INEOS Shale

3. Our Proposals: Explained

Land adjacent to Common Road, Harthill, Rotherham

Construction of a well site and creation of a new access track, mobilisation of drilling, ancillary equipment and contractor welfare facilities to drill and pressure transient test a vertical hydrocarbon exploratory core well and mobilisation of workover rig, listening well operations, and retention of the site and wellhead assembly gear for a temporary period of five years on land adjacent to Common Road, near Harthill.

May 2017

OUR PROPOSALS: EXPLAINED

This summary document introduces INEOS Upstream's proposals which are the subject of this planning application. It provides a short explanation of the context to the proposals and what the proposals will (and will not) involve. It is to be read alongside the rest of the planning application documents, where more detail is to be found.

INEOS Shale
AN INEOS UPSTREAM BUSINESS

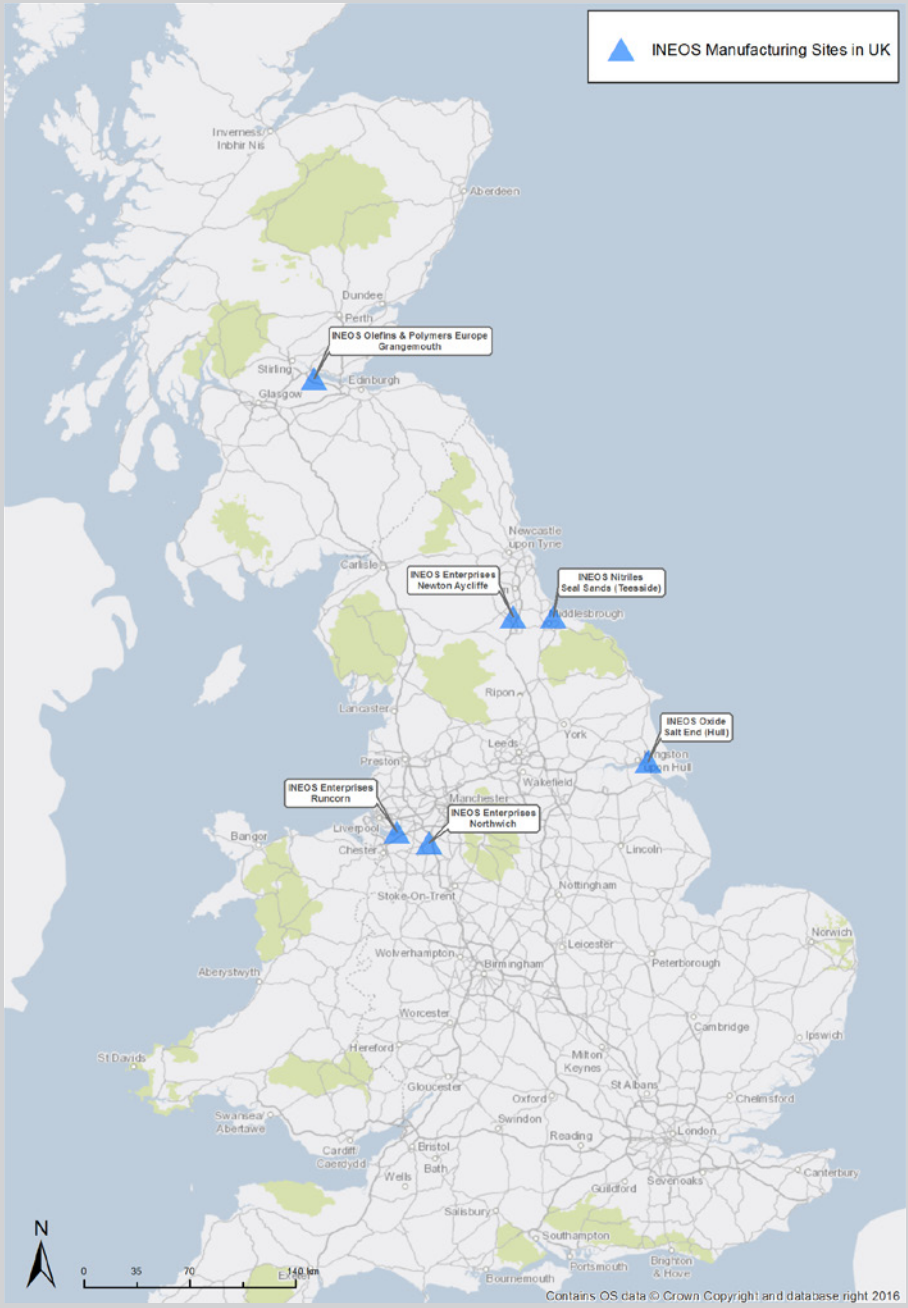
WHO ARE INEOS UPSTREAM?

INEOS Upstream is a division within INEOS dedicated to exploring for shale gas. INEOS is a global chemical company and one of the UK's largest manufacturing businesses employing 4,000 people across seven sites. We also produce gas from the North Sea. We are highly experienced in complicated manufacturing processes and safety is our top priority.

INEOS is investing in exploring for shale gas because we believe in its potential and the significant benefits it can bring for a viable UK manufacturing sector, our energy security, the local and national economy and in addressing climate change.

INEOS Upstream has been granted licences by Government[1] across various areas within the UK, including in this location, to enable it to progress with this exploration, subject to the grant of planning permission and other environmental permits. In being granted these licences, INEOS Upstream is under an obligation to maximise the available resource.

INEOS IS A GLOBAL CHEMICAL COMPANY AND ONE OF THE UK'S LARGEST MANUFACTURING BUSINESSES EMPLOYING 4,000 PEOPLE ACROSS SEVEN SITES



1. Known as Petroleum Exploration and Development Licenses (PEDLs); only the holder of such a license is authorised to explore for oil and gas in the area covered by the license.

WHAT IS SHALE GAS?

Shale gas is a natural gas, just like the gas that many of us use for cooking and heating our homes and which has been extracted from under the North Sea and from onshore locations within England for many years.

It is found in the shale layers of rock. The shale rocks which are considered most likely to contain shale gas lie some 2,000m to 5,000m below the surface, in areas of North Yorkshire, the East Midlands, Lancashire, Cheshire and Scotland.

Shale rocks don't have the same number of natural gaps and fractures within them, compared to the likes of sandstones and limestones. Therefore, the gas is held within the shale where it was formed.

When looking to extract natural gas from shale, the flow of gas is made possible through horizontal drilling and what is called hydraulic fracturing. Hydraulic fracturing is the pumping in to the drill hole of a fluid containing sand and a small amount of chemicals to open, and hold open, tiny fractures through which the gas can flow up to the surface along the drill hole.

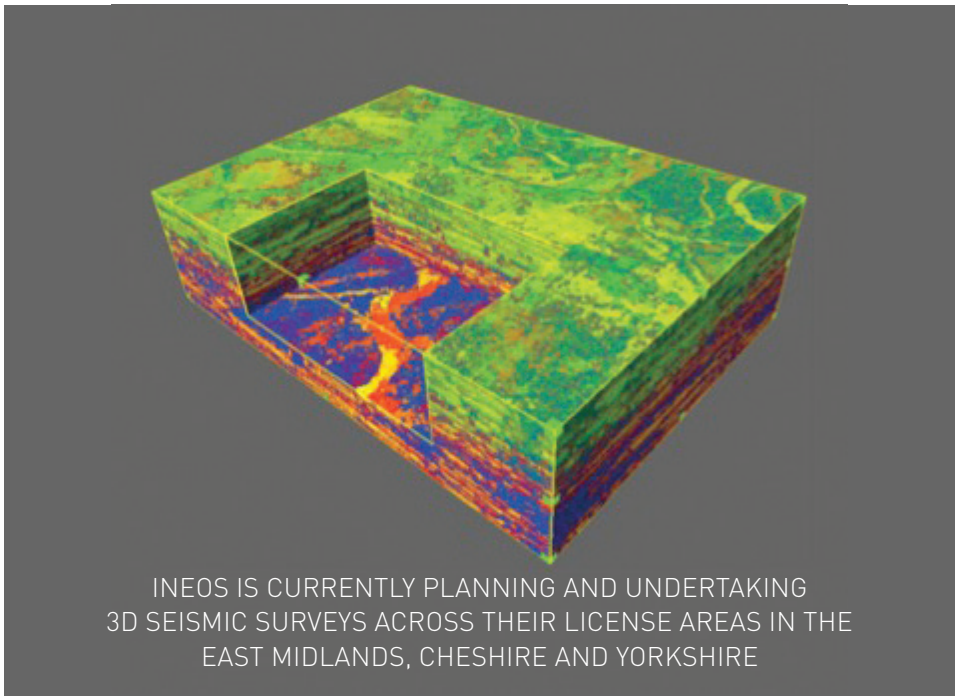
This is a method that has been used for oil and gas extraction since the 1980s both in the UK (on and offshore) and the United States. Only now is it being applied to shale gas in the UK, as a greater understanding of the potential of the shale gas resource has emerged.

Evidence has been compiled, particularly by the British Geological Survey[2], which indicates that the amount of shale gas found within the UK could be very significant. What is unclear at this stage, and forms the basis of INEOS Upstream's exploratory work, is how much of it can be technically and commercially extracted. Further surveying, exploration and testing is needed, before the potential of the UK shale gas resource can be fully established.

"If the UK, like it has done in developing the North Sea, can develop a Shale industry with a strong and demonstrable safety practice, operational and environmental practices; then we can take those skilled jobs, equipment and know how to our neighbours in Europe".

SHALE GAS IS THE SAME AS NORTH SEA GAS. BOTH COULD BE USED TO HEAT OUR HOMES

GAS DOESN'T JUST HEAT OUR HOMES, IT IS A BUILDING BLOCK FOR PLASTICS AND CHEMICAL MANUFACTURING, WHICH MAKE THE PRODUCTS AROUND US; INCLUDING MEDICINE, PLASTICS, CLOTHES, COMPUTERS AND EVEN RENEWABLE ENERGY TECHNOLOGY



INEOS IS CURRENTLY PLANNING AND UNDERTAKING 3D SEISMIC SURVEYS ACROSS THEIR LICENSE AREAS IN THE EAST MIDLANDS, CHESHIRE AND YORKSHIRE

2. The British Geological Survey (BGS) is a partly publicly funded body which aims to advance geoscientific knowledge of the United Kingdom

WHY IS IT IMPORTANT?

Gas is a fuel that we burn for energy and use as a raw material. We have a need for both, in the short and long term.

As a source of energy it is burned in power stations to create electricity and is piped directly in to our homes and businesses, to fuel central heating, fires and cooking appliances. Around one third of our energy needs is fuelled by gas[3]: 30% of our electricity is generated from gas[4]; 8 out of 10 homes use gas for heating[5].

The UK's climate change commitments seek to reduce the reliance on fossil fuels such as coal and gas over time, and to rely instead on nuclear power and renewable energy ('low carbon' fuels), but this will take decades and in the meantime we have energy needs that must be met. Gas is 'cleaner' than coal in terms of emissions and will perform a critical role in this transition period[6,7].

Gas is also used in making chemicals, which are in turn used to make much of what we rely on day to day.

"There is no substitute for gas in making a wide range of products such as plastics (used in cars, computers, wind turbines, buildings etc.), medicines and clothing. We will still need gas to make all these products once we have reduced reliance on it as an energy source".

But our existing sources of supply are declining. Since 2004 the UK has become a net gas importer: we need and use more gas than we can extract. Without new sources, this will only become more extreme. We now import over half of our gas[8] and Government estimates our reliance on imports will reach 60% by 2020 and 90% during the 2030s[9].

There are many downsides to this:

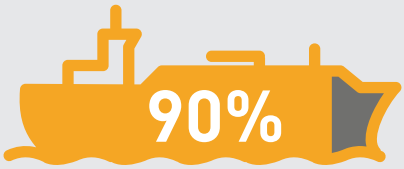
- It raises the risk of us being affected by global events, both in terms of the security of energy supply and its cost.
- We have no control over how other countries extract the gas and the environmental impacts this may be having.
- Transporting gas in to the UK by ship has its own environmental impact (in the use of fuel for the ships).
- We don't gain any economic benefits, such as job creation or tax revenue.

"Indigenously sourced natural gas is good for the UK economy; just like the North Sea sourced natural gas".

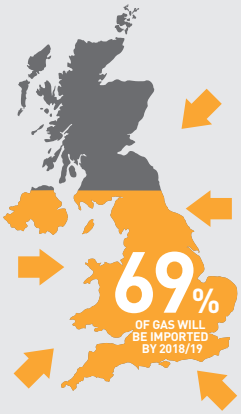
The importance of having a national supply of gas is recognised by Government as is the importance of shale gas as a potential source of that supply. It is Government policy that there is a national need to explore and develop our shale gas and oil resources in a safe, sustainable and timely way. It has been expressed by Government that there is 'a need to seize the opportunity now to explore and test our shale potential'[10].

30% OUR ELECTRICITY IS GENERATED FROM GAS

8 OUT OF 10 HOMES USE GAS FOR HEATING



GOVERNMENT ESTIMATES OUR RELIANCE ON GAS IMPORTS WILL REACH 90% DURING THE 2030s



SHALE GAS WILL MAKE US LESS DEPENDENT ON IMPORTED GAS FROM EUROPE AND THE MIDDLE EAST

3. Shale Gas and Oil: Written Ministerial Statement (16th September 2015)
4. Department of Business, Energy and Industrial Strategy, Digest of UK Energy Statistics (2016), Table 5.2
5. National Grid, UK Future Energy Scenarios; UK Gas and Electricity Transmission (2014)
6. Intergovernmental Panel on Climate Change, Climate Change 2014: Mitigation of Climate Change (2014)
7. Committee on Climate Change, 'Does the IPCC endorse shale gas?(2014)
8. Department of Business, Energy and Industrial Strategy, 'Digest of UK Energy Statistics, 2016', Chapter 4
9. National Grid, Gas Ten Year Statement (2014)
10. Ministerial Written Statement, 16 September 2015

WHAT DOES THIS PLANNING APPLICATION PROPOSE?

From the evidence that has been assembled to date, by the likes of the British Geological Survey, it has been established there is a potential shale gas resource in this area. This proposal is INEOS Upstream's next step in determining how feasible it is to extract this resource.

It involves exploratory drilling works only, but those works are essential. Without drilling down in to the resource and testing it, there is no practical means of establishing how much gas may be present and whether the gas can be technically and commercially extracted.

The proposal involves drilling down to the shale rock layer and extracting a sample of the rock. This is known as a 'core well' as it takes a core sample. To extract the core sample from the shale layers, a vertical well (7.5-22.5cm in diameter) will be drilled to a depth of between 2,000m and 5,000m[11]. The core sample is then sent for laboratory analysis of its structure and its gas content. This information will allow us to determine whether or not to move to the next stage and test to see if the gas flows.

The process entails:

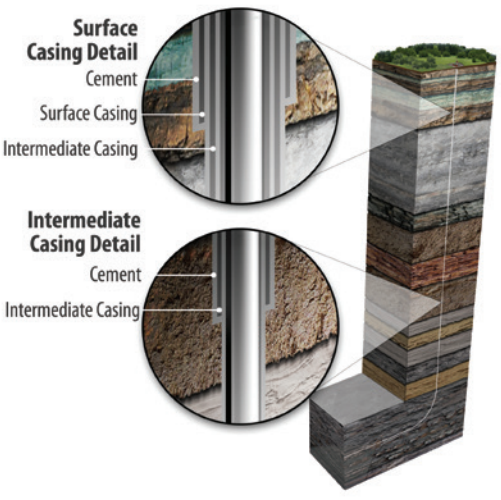
- A 'well pad' will be constructed, which provides a firm, level base to place drilling equipment and other facilities upon. It is surrounded by earth mounds to screen the operations and a membrane is placed underneath to prevent any fluid from the site entering the surrounding environment.
- A drilling rig will be brought in by road and, similar to a large crane on a construction site, assembled on site.
- A well hole (or 'bore') will be drilled down below the aquifer level (up to 180 metres below ground) and a steel pipe ('casing') inserted in the hole to keep the hole separate from the surrounding rock and ground water. Cement will be pumped in to the space between the outside of this casing and the rock to create a seal between the two and provide stability to the casing.
- We will then drill down to around 470 metres depth and insert a second steel casing inside the first one and pour cement between the two casings. Drilling will then continue to just above the shale rock layer. At this point we will insert a third steel casing and cement. Finally we will drill in to the shale layer to take our core sample at approximately 1000m-2500m, with additional casing cemented in place where appropriate.
- This stage is a bit like extracting a core from an apple – we remove a cylinder of rock (approximately 7.5-22.5cm in diameter) and bring it up to the surface in a sealed tube. This is then sent to a laboratory for analysis of its geological composition, structure and gas content.
- The depth of the well in total will be approximately 2800m.

During drilling, we will log the well, to gather data about the geology, including the structure, brittleness and temperature of the shale and other horizons. We would also examine its potential gas content, the quality of any gas, and how easy it would be to extract from the shale. We would carry out a "Pressure Transient Test" (PTT - also termed a "leak off test") to assess the pressure within the shale, which is an important measure as to how likely the gas could be extracted efficiently. This would involve squeezing a small amount of a salt solution (KCl) into the shale, and measuring the decrease in pressure of this solution over approximately two weeks. There would be no attempt to produce gas from the well by hydraulic fracturing.

This entire process is tried and tested. It applies a method that has been used in drilling for oil, gas and other below-ground resources for many years across the UK and elsewhere. It is not new, nor unusual.

The proposal has been carefully designed, informed by a full understanding of this particular site and its surroundings. INEOS will use equipment and employ working methods that avoid, minimise or mitigate impacts on the environment. The planning application comprehensively assesses the potential impacts of the proposals.

In order to conduct these works, in addition to the grant of planning permission, INEOS must obtain various environmental permits and licenses and approvals from relevant regulatory bodies such as the Environment Agency, Health and Safety Executive (HSE) and The Oil and Gas Authority. Those same regulatory bodies will also monitor the activities to ensure they are undertaken in a safe and environmentally sound manner, consistent with the terms of any permits issued. INEOS has vast experience of working within the UK's robust regulatory regimes and takes its responsibilities seriously. The planning authority can, and must in making its decision, rely on these separate regulatory regimes operating effectively.



11. Refer to the application documents for further detail on the intended depth

WHAT HAPPENS NEXT?

This planning application seeks permission to drill a single well. If approved, it will take around three months to prepare the site and five months to undertake the drilling, sampling and testing.

Once the drilling, core sampling and testing has taken place, the planning permission would allow the well to be maintained for a period of up to five years from the date of permission. This would be to allow it to be used as a below ground level monitoring point should further exploration progress in the wider basin area.

The planning application seeks consent for the well to be plugged and the site restored at the end of the five-year period. To plug the well hole (or 'bore') it is filled with a cement plug and sealed, all surface equipment is removed and the ground restored to its former use. Monitoring and aftercare of the restored site will be undertaken. This process is regulated by the HSE, the planning authority and the Environment Agency and these bodies need to be satisfied that there will be no risk to the environment or safety from the restored site.

AND AFTER THIS STAGE?

Any additional use of the site beyond that described above, would require a separate, new application for planning permission.

Potential future activities are described below. It is important to note that these **do not form part of the current application and are provided for information purposes only.** These may not occur, or if they do, not necessarily in this location.

Gas Flow Testing and Horizontal Drilling

If analysis of the shale rock indicates the area has potential we may wish to apply for planning permission to drill a new well to conduct a test of the flow of gas. This could be from an existing well site or a new well site, depending on the assessments carried out on the geology and at the surface. A new well would likely be drilled horizontally through the shale using the same process and containment measures as described above.

Hydraulic Fracturing

To further increase the area of shale that is exposed, this well would be hydraulically fractured (commonly known as 'fracking'). This would involve creation of fractures in the shale by controlled pumping of fluid containing water, sand (to hold open the cracks created) and small amounts of other chemicals to improve the effectiveness of the process. The extent and direction of the fractures would be monitored and controlled. The fractures will not extend into the ground-water aquifers as these are much nearer to the surface than the horizontal well bore.

Fracturing the rock would release gas, which would be measured at the surface. This would establish if the well is likely to be commercially viable.

Production

If these tests show that the well could be viable, further consent could be sought to continue production. No further fracturing of the well would be undertaken and very small-scale surface equipment would be necessary to ensure the safe flow of gas to surface. The well could continue to produce gas for up to 20 years.

Intended use for the gas (whether to power an electricity generator in the short term, or to be fed into the National Grid following necessary treatment) would form part of future planning applications once the composition and quantity of the gas is known.

Production development

Should all the tests show the area to have a significant commercially-viable resource, further planning applications for additional wells and hydraulic fracturing would be submitted. These would be designed to minimise the local level effects of the development. For example, it is possible to drill multiple wells from a single well site to maximise gas production with a small surface footprint, and water pipelines could be installed to minimise vehicle movements.

Decommissioning

Once all the gas is extracted, the remaining wells would be plugged and the well pad would be restored to its former use, and subjected to monitoring and aftercare required by the planning authority, HSE and Environment Agency.

INEOS HAS PROMISED TO SHARE 6% OF ITS GAS REVENUES WITH LANDOWNERS AND LOCAL COMMUNITIES

COMMUNITY ENGAGEMENT

INEOS Upstream is committed to full and open consultation with local communities. We have engaged with all stakeholders in communities near to the proposed site before submitting the planning application and this will continue through each stage of the process. Regular and in depth community engagement is absolutely vital to delivering our plans and conveying the benefits to all stakeholders.

As with any construction operation there can be a period of disturbance and inconvenience to the local community. INEOS Upstream has been mindful of this in selecting its sites, but will also endeavour to minimise this through community liaison and activity management procedures.

"Locally sourced low cost energy sustains and helps keep existing local industry and jobs competitive and secure"

CONCLUDING COMMENTS

In conclusion:

- The proposal is critical to exploring the potential of shale gas in this area
- Without exploration, the UK will not be able to establish the potential of this resource
- The application concerns only this core well stage, with any future stage subject to separate planning applications to be judged on their own merits at that time
- The technology and method to be applied is tried and tested and developed to meet specific site requirements taking in to account the local characteristics
- The proposed development is designed and will be managed to either avoid, minimise or mitigate potential effects
- The proposal is wholly consistent with the Government's support for shale gas as a prospective resource capable of enhancing energy security, economic performance, and UK's path to a low-carbon future
- INEOS Upstream takes its responsibilities seriously and will continue to engage with all local stakeholders through this planning application process and subsequently.