Department of Energy & Climate Change

Fracking UK shale: climate change

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Hydraulic fracturing, known as fracking, is a technique used in the extraction of gas and oil from 'shale' rock formations by injecting water at high pressure. The UK is committed to cutting greenhouse gas emissions by 80% from 1990 levels by 2050. This guide explains the Government's view that we can extract shale gas and meet our carbon commitments. It draws on a recent study by DECC's Chief Scientist, Professor David MacKay, and Dr Tim Stone.

"Our study indicates that shale gas, if properly regulated, is likely to have a greenhouse gas footprint no worse than the other fossil fuels that society currently depends on. To ensure that shale gas exploitation doesn't increase cumulative greenhouse gas emissions it is crucial that society maintains efforts to drive down the costs of low- carbon technologies, including carbon capture and storage."

The Government is actively considering recommendations from the report.

Managing emissions from shale gas

The process of extracting shale gas, which includes exploratory drilling, hydraulic fracturing, gas production and well abandonment phases, has the potential to release methane – a powerful greenhouse gas – into the atmosphere. These emissions could increase the carbon footprint of shale gas. In large quantities, it could lessen the climate benefits of using natural gas over oil or coal.

In most cases, there is no economic use for the gas at exploration stage and flaring (burning it off) is the best option to minimise the emissions. Flaring reduces the greenhouse gas emissions by about 80% compared to simply allowing it to escape into the atmosphere. In production operations, operators will normally capture as much of the methane as possible and export it by pipeline.

Existing regulatory controls require operators to minimise venting (though this is sometimes necessary for safety reasons) and to make use of gas wherever possible (either on the site or by exporting it) rather than flaring it.

Technologies that can help prevent greenhouse gas emissions from shale gas sites already exist. During exploratory drilling, operators can capture methane from the fracking fluid which flows back up the well with "green completions" equipment and techniques, and the methane can then be flared.

For more details of these techniques and the regulations that will address air pollution from shale gas and oil, please see the "Local air quality" factsheet (https://www.gov.uk/government/publications/about-shale-gas-and-hydraulic-fracturing-fracking)

Understanding and minimising the carbon footprint of shale gas and oil

A recent study by DECC Chief Scientist David MacKay examined the carbon footprint and climate change implications for UK shale gas[1]. The study found that the carbon footprint for shale gas is significantly less than that for coal when used for electricity generation (423 – 535 gCO2e/kWh$_{(e)}$ versus 837 – 1130 gCO2e/kWh$_{(e)}$ – see figure below). The study also found that, if well regulated, local greenhouse gas emissions from shale gas operations should represent only a small part of the carbon footprint. Most carbon emissions will come from its final use as a fuel.

Local emissions will need to be offset by cuts elsewhere in the economy if they would increase national emissions beyond the level set under our carbon budgets.[2]

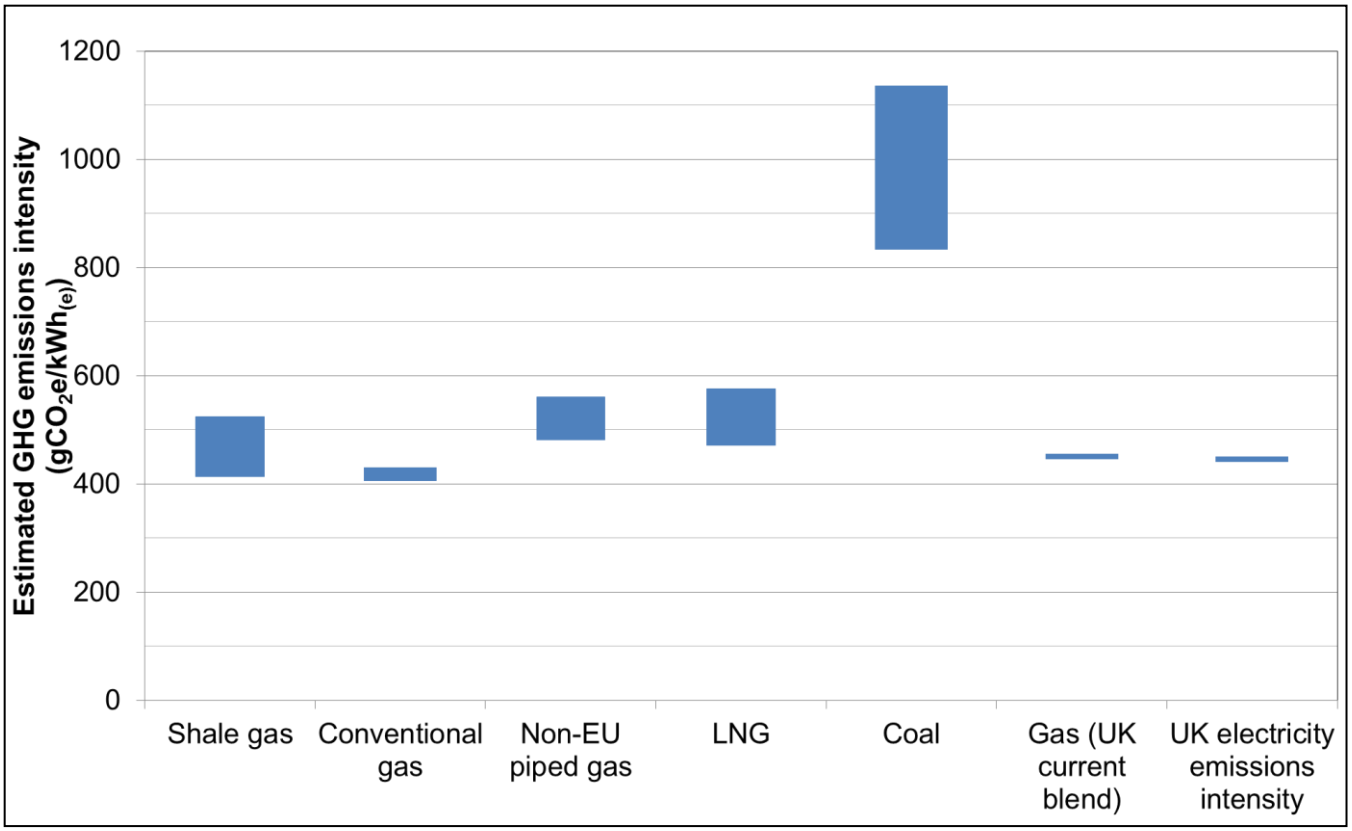

Figure: This comparison includes life-cycle emissions for electricity generation from various sources of gas, and coal. Emissions for shale gas depend on how much methane is released; these figures assume 90% would be captured and flared. Source: MacKay Stone 2013 report.

The UK's low-carbon transition

The UK is legally committed to cutting greenhouse gas emissions by at least 80% by 2050, and to meeting renewable energy targets by 2020. We will tackle climate change, maintain our energy security, minimise costs and maximise benefit to our economy. To do this, we must continue to develop low-carbon energy supplies.

Replacing coal or petroleum with natural gas can help us reduce greenhouse gas emissions in the near-to-mid-term. In the US, energy sector emissions are at the lowest levels since 1994, partly because of the substitution of natural gas for other fossil fuels.

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[1] https://www.gov.uk/government/publications/potential-greenhouse-gas-emissions-associated-with-shale-gas-production-and-use

[2] https://www.gov.uk/government/publications/gas-generation-strategy

UK energy security during the low-carbon transition

A third of UK energy demand is met by gas. In 2012, around a quarter of the gas used in the UK was used to produce electricity, a fifth by industry, and around 40% to cook our food and heat our buildings. 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 yet.

In 2003, we were a net exporter of gas. But North Sea production is declining and now we are a net importer. By 2025 we expect to be importing close to 70% of the gas we consume.

The UK has invested in facilities to make sure gas is easy to import. There have been no major interruptions to gas supplies in recent history, but we cannot be complacent. To secure our energy supply we must maximise UK production of fuels we need, including gas, increase generation from renewables and new nuclear and then use our energy more wisely.

It is in our interests for much of our future oil and gas to be produced in the UK, where we can be confident about environmental and safety standards. We have robust regulations to protect people and the environment, and ensure safe working.

More information

A recent study by DECC's Chief Scientist looked at the potential greenhouse gas emissions from shale gas production and discusses its compatibility with global climate change targets.

The University of Texas recently published research into the extent of methane emissions from shale gas pre-production and production stages.

The Government has published a Gas Generation Strategy setting out why we believe gas will be important for UK energy security and as part of our low carbon transition.

The Environment Agency has published information on monitoring and control of fugitive methane from unconventional gas operations http://www.environment-agency.gov.uk/business/topics/134508.aspx

The Department of Energy and Climate Change, Environment Agency (England), Scottish Environment Protection Agency and Health and Safety Executive have worked with the UK Onshore Operators Group to agree best practices for onshore shale gas wells. The [UK Onshore Operators Group's UK Onshore Shale Gas Well Guidelines provide a description of the Hydraulic Fracturing Programme (HFP).

The British Geological Survey has information on shale gas and groundwater on its website, including information on the national methane baseline study.

The Scottish Environment Protection Agency has more information on environmental regulation in Scotland.

Natural Resources Wales has more information on environmental regulation in Wales.

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