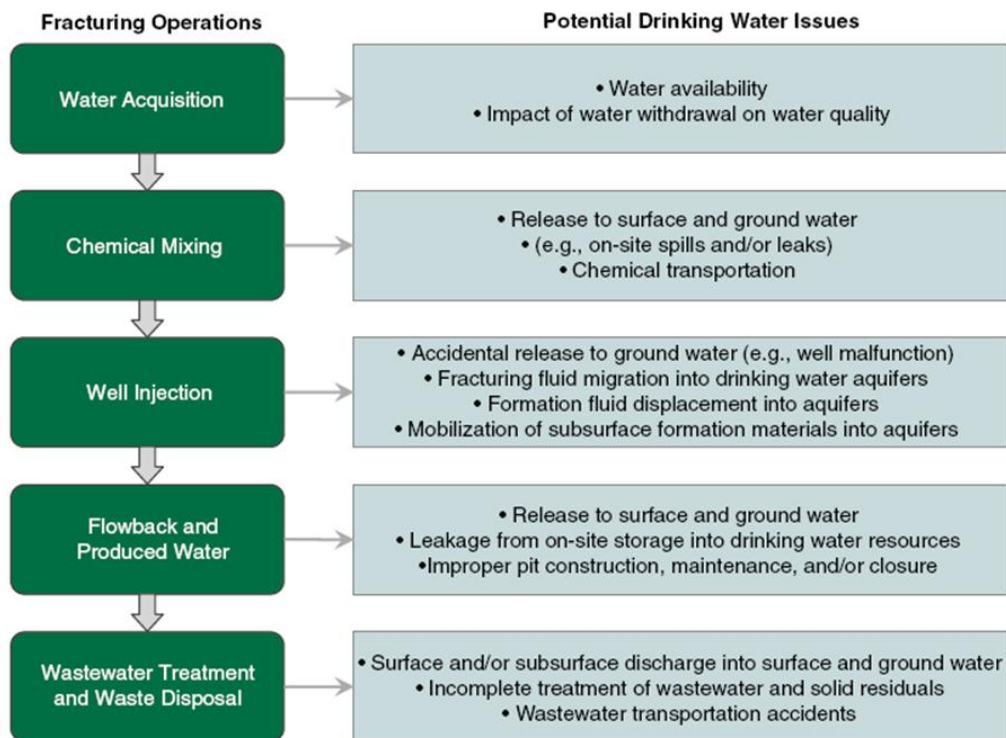
Cuadrilla has been granted licenses in the UK to explore shale formations for the presence of hydrocarbons. This exploration is on-going and it is expected that if licenses are granted to extract gas and oil using fracking, this will not commence until 2014 at the earliest.

Why is fracking controversial?

There are a number of concerns over fracking, namely the risk of water contamination, earthquakes, water use, land take, traffic and infrastructure, and the perceived threat the industry has on renewable obligations and climate change mitigation targets.

The following diagram shows some of the potential risks to drinking water at different stages of the process, as identified by the U.S. Environmental Protection Agency.

Potential impacts on drinking water from fracking



Source: U.S. EPA 2011 Draft to study the potential impacts of hydraulic fracturing on drinking water

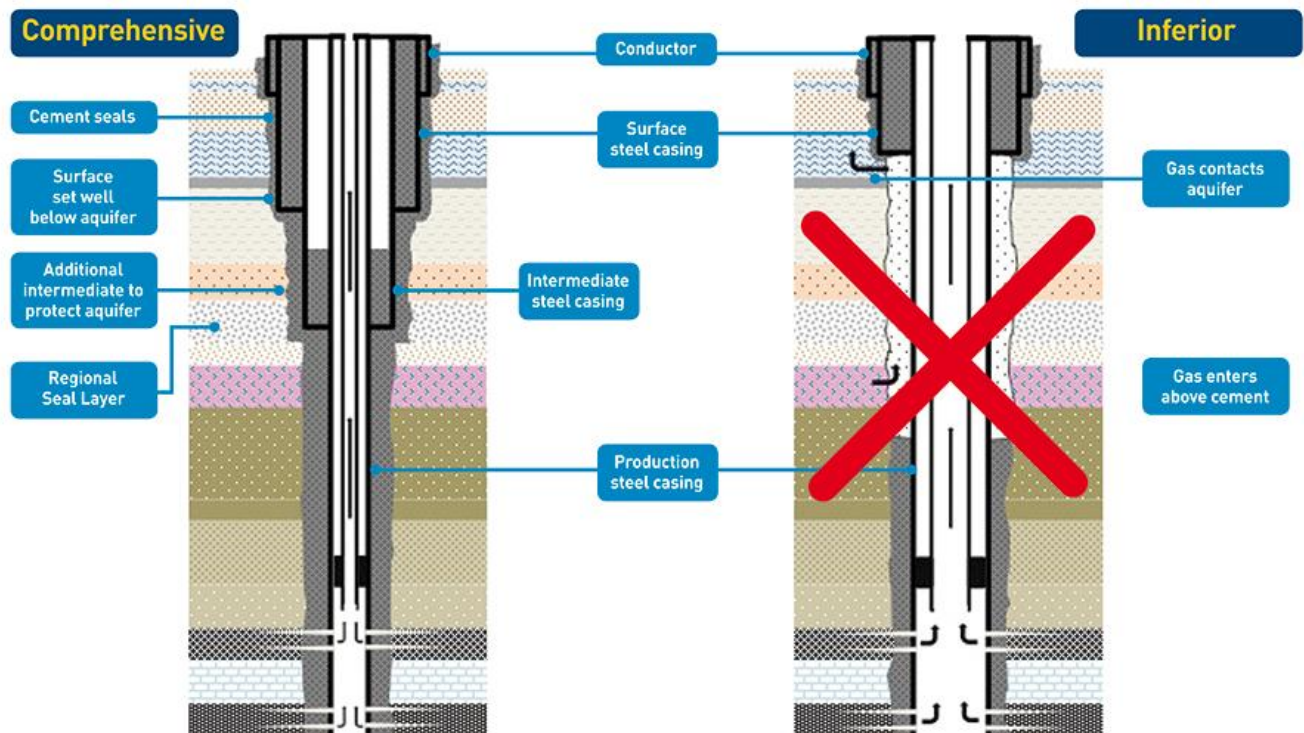
Tim Yeo MP - chairman of the energy select committee has commented: "We can't see any evidence that UK water supplies might be at risk from shale gas - if it is done properly." The committee has also said that environmental problems suffered in the US could be overcome by tight regulation and good industry practice.

The industry itself also vigorously denies that shale gas is unsafe and blames pollution incidents as examples of bad practice, rather than an inherently risky technique. Well shaft construction regulations in the UK differ from those in the USA; requiring well shafts to be fully cemented with extra casing above between aquifers and shale formations to prevent fracking fluid contaminating water.

The diagram overleaf demonstrates the well design that would be used in the UK and compares it to poor well construction which may have led to contamination of aquifers in America.

In the UK, water use would be subject to license and drought plans through the Environment Agency and local water company. Some of the water returns up the well shaft as flow-back fluid. Some of this can be recycled but some would return contaminated with minerals and salts and would have to be processed. Naturally occurring radioisotopes in the soil can also contaminate the flow back fluid and this would need to be disposed of by permit. The UK has water disposal plants that would easily be able to cope with the quantities generated. Transporting the water to these sites would increase local traffic for up to three weeks after fracking.

Well design



Source: Cuadrilla 2011

Natural gas from shale is a fossil fuel has the potential to contribute to global warming although, carbon (and noxious gas) emissions from natural gas are much lower than from oil and coal, and water use is lower than by coal or nuclear industries. Fracked wells in American have been criticised for releasing methane gas. This can occur due to poor control of produced gas and methane can also escape with flow back water. This is referred to as 'fugitive' methane. There is technology, known as green completion, which prevents the emission of fugitive methane. Although green completion has only been used sparsely in America, the Environment Agency have said that they would expect green completion technology to be used in the UK. Natural gas extracted through fracking is, in the UK, expected to be of a high quality, the result being that refining is unlikely to be necessary. Refining natural gas produces methane emissions. The Environment Agency have stated that should this be necessary they would require the methane to be flared, subject to approval by the Health and Safety Executive. Flaring methane would convert it to carbon dioxide – a much less potent greenhouse gas. While the Environment Agency expect such instances to be rare, they have stated that if the shale gas operator were to flare gas on a large scale permits would be needed and the operator would be required to monitor for oxides of nitrogen, volatile organic compounds, sulphur dioxide and methane.

There are concerns that the exploitation of shale gas reserves could lead to a reduced focus in renewable technologies. The extraction of shale gas does not qualify for any government subsidies so public funds would not be diverted away from renewables. The UK has strict obligations to meet international targets on renewable energy use. However, there is a possibility that if the UK were to increase its energy security using shale gas reserves, renewable energy policy could receive less political attention.

There are also worries that the fracking process can cause small earth tremors. Two small earthquakes of 1.5 and 2.2 magnitude that hit the Blackpool area last year were attributed to hydrocarbon explorations. Earth tremors are a common occurrence, but are usually too small to detect above the surface. The scale of those which affected Blackpool are thought to be extremely rare and were caused by the presence of a stress fault which accepted large quantities of water over 4 consecutive fracks. If licenses are granted for extraction, each well would probably be fracked just once.

Each well is likely to be in production for 30-50 years, although there would be little activity at the site after drilling, fracking and recovery of flow back fluid – which would take approximately 3-4 months. At the end of its productive lifetime, the well is plugged. The top 12 meters of the casing is removed and the well is cemented up to this point. The top is then filled with the original spoil and topsoil. It is unlikely that any extra roads will be needed as there are few remote places in the UK where shale gas is likely to be found but a hard standing would be required during the drilling process. This can later be removed.

How is fracking regulated?

A number of agencies and departments are involved in the regulations surrounding fracking, with the Department of Energy and Climate Change (DECC) being responsible for granting licences for the exploration and extraction of hydrocarbons.

From the outset, each application must go through the local planning process and before any drilling occurs, an application for authorisation for any discharge must be made to the Environment Agency (EA). As part of this process, operators are required to disclose the content of fracking fluids to the Environment Agency. The Health and Safety Executive scrutinises the well design for safety and stability of structure.

Both the Environment Agency and the Health and Safety Executive (HSE) work to ensure operations are safe, for people and the environment. This includes regular checks and site visits. The HSE will monitor progress on the well to determine if the operator is conducting operations as planned. The HSE are also notified of any unplanned events.

What are the advantages of shale gas?

The decline in production from the North Sea has seen the UK become a net importer of gas since 2004. 200 trillion cubic feet (TCF) of gas has been discovered in Lancashire, although only 10-20% of this is thought to be extractable. Currently the UK uses 3TCF/yr. While shale gas is not anticipated to supply a large proportion of Britain's gas needs it could act as an alternative to imports, improving the UK's energy security.

In the USA gas prices, and the prices of related products such as manufactured fertilisers have fallen, due in part to the increase in production of natural gas from shale.

In addition, Cuadrilla estimate that around 5,000 jobs could be created in the UK.

What are the implications for agriculture?

The implications for agriculture appear to be minimal but could be significant at a local level. Land take is not permanent, and access would need to be granted by the landowner. This could act as an additional revenue stream to the landowner.

Once a well has been plugged steel casing and cement would be present 12 meters below the soils surface. While it is unlikely that the presence of the well shaft 12 meters below the surface would have any effect on field work, the presence of the well shaft would need to be mapped and included in sales documentation.

The fracking industry does represent an additional water user which could increase water stress in times of shortages. The NFU responds to each water company's drought plan and we strongly argue that in times of water shortage agriculture must be a priority. We would also engage with local frackers to make them aware of times of high water use by agriculture, for example for irrigation of a particular crop that is grown in the area.