

Fracking's environmental impacts scrutinised

September 22 2014, by Aeron Haworth

(Phys.org) —Greenhouse gas emissions from the production and use of shale gas would be comparable to conventional natural gas, but the controversial energy source actually fared better than renewables on some environmental impacts, according to new research.

The UK holds enough [shale gas](#) to supply its entire gas demand for 470 years, promising to solve the country's energy crisis and end its reliance on fossil-fuel imports from unstable markets. But for many, including climate scientists and environmental groups, shale gas exploitation is viewed as environmentally dangerous and would result in the UK reneging on its greenhouse gas reduction obligations under the Climate Change Act.

University of Manchester scientists have now conducted one of the most thorough examinations of the likely environmental impacts of shale gas exploitation in the UK in a bid to inform the debate. Their research has just been published in the leading academic journal *Applied Energy* and study lead author, Professor Adisa Azapagic, will outline the findings at the Labour Party Conference in Manchester on Monday (22 September).

"While exploration is currently ongoing in the UK, commercial extraction of shale gas has not yet begun, yet its potential has stirred controversy over its environmental impacts, its safety and the difficulty of justifying its use to a nation conscious of climate change," said Professor Azapagic.

"There are many unknowns in the debate surrounding shale gas, so we have attempted to address some of these unknowns by estimating its life cycle environmental impacts from 'cradle to grave'. We looked at 11 different impacts from the extraction of shale gas using hydraulic fracturing – known as 'fracking' – as well as from its processing and use to generate electricity."

The researchers compared shale gas to other fossil-fuel alternatives, such as conventional natural gas and coal, as well as low-carbon options, including nuclear, offshore wind and solar power (solar photovoltaics).

The results of the research suggest that the average emissions of greenhouse gases from shale gas over its entire life cycle are about 460 grams of carbon dioxide-equivalent per kilowatt-hour of electricity generated. This, the authors say, is comparable to the emissions from conventional natural gas. For most of the other life-cycle environmental impacts considered by the team, shale gas was also comparable to conventional natural gas.

But the study also found that shale gas was better than offshore wind and solar for four out of 11 impacts: depletion of natural resources, toxicity to humans, as well as the impact on freshwater and marine organisms. Additionally, shale gas was better than solar (but not wind) for [ozone layer depletion](#) and eutrophication (the effect of nutrients such as phosphates, on natural ecosystems).

On the other hand, shale gas was worse than coal for three impacts: ozone layer depletion, summer smog and terrestrial eco-toxicity.

Professor Azapagic said: "Some of the impacts of solar power are actually relatively high, so it is not a complete surprise that shale gas is better in a few cases. This is mainly because manufacturing solar panels is very energy and resource-intensive, while their electrical output is

quite low in a country like the UK, as we don't have as much sunshine. However, our research shows that the environmental impacts of shale gas can vary widely, depending on the assumptions for various parameters, including the composition and volume of the fracking fluid used, disposal routes for the drilling waste and the amount of shale gas that can be recovered from a well.

"Assuming the worst case conditions, several of the environmental impacts from shale gas could be worse than from any other options considered in the research, including coal. But, under the best-case conditions, shale gas may be preferable to imported liquefied natural gas."

The authors say their results highlight the need for tight regulation of shale gas exploration – weak regulation, they claim, may result in shale gas having higher impacts than coal power, resulting in a failure to meet climate change and sustainability imperatives and undermining the deployment of low-carbon technologies.

Professor Azapagic added: "Whether shale gas is an environmentally sound option depends on the perceived importance of different environmental impacts and the regulatory structure under which shale gas operates.

"From the government policy perspective – focusing mainly on economic growth and energy security – it appears likely that shale gas represents a good option for the UK energy sector, assuming that it can be extracted at reasonable cost.

"However, a wider view must also consider other aspects of widespread use of shale gas, including the impact on [climate change](#), as well as many other environmental considerations addressed in our study. Ultimately, the environmental impacts from shale gas will depend on which options

it is displacing and how tight the regulation is."

Study co-author Dr Laurence Stamford, from Manchester's School of Chemical Engineering and Analytical Science, said: "Appropriate regulation should introduce stringent controls on the emissions from [shale gas extraction](#) and disposal of drilling waste. It should also discourage extraction from sites where there is little shale gas in order to avoid the high emissions associated with a low-output well.

He continued: "If shale gas is extracted under tight regulations and is reasonably cheap, there is no obvious reason, as yet, why it should not make some contribution to our energy mix. However, regulation should also ensure that investment in sustainable technologies is not reduced at the expense of shale gas."

More information: Laurence Stamford, Adisa Azapagic, Life cycle environmental impacts of UK shale gas, *Applied Energy*, Volume 134, 1 December 2014, Pages 506-518, ISSN 0306-2619, [dx.doi.org/10.1016/j.apenergy.2014.08.063](https://doi.org/10.1016/j.apenergy.2014.08.063).

Provided by University of Manchester

Citation: Fracking's environmental impacts scrutinised (2014, September 22) retrieved 9 April 2024 from <https://phys.org/news/2014-09-fracking-environmental-impacts-scrutinised.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
