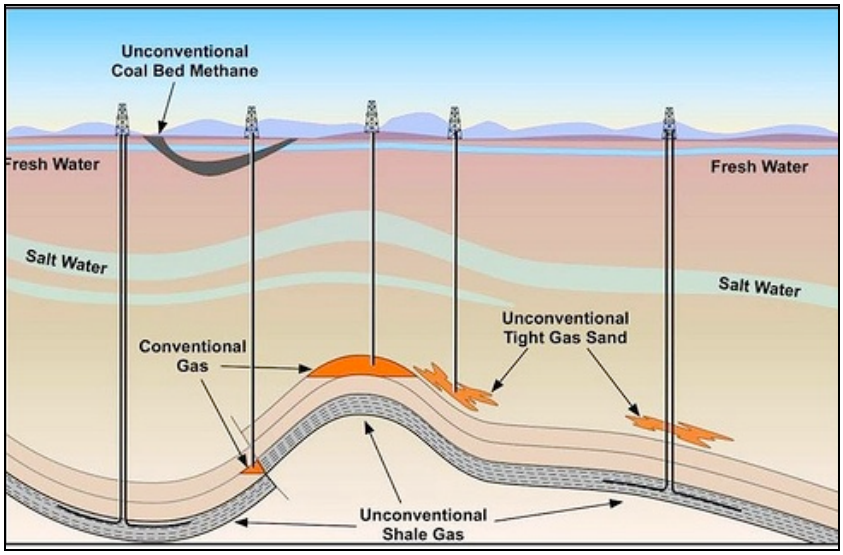
Friends of the Earth Scotland policy briefing paper

Fracking and Unconventional Gas in Scotland

30 March 2012

What is unconventional gas?

Conventional gas extraction involves drilling vertically through rock formations into gas pockets, from which the gas rises through the borehole and is captured at the wellhead. However, as these convenient and relatively easily accessed pockets dry up, the industry has been developing ways of extracting gas that is trapped inside the rock formations – known as unconventional gas. The UK has potentially vast reserves of unconventional gas trapped inside shale rock and coal seams. In Scotland, unconventional gas reserves are largely **coalbed methane (CBM).**



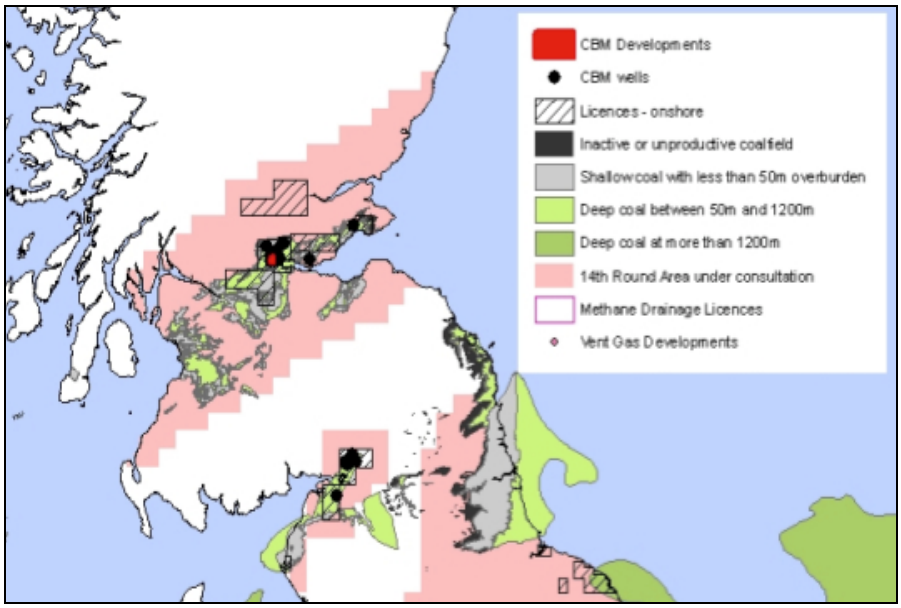
Unconventional Gas Extraction (Frack Off 2012)

What is fracking

Hydraulic fracturing – or fracking – is a technique that, combined with advances in horizontal drilling, has opened up potentially vast reserves of shale gas and coalbed methane across the globe. It involves drilling deep in the earth, vertically and horizontally, and pumping a mix of water, proppants (such as sand) and chemicals (including highly carcinogenic benzene and formaldehyde) into the borehole under high pressure to ease the flow of gas for extraction. The amount of water and chemicals required varies depending on the permeability of the rock. It's an expensive process that is only economically viable when the price of fossil fuels is high.

What's going on in Scotland

In Scotland, there are some pockets of shale that could produce gas, but there is a lot more potential for coalbed methane, especially in the Central Belt, Fife and the Scottish Borders. The extraction process can vary, but carries similar risks to those related to the shale gas industry. Sometimes it is enough to drill vertically and horizontally into the seam, and pump out the water adsorbed in the coal, to get CBM gas flowing. Other times the seam has to be fracked to get at the gas.



The areas in pink will be tendered for exploration in late 2012 (DECC 2010)

The UK Department for Energy and Climate Change (DECC) issues Petroleum Exploration and Development Licenses (PEDLs) across the whole of the UK, as aspects of energy policy are reserved to Westminster. PEDLs cover onshore exploration and development of shale gas and coal bed methane (as a petroleum byproduct) and monitoring of seismic activity, although CBM also requires permission from the Coal Authority for access to coal formations.

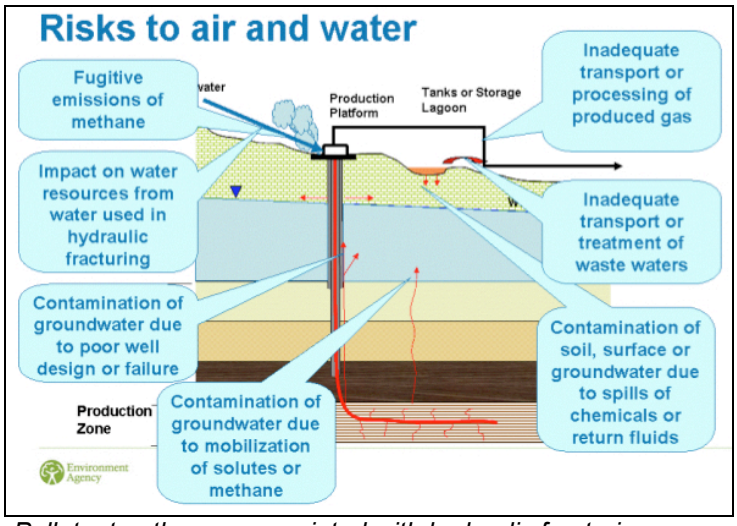
Six areas are currently licensed for onshore gas exploitation in Scotland. Greenpark Energy (now owned by Dart Energy) is fracking for coalbed methane at a test site in Dumfries & Galloway. Dart Energy is developing a coalbed methane site at Airth, near Stirling. A third company, Reach CSG is hoping to exploit coalbed methane in North Lanarkshire. However, later this year, the UK Department for Climate Change and Energy is due to start tendering exploration licenses covering the whole of the central belt of Scotland and Fife, as well as areas in the Scottish borders. This means the issue could affect more areas in the next few years.

Environmental Impacts

While the European industry is still in its infancy, the unconventional gas industry in the USA has been operating commercially for some years now, with the longer-term consequences becoming increasingly visible. Risks include water contamination, use and disposal, earth tremors, and local impacts. Crucially too is the risk of 'carbon lock-in' to an industry that could make it impossible to meet future carbon reduction targets.

1. Water Contamination

A key risk associated with unconventional gas developments is contamination of groundwater and aquifers, leading to contamination of drinking water and water used for agricultural purposes or finding its way into wildlife and ecosystems. Groundwater can be contaminated by chemicals used in frack fluid, from escaped methane gas, and in some cases from the dewatering process of coal seams – water that has been stewing in coal for thousands of years is far from pure, and is at least very saline. This contamination is possible during a number of different stages, as this Environment Agency illustration demonstrates.



Pollutant pathways associated with hydraulic fracturing (Environment Agency 2011)

The human impacts of this water contamination is portrayed in the 2010 video documentary, 'Gaslands' which showed residents of Dimmock, Pennsylvania setting the water in their taps on fire because it was so contaminated with methane; and communities, unable to drink or even shower in their tap water, being supplied with portable water or purification kits by the gas companies.[1] In addition a recent US study highlighted the impact for local farmers and animal welfare, concluding: "a worker shut down a chemical blender during the fracturing process, allowing the release of fracturing fluids into an adjacent cow pasture, killing 17 cows in one hour."[2]

2. Water Use and Disposal

Hydraulic fracturing requires vast quantities of water to be pumped into shale or coal seams under high pressure. A single shale gas 'fracture treatment' can use over 500,000 tonnes of water, but a well requiring multiple treatments may use several million tonnes.[3] In addition to putting pressure on local

1 Gasland: trailer at http://www.youtube.com/watch?v=dZe1AeH0Qz8; feature film available from http://www.gaslandthemovie.com/

2 Bamberger & Oswald, Impacts of gas drilling on human and animal health, New Solutions Vol. 22(1) 51-77, 2012 http://baywood.metapress.com/app/home/contribution.asp?referrer=parent&backto=issue,1,1;journal,1,56;linkingpublicationresults,1:300327,1

3 Andrews, Anthony et. al. 2009 'Unconventional Gas Shales: Development, Technology, and Policy Issues' Congressional Research Service. p 22 http://www.fas.org/sgp/crs/misc/R40894.pdf

water resources, there are risks associated with the disposal of and possible leakage of contaminated water.

Fracking for coal bed methane requires less water than for shale because of the greater porosity of coal. With CBM, however, whether or not fracking is used there is the additional problem of de-watering coal seam and the disposal of this water. This water can be very saline, and contain other substances absorbed from the coal. There is the added risk of depleting ground water and aquifers by extracting it from adjoining coal seams, and possible risks of subsidence.

In addition, local water infrastructure may not be equipped to cope with the huge volumes of fluids needing to be disposed of, nor able to treat the toxins and hazardous chemicals contained in such wastewater.

3. Earth Tremors

Fracking has been suspended at a site near Blackpool following an industry study commissioned by the operator that confirmed it was the likely cause of recent earth tremors.[4] While this is worrying in itself, the most significant impact of these relatively low magnitude earth tremors is the potential damage they could cause to borehole casing. Damage to this casing would increase the risk of contaminated water or fracking fluid escaping into nearby earth and groundwater. Additional risks include possible damage to sensitive equipment in data centres. Rabobank have been a key opponent to a fracking development in the Netherlands due to concerns over disruption to their new data centre.[5]

4. Local impacts

Other environmental impacts from shale and CBM developments include lorry traffic to and from the wellheads. While the above ground infrastructure for an individual well head is fairly neat, each well head needs a larger area for all the water pumping trucks to sit on, and each development needs many wellheads.

In evidence to the Energy and Climate Change Select Committee the Tyndall Centre pointed out that: "the 'novel' risks associated with hydraulic fracturing of wells are not the only potential drawback of shale exploration, particularly when considering relatively highly populated countries such as the UK. More 'run of the mill' impacts such as vehicle movements, landscape, noise and water consumption may also be of significant concern locally and more generally, especially, when one considers the scale of development required to deliver significant supplies to the UK."[6]

5. Climate change and fuel poverty

The UK Committee on Climate Change (CCC) makes it clear that we need to have decarbonised our energy sector by 2030, in order to meet carbon reduction targets in 2050. Investing in gas developments now risks locking us into a legacy of high carbon infrastructure incompatible with our climate targets. So even if the UK meets 2020 targets, using fracked gas as a 'bridge fuel' will make it much harder to meet future targets. We need to be weaning ourselves off fossil fuels, not exploring and developing new and risky ways of extracting difficult to get resources. The crucial point is that even if exploiting these new sources of fossil fuels was proven to be 'safe', the impact of burning them on the climate will topple us into catastrophic global warming.

Beyond climate change is the danger that increased investment in the gas, whether that be conventional and/or unconventional, will drive increased fuel poverty. While renewables are much maligned for rising household energy bills, the CCC estimate that since 2004, less than 16 per cent of price rises are due to environmental policies, with more 50 per cent due to the rising cost of wholesale gas.[7] Investment in gas, based on the promise of a cheap, indigenous supply that is unlikely to materialise risks locking us into a high-carbon, high-cost energy future suited only to the interests of the big six energy companies.

4 4 http://www.cuadrillaresources.com/cms/wp-content/uploads/2011/11/Final_Report_Bowland_Seismicity_02-11-11.pdf

5 http://www.dutchnews.nl/news/archives/2011/03/rabobank_worried_about_gas_dri.php

6 http://www.publications.parliament.uk/pa/cm201011/cmselect/cmenergy/writev/shale/sg12.htm

7 http://www.theccc.org.uk/reports/household-energy-bills

Regulation

The gas industry is quick to point out that European and UK regulatory frameworks are much tougher than in the USA and it is unlikely that impacts would be directly replicated here. In 2011 the UK Energy and Climate Change Select Committee held an inquiry into shale gas, and concluded that hydraulic fracking in itself wasn't inherently risky in relation to aquifer contamination; any risks were associated with the integrity of the well, which made the activity no different to conventional gas exploration.[8]

However a key difference between unconventional gas drilling (whether or not fracking is used) and conventional gas drilling is the sheer number of wells required to exploit the resource. With conventional gas a single well is drilled to tap into the convenient pocket of gas. With unconventional gas, the gas is trapped (or 'absorbed' in the case of CBM) in the rock and many more boreholes are required to extract it, as well as the additional stimulus of dewatering the seam (in CBM) and hydraulic fracturing (in shale and often CBM).

So if risks can be split into those related to the gas industry as a whole (e.g. inadequate wellbore casing, well blowouts, spillages etc) and those related to the unconventional gas industry (e.g. the use of toxic chemicals in fracking fluids, the fracking process itself triggering earth tremors increasing risk of damage to well casing, the de-watering of coal seams and possible subsidence and water disposal associated with that); then unconventional gas operations are at risk from all of these (give or take fracking related risks in some CBM developments) but multiplied by around 100 per field due to the sheer number of wells.

Activity that might affect Scotland's water environment is regulated under the Water Environment (Controlled Activities) (Scotland) Regulations 2011,[9] (more commonly known as the Controlled Activities Regulations (CAR)) by Scottish Environment Protection Agency (SEPA).

The Environment Minister Stewart Stevenson confirmed that in relation to fracking "SEPA's specific obligations under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 are to consider the risks to the water environment. Those are the only environmental factors considered by SEPA."[10] Energy Minister Fergus Ewing added that "CAR licences are only issued when SEPA are satisfied that any risks to the water environment are negated or within manageable tolerances."[11]

Conclusion

There are clearly substantial and immediate environmental impacts associated with 'fracking' and unconventional gas extraction. These include water contamination, water use and disposal, earth tremors, and local impacts. Crucial too is the risk of 'carbon lock-in' to an industry that will make it impossible to meet future carbon reduction targets. For these reasons Friends of the Earth Scotland believe that no further CBM or shale gas activities should proceed, and call on the Scottish Government to suspend all ongoing activities, and put in place a moratorium on any new projects, in terms of research and exploration as well as exploitation.

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8 http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenergy/795/79502.htm

9 http://www.legislation.gov.uk/ssi/2011/209/contents/made

10 In response to Alison Johnstone MSP Scottish Parliament Debate 17 November 2011:
http://www.scottish.parliament.uk/parliamentarybusiness/28862.aspx?r=6550&mode=html#iob_59555

11 In response to PQ S4W-04086