

# SHALE GAS KEY FACTS

FRACKING HAS BEEN USED  
IN THE OIL AND GAS INDUSTRY  
FOR OVER

**50**  
YEARS

**64,000**  
JOBS

BOTH E&Y AND THE IOD  
ESTIMATE THAT AT ITS PEAK  
SHALE GAS COULD CREATE  
MORE THAN 64,000 JOBS



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



FRACKING FLUID IS 99.5% WATER  
AND SAND. THE OTHER 0.5% IS  
MADE UP OF BASIC ADDITIVES.



GAS IS 65% CLEANER  
THAN COAL



GAS IS ESSENTIAL FOR THE  
MANUFACTURE OF CHEMICALS USED  
IN OUR EVERY DAY LIVES

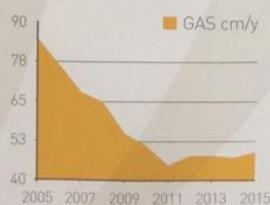


80% OF PEOPLE USE GAS  
TO HEAT THEIR HOME



**5/20**  
MONTHS  
DISRUPTION  
OF PRODUCTION

**NORTH SEA GAS DECLINE**  
(BILLION cm/y)



Source: Wood Mackenzie

**INEOS**  
Shale

# FRACKING

Fracking is a short-term operation that takes place after drilling has finished allowing gas trapped in the shale rock to flow to the well and up to surface.

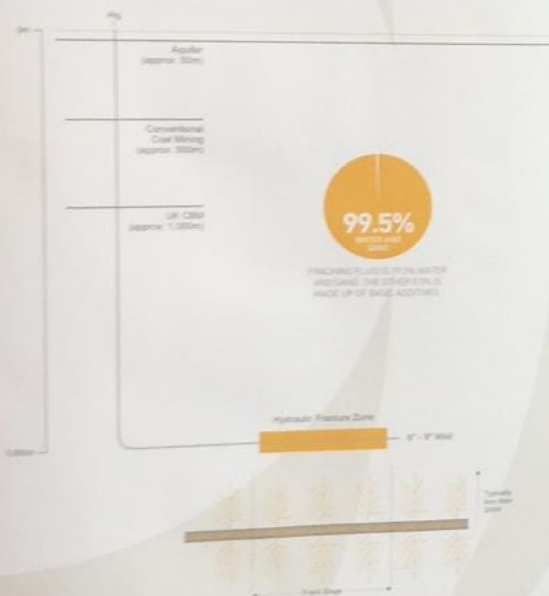
FRACKING HAS BEEN USED IN THE OIL AND GAS INDUSTRY FOR OVER

**50**  
YEARS

**1.1m**

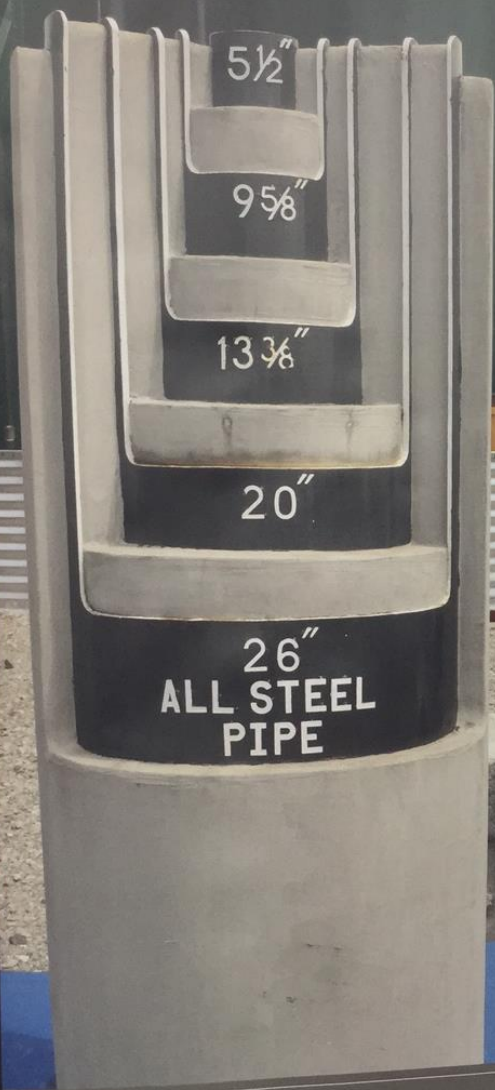
WELLS HAVE BEEN DRILLED IN THE UK SINCE 2011. APPROXIMATELY 1.1 MILLION WELLS HAVE BEEN DRILLED WORLDWIDE.

It involves pumping fluid at high pressure, into certain predefined locations in the wellbore to create lots of tiny cracks in the shale rock, which are then propped open by the sand carried in the frack fluid mixture.



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## WELL PROTECTION

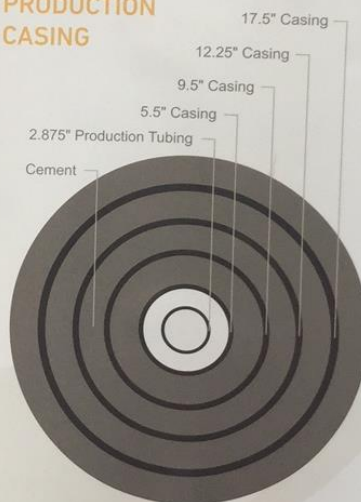


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## WELL PROTECTION



### PRODUCTION CASING



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# EARTHQUAKES

Controls are in place so that operators will have to assess the location of faults before fracking using 3D seismic surveys. During the fracking operation monitoring must take place in real time and stop if even minor earth tremors occur.



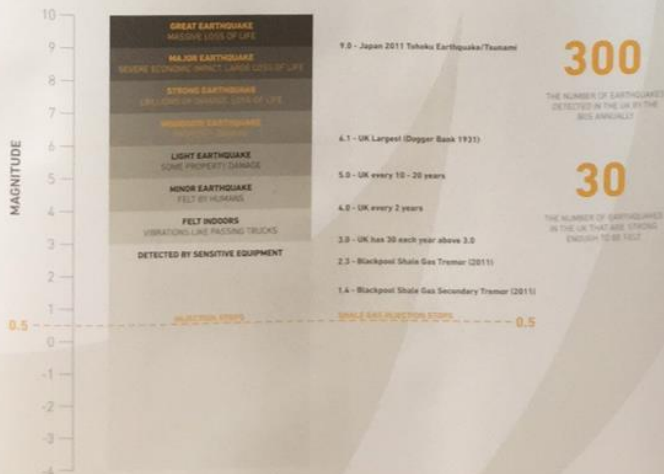
**M0.0**  
INJECTION PROCEEDS  
AS PLANNED



**M0.0-0.5**  
INJECTION PROCEEDS  
WITH CAUTION



**M0.5**  
INJECTION STOPPED  
IMMEDIATELY



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## ADDITIVES

- The fluid used to frack shale to extract gas is 99.5% water and sand – it does not contain harmful concentrations of chemicals.
- Typically fewer than a dozen chemicals are used in a given mixture, these are dependent on the specific characteristics of the rock at each site.
- All chemical additives have to be classified as non-hazardous by the Environment Agency.



THE ADDITIVES IN FRACK  
FLUID ARE CLASSIFIED AS  
NON-HAZARDOUS

### TYPICAL ADDITIVES

Gellant	0.32%
Acid	0.044%
Corrosion inhibitor	0.032%
Friction reducer	0.032%
Clay control	0.022%
Crosslinker	0.020%
Scale inhibitor	0.015%
Breaker	0.013%
Iron control	0.003%
Biocide	0.0006%

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## ADDITIVES

Additives used in fracking fluid are found in everyday household items.



### ADJUSTING AGENTS

Adjusting agents typically use sodium carbonate to maintain the effectiveness of the other additives. Sodium carbonate is used in soap, water softener, glass and ceramics.



### GUAR GUM

Guar gum is used to thicken the water so that it can carry the sand more effectively. Guar is also used in cooking sauces, toothpaste and ice cream.



### FRICTION REDUCERS

Friction reducers such as polyacrylamide allow the fluid to be pumped at a lower pressure than if water alone was used. Polyacrylamide is also used in water treatment and face creams.



### BIOCIDES

Biocides such as glutaraldehyde are used to prevent bacteria from forming.



### BRINE

Brine, typically produced with potassium chloride. Potassium chloride is a low sodium soluble salt substitute.



### SCALE INHIBITORS

Scale inhibitor such as ethylene glycol (0.01% of the fluid) to prevent scale. Ethylene glycol is used in antifreeze.



### HYDROCHLORIC ACID

Hydrochloric acid diluted to around 0.03% of the fluid is used to initiate cracks in the rock. Hydrochloric acid is used in food production, cleaning swimming pools, and is created naturally in the stomach.



### BREAKERS

A breaker such as ammonium persulfate is used to maintain the consistency of the fluid. Ammonium persulfate is used in detergent and hair cosmetics. Isopropanol may also be used – this is used in antiperspirant.



### CROSSLINKERS

A crosslinker such as borate to maintain consistency of the fluid at temperature. Borate salts are used in soap and cosmetics.



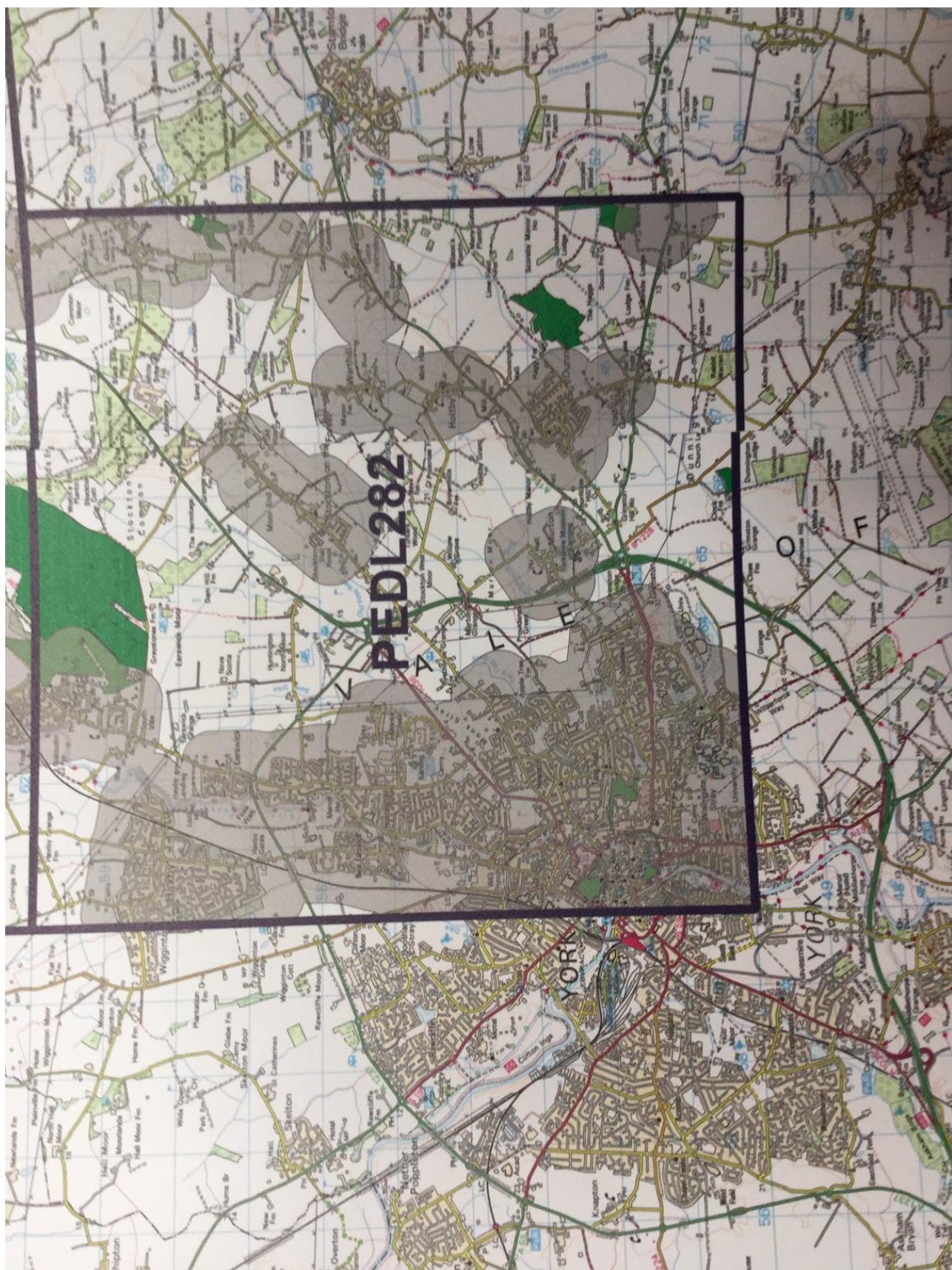
### CORROSION INHIBITORS

Corrosion inhibitors to prevent corrosion of the pipes and ensure the well stays sealed. Typically N-vinyl-2-pyrrolidone is used – used in pharmaceuticals. Citric acid may be used – used in food flavouring. Ammonium bisulfite – used in cosmetics and beverage production.

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5km



The aerial photo is from Google Earth showing the Jonah Field in Wyoming (United States of America)  
The Whitelee Windfarm overlay and potential INEOS sites are to scale with the Wyoming aerial

- Whitelee Windfarm, Glasgow, Scotland - Turbine Sites & Road Network
- INEOS - Midland Valley of Scotland Proposed Horizontal Drilling Sites

**WELL SPACING - THE WYOMING MYTH**

**INEOS  
Upstream**



# SHALE GAS & MANUFACTURING

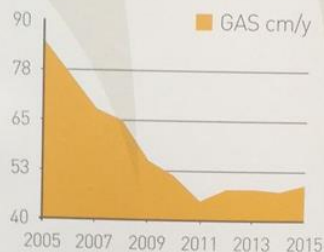
## U.S.A.

- US manufacturing industry has reversed a long term decline in investment
- The US chemical industry now has a global cost advantage
- \$164 billion is being invested in 264 new US chemicals projects creating hundreds of thousands of jobs

## U.K.

- Supplies of raw material from the North Sea (particularly ethane and other light hydrocarbons) rapidly drying up
- Energy costs uncompetitive compared to the rest of world
- High-profile manufacturing industry closures
- UK can reinvigorate the petrochemicals industry and the manufacturing sector that relies on its products
- UK can provide valuable new jobs, exportable skills and tax revenues
- If we develop our own shale gas resources

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**INEOS**  
**Shale**

# WHY INEOS?

INEOS brings something unique to the emerging shale gas industry:

- Safety is our highest priority

## INEOS SAFETY PERFORMANCE



OSHA Recordable Rate Per 200 000 hrs: Employees + Contractors

Chemical manufacturing 1.00 Best in class 0.3

- Expertise – both above and below ground
- INEOS own and operate petrochemical plants around the world
- INEOS safely handles flammable gases every day
- INEOS supplies 1 in 10 homes with gas from our North Sea operations
- INEOS has the leading experts in shale in its team
- INEOS uses gas for energy and as a raw material
- INEOS is well capitalised
- INEOS is in it for the long term
- INEOS is committed to sharing the benefits of shale gas with communities
- INEOS is committed to open communication on shale gas

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# COMMUNITY PROMISE

- As with any drilling or construction operation there can be a period of disturbance and inconvenience to the local community.
- INEOS will endeavour to minimise this through careful site selection, community liaison and activity management procedures.
- INEOS has developed an industry leading community benefits package that seeks to give communities a real stake in development.
- INEOS has promised to share **6%** of revenues. **4%** percent of this would go to homeowners and landowners in the immediate vicinity of a well, and a further **2%** to the wider community.
- Based on our estimates, a typical 10km by 10km development area would generate £375m for the community over its lifespan.
- Overall we anticipate that our future shale gas business could contribute over £2.5bn to communities, having a material impact on regional economies and the standard of public services.



HOW INEOS WILL SHARE THE REVENUE



[www.ineosupstream.com](http://www.ineosupstream.com)

#letstalkshale

email: [shale.information@ineos.com](mailto:shale.information@ineos.com)

[www.gov.uk/government/organisations/department-of-energy-climate-change](http://www.gov.uk/government/organisations/department-of-energy-climate-change)

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environment-agency](http://www.gov.uk/government/organisations/environment-agency)

[www.sepa.org.uk](http://www.sepa.org.uk)

[www.ukoog.org.uk](http://www.ukoog.org.uk)

<https://royalsociety.org/topics-policy/projects/shale-gas-extraction/report/>