February 2012

Submission to the Environment and Sustainability Committee of the National Assembly for Wales

cyfeillion y ddaear cymru
friends of the earth cymru

in response to

the Session Examining Shale Gas and Gasification

This submission is *additional* to the submission to the Petitions Committee

Summary

1. There is a significant and growing body of evidence that the use of shale gas (and possibly underground coal gasification) cause a higher level of greenhouse gas emissions than would otherwise be the case.

2. There is also a significant and growing body of evidence that the use of shale gas can cause serious water and air pollution, and could lead to an unsustainable demand on water. Pollution concern is particularly acute in relation to groundwater.

3. The flowback liquid from fracking operations is highly likely to be contaminated with a variety of chemicals and radioactive compounds. This makes it hazardous waste. Wales has no commercial hazardous waste treatment sites, so large quantities of this hazardous material will need to be removed from Wales – presumably by lorry.

4. Welsh planning policy demands that sound science be used responsibly, which in this context entails a precautionary approach. Policy also demands that unconventional gas be specifically acknowledged as a source of greenhouse gas production (and is a process which therefore runs counter to policy seeking to mitigate climate change). A new policy, or an addendum to Planning Policy Wales (PPW), is the appropriate means of dealing with the specific issues arising from unconventional gas exploitation.

5. In view of the urgent need to mitigate climate change, Friends of the Earth Cymru has proposed an additional planning policy that provides for a sound precautionary approach to decision-making:

   Planning permission for unconventional gas operations (including test drilling and extraction) will not be granted unless:
   - *a) the planning authority is satisfied that all reasonable scientific doubt that there is any risk of adverse impacts including groundwater contamination has been eliminated*
   - *b) the proposal will not compromise the planning authority's duties in relation to climate change mitigation and adaptation; and*
   - *c) the proposal is environmentally acceptable, or it can be made so by planning conditions or obligations.*

6. Given that policy in England is strongly in favour of unconventional gas, and given the existing uncertainties over environmental problems the use of the various technologies in the UK could cause, the precautionary principle suggests that a more restrictive planning regime would be of considerable benefit to the Welsh environment. Should unconventional gas operations proceed safely and with no contamination in England for a number of years, consideration could be given to relaxing the planning regime.

7. This is exactly the sort of learning that devolution is designed to elicit. In a corollary of England learning about the environmental benefits for Wales of charging for carrier bags, Wales could learn about the risk associated with unconventional gas activities carried out in England.

8. In the short term we recommend the Welsh Government adopt a moratorium on unconventional gas exploration until sufficient information is available to determine with a high degree of certainty the likely impacts on the environment.

9. In addition, and without prejudice to the recommendations above, the Environmental Impact Assessment Regulations (England and Wales) 1999 should be amended to include the requirement for a full EIA to be conducted for each unconventional gas application. Fracking operations exempt themselves by ensuring they have a surface operation smaller than the 1 ha limit (ordinarily they are 0.99 ha) that would make them subject to these Regulations.

Introduction

10. The UK Government announced in December that fracking for shale gas can resume in principle in the UK. Friends of the Earth believes that this is a gamble that we do not need to take. Fracking for shale gas:

    - Helps keep us hooked on fossil fuels instead of moving towards an energy system based on energy saving and renewable sources;
    - Brings serious risks to the local environment and
    - Is unlikely to cut energy bills.

11. We cover these points in more detail below. We deal briefly with Underground Coal Gasification at the end.

How much shale gas is there?

12. There are no firm figures for either UK shale gas resources (the volume of gas underground) or reserves (the volume of gas that can be extracted, which depends on factors including technology and cost). Cuadrilla, the company drilling in Lancashire, has estimated the resources in its licence area at around 5,660bcm, or around 56 years' worth of current UK gas consumption. Cuadrilla's CEO, Francis Egan, has said that they can supply a quarter of UK gas demand from its licence area alone[1]. DECC is shortly expected to publish new figures from the British Geological Survey (BGS) which have been rumoured to estimate UK shale gas resources at 200 times its previous figure at around 38,000 – 48,000 bcm[2]. However only a small percentage of this – typically 10% - might be recoverable.

13. Experience elsewhere shows that any numbers are very volatile:

    - Estimates of shale gas reserves in Poland were cut by 85% last year, based on analysis of data from wells drilled between the 1950s and 1980s[3].
    - The US Energy Department cut estimates of technically recoverable gas in the Marcellus Shale, one of the most mature shale gas plays, by 66% in 2012, citing improved data on drilling and production[4]

[1] Sunday Telegraph 1st December 2012 'Cuadrilla set to resume fracking as George Osborne backs UK shale gas' http://www.telegraph.co.uk/finance/newsbysector/energy/9716558/Cuadrilla-set-to-resume-fracking-as-George-Osborne-backs-UK-shale-gas.html

[2] The Times 9th February 2013 'Britain has shale gas for 1,500 years, but bills won't be lower' http://www.thetimes.co.uk/tto/business/industries/naturalresources/article3683377.ece

[3] Bloomberg 26th March 2012 'Shale boom in Europe fades as Polish wells come up empty' http://www.bloomberg.com/news/2012-03-26/shale-boom-in-europe-fades-as-polish-wells-come-up-empty-energy.html

[4] Bloomberg 23rd January 2012 'US cuts estimate for Marcellus Shale gas reserves by 66%' http://www.bloomberg.com/news/2012-01-23/u-s-reduces-marcellus-shale-gas-reserve-estimate-by-66-on-revised-data.html

Environmental risks

14. Fracking brings many environmental risks. The risks for the local environment and human health have recently been assessed in a report for the European Commission. This assessed that there was a 'high risk' of local environmental problems including groundwater contamination, surface water contamination, water resource use and air pollution from the cumulative impact of fracking at several sites[5].

Climate change

15. Advocates of shale gas say it has lower overall emissions than coal or conventional gas, but the academic jury is still out. The key issue for comparing gas with coal is how much methane escapes during gas exploration and production of, known as 'fugitive emissions'. Methane is a much more powerful greenhouse gas than carbon dioxide. Experts say that if fugitive emissions are below about 3.2% of total well production then natural gas has a lower climate impact than coal. The US EPA estimates that fugitive emissions are below this, but recent US monitoring suggests that fugitive emissions could be over 4% and up to 9% in some cases, eroding any climate advantages[6].

16. The Environment Agency suggests that fugitive emissions of 4% would be about twice the amount originally envisaged from desk studies[7]. However, conducting research on this matter in the UK *"would require a significant research budget from such as DECC for the UK or… at a European scale the EC Commission"*[8].

17. In a confidential paper to the DECC's Chief Scientist, an anonymous author notes: *"The largest contribution to emissions in the pre-production phase comes from well completion. Upon completion of hydraulic fracturing a combination of fracturing fluid and water is returned to the surface (flow back). The flow back contains a combination of water, sand, hydrocarbon liquids and natural gas. Equipment historically at production wells are not designed to handle this initial mixture of wet and abrasive fluid. Standard practice has been to vent or flare the natural gas during this step, and direct the waste water into ponds or tanks… Existing DECC controls already limit venting to the technical minimum, and limit flaring to the economic minimum"*[9]. It is worth pointing out that the 'economic minimum' referred to for flaring will be determined by the operator.

18. A confidential briefing note commissioned by DECC confirms that several areas of substantial concern for climate change need either to be reviewed for greenhouse gas accounting or a brand

[5] AEA Technology for the European Commission (2012) Support to the identification of potential risks for the environment and human health arising from hydrocarbons operations involving hydraulic fracturing in Europe' http://ec.europa.eu/environment/integration/energy/pdf/fracking%20study.pdf

[6] Nature 2nd January 2013 'Methane leaks erode green credentials of natural gas' http://www.nature.com/news/methane-leaks-erode-green-credentials-of-natural-gas-1.12123

[7] Environment Agency (2012) 'Monitoring and control of fugitive methane from unconventional gas operations' http://cdn.environment-agency.gov.uk/scho0812buwk-e-e.pdf

[8] Freedom of Information request: Email from E&B Climate Change mitigation team in Environment Agency on 19th December 2012

[9] Freedom of Information request: Paper to DECC's Chief Scientist 'Carbon intensity of shale gas' on 28th September 2012

new methodology developed[10]. These include fugitive releases from equipment, gas venting, gas flaring, shale gas combustion, gas processing, fugitive emissions from fracking and flowback, and emissions resulting from wastewater treatment and disposal (described as a 'high emissions' process). The report concludes that just 330 fracking wells could double the greenhouse gas emissions profile of the entire UK oil and gas sector.

19. Any benefit over conventional gas is also unclear. A study for the European Commission found emissions from shale gas production were 1-8% higher than for conventional pipeline generation within Europe. It also found that shale gas emissions could be lower than for conventional pipeline gas from outside Europe or for LNG imports but that this depends on industry practices, and there might be no benefits[11].

20. If shale gas does have lower climate impact than coal, then any climate benefit depends on shale gas being burned instead of coal. The industry points to shale gas replacing coal in the US helping cut carbon emissions, but analysis from the Tyndall Centre shows that much of the coal not used in the US was exported, meaning that half the emissions benefit was lost. Coal use for electricity generation in the UK rose from 22.9% in the 3rd quarter of 2011 to 35.4% in the 3rd quarter of 2012[12]. In a world with a growing demand for energy, and without a global climate deal, shale gas will probably be used as well as coal.

21. Globally, the International Energy Agency (IEA) has calculated that a 'Golden Age of Gas' with *"an accelerated global expansion of gas supply from unconventional resources"* which more than triples to 2035[13]. This *"puts CO2 emissions on a long-term trajectory ... consistent with a probable temperature rise of more than 3.5 degrees Celsius in the long term"*[14]. This is well above the threshold for triggering catastrophic climate change: as the IEA admits *"we are not saying that it will be a golden age for humanity - we are saying it will be a golden age for gas"*[15].

22. Exploitation of shale gas in the UK could have a major impact on investment in renewable energy. Professor Paul Stevens of Chatham House has written that "*the anticipation of cheap natural gas could inhibit investment in renewables. But again, if the revolution fails to deliver a lot of cheap gas, by the time this is realized it could well be too late to revert to a solution to climate change based upon renewables*"[16].

[10] Freedom of Information request: Report commissioned by DECC 'NAEI Briefing Note: Shale gas exploration and production and impacts on the UK GHG inventory'
[11] European Commission (2012) 'Climate impact of potential shale gas production in the EU' http://ec.europa.eu/clima/policies/eccp/docs/120815_final_report_en.pdf
[12] DECC 'Energy Trends December 2012' Section 5 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65835/3945-energy-trends-section-4-electricity.pdf
[13] International Energy Agency (2012) 'Golden Rules for a Golden Age of Gas' p63 http://www.worldenergyoutlook.org/media/weowebsite/2012/goldenrules/weo2012_goldenrulesreport.pdf
[14] Ibid p91
[15] BBC Campaigners' anger over agency's shale gas report 29th May 2012
[16] Chatham House August 2012 'The 'Shale Gas Revolution': Developments and Changes' http://www.chathamhouse.org/sites/default/files/public/Research/Energy,%20Environment%20and%20Development/bp0812_stevens.pdf

Water use

23. Fracking is a water-intensive activity, with each frack in the US using between 2 and 6.4 million gallons. At the one site fracked in the UK, 8.4 million litres or 1.85 million gallons of water were used[17]. There has been little research to date on whether this level of water use is sustainable at the local and regional level in the UK, particularly in areas that have suffered from drought. Water UK, which represents the water utilities, has said *"where a large number of gas boreholes exist in a local area, there is a risk of water shortages for other purposes"*[18]. This could be aggravated by future climate change affecting water supplies: according to the Chartered Institute of Water and Environmental Management (CIWEM) *"whether this level of water use is appropriate in the long term to source energy requires further research"*[19].

Water contamination

24. Methane and fracking fuid may escape / contaminate water via a number of different routes:

- Migration via naturally occurring fractures in the rock or via extension of fractures created by fracking
- Leaks via well-casings that have been inadequately completed or which have subsequently failed
- Leaks or spills of fracking fluid or 'produced water' above ground. The amount of water that returns to the surface varies greatly, and can be from 20% to 80%, depending on the individual well

25. Despite industry claims, there is considerable evidence of contamination from both methane and fracking chemicals. One study of aquifers overlying the Marcellus and Utica shales in the north-eastern US found *"systematic evidence of methane contamination of groundwater associated with shale gas extraction"*[20].

26. The industry claims that fracking is a proven technology, widely used for 60 years. But fracking as proposed in the UK is at best a decade old development based on new technologies that are still being refined.

27. If there is a risk of contamination, what chemicals could be involved? A major problem is that there is limited data on the chemicals that have been used for fracking. This is because US law excludes fracking from federal regulation by the Environmental Protection Agency although disclosure is required by some US states and some companies are posting the composition of the fracking fluid they are using online[21]. In the UK, companies will be required to publish the contents of fracking fluid.

[17] Cuadrilla Resources 'Composition of components in Bowland Shale hydraulic fracturing fluid for Preese Hall-1 well http://www.cuadrillaresources.com/wp-content/uploads/2012/02/Chemical-Disclosure-PH-1.jpg
[18] Water UK (2012) 'Risks to water supplies posed by gas shale extraction' http://www.water.org.uk/home/policy/positions/shale-gas/water-uk-position-paper-on-gas-shale-extraction--sept-2012-.pdf
[19] CIWEM (2012) 'Hydraulic Fracturing (Fracking) of Shale in the UK' http://www.ciwem.org/media/624838/Fracking_Oct2012.pdf
[20] Osborn et al (2011) 'Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing' http://www.pnas.org/content/early/2011/05/02/1100682108.full.pdf+html
[21] See http://fracfocus.org

An assessment[22] of 353 chemicals known to be used in fracking in the US found that a quarter could cause cancer and 40 - 50% could affect the nervous system, immune and cardiovascular systems.

28. The industry says that chemicals are a very small percentage of the liquid pumped underground, but with huge volumes of water used, this still means a huge quantity of chemicals. If you assume take a conservative estimate that the chemicals are just 0.5% of the say 4 million gallons of water used, this means that each fracking operation involves 20,000 gallons (about 75,000 litres) of chemicals.

29. In addition to the chemicals, fracking waste water may also contain substances from deep underground such as strontium, benzene, toluene and Naturally Occurring Radioactive Material (NORM) such as Radium 226[23]. An investigation by the New York Times found that nearly three-quarters of the more than wells studied in the north east US produced waste water with high levels of radiation, including at least 116 wells with levels that were hundreds of times the US EPA's drinking water standard, and at least 15 wells with levels thousands of times the standard[24].

30. The Tyndall Centre for Climate Change Research considers that the flowback fluid is *"likely to be considered as hazardous waste[25] in the UK"*[26]. We know that there are no commercial hazardous waste landfill sites in Wales[27]. However, we do not know if there are any hazardous waste treatment sites in Wales that could treat fracking flowback fluid. Treatment of this fluid offsite is certain to require significant numbers of lorry movements. The Environmental Services Association has called for the Environment Agency to review its permits for hazardous waste treatment[28].

31. The UK Government claims that the current regulatory system is adequate: Energy Secretary Ed Davey has said that *"there are already in place robust regulatory controls on all oil and gas activities"*[29]. The Welsh Government concurs: *"We consider that the precautionary approach adopted in national planning policy is sufficiently robust"*[30]*.* Although regulations will be tougher in the UK than in the US, it is impossible to say whether they will be tough enough: the Environment Agency, the principal regulator, has at the time of writing not completed a consultation draft of its technical

[22] Colborn et al (2011) 'Natural Gas Operations from a Public Health Perspective' http://cce.cornell.edu/EnergyClimateChange/NaturalGasDev/Documents/PDFs/fracking%20chemicals%20from%20a%20public%20health%20perspective.pdf

[23] Food & Water Watch (2012) 'Fracking: the new global water crisis' http://documents.foodandwaterwatch.org/doc/FrackingCrisisEU.pdf

[24] New York Times 26th February 2011 'Regulation Lax as Gas Wells' Tainted Water Hits Rivers' http://www.nytimes.com/2011/02/27/us/27gas.html?pagewanted=all&_r=0

[25] Environment Agency 'What is hazardous waste?' http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho0411btqz-e-e.pdf

[26] Tyndall Centre for Climate Change Research (2011) 'Shale gas: a provisional assessment of climate change and environmental impacts' http://www.tyndall.ac.uk/sites/default/files/tyndall-coop_shale_gas_report_final.pdf

[27] Environment Agency, 'Hazardous waste in Wales' http://www.environment-agency.gov.uk/research/library/data/98052.aspx

[28] Resource UK 16th January 2013 'ESA calls for better treatment of hazardous waste' http://www.resource.uk.com/article/UK/ESA_calls_better_treatment_hazardous_waste-2634#.UStSQB3OKSo

[29] Ministerial Statement 13th December 2012 'Exploration for shale gas' https://www.gov.uk/government/speeches/written-ministerial-statement-by-edward-davey-exploration-for-shale-gas

[30] Environment Minister 8th November 2012 Letter to the Petitions Committee http://www.senedd.assemblywales.org/documents/s11852/08.11.12%20Correspondence%20-%20Minister%20for%20Environment%20and%20Sustainable%20Development%20to%20Chair.pdf

guidance on shale gas exploration, and is unable to say when this will be ready. It has not started looking at regulations needed for shale gas production. The approach of the Health and Safety Executive is perhaps instructive: around 5% of the resource of the six wells inspectors is being expended on shale gas issues[31].

32. Mark Menzies, Conservative MP for Fylde where Cuadrilla is active, and Parliamentary Private Secretary to former Energy Minster Charles Hendry has said *"I do not believe that the regulatory system is robust or transparent enough to instill public confidence"*[32]. Professional bodies have also expressed concerns: CIWEM has said that *"the UK should … not encourage fracking as a part of our energy mix until there is more evidence that operations can be delivered safely, that environmental impacts are acceptable and that monitoring, reporting and mitigation requirements are comprehensive and effective"*[33].

33. The Government has set up an Office for Unconventional Gas and Oil which it says will provide a regulatory regime which will be *'simplified and streamlined'* yet also *'robust'*[34]. These potentially competing demands have been questioned by the Chair of the House of Commons Energy and Climate Change Committee, Tim Yeo MP, who has referred to *"The combination of roles in the Office for Unconventional Gas and Oil, which appears to be acting as a cheerleader for the industry as well as a regulator"*[35].

Air pollution

34. Fracking for shale gas has also been linked to increased levels of air pollution and associated health problems. Monitoring[36] of air quality near fracking sites in western Colorado found over 50 non-methane hydrocarbons (NMHCs) near shale gas wells. Of these, 44 have health impacts including 35 which affect the brain and nervous system. Some of these were found at levels which could potentially harm children exposed pre-birth. Although the pollution was not conclusively linked to the gas wells, there is little other industry and not much traffic in the area monitored.

Earthquakes

35. Earthquakes triggered by test-fracking in Lancashire in early 2011 prompted the *de facto* moratorium on fracking. In addition to the concerns of local people about damage to properties, an even greater risk is to the integrity of the well-linings, typically made of steel and cemented in place, designed to reduce or eliminate the possibility of leaking methane or flowback water. Tony Grayling, Head of

[31] House of Commons Hansard Written Answer 12th February 2013
http://www.publications.parliament.uk/pa/cm201213/cmhansrd/cm130212/text/130212w0002.htm#130212w0002.htm_wqn23
[32] House of Commons Hansard 24th October 2012 column 1038 Adjournment debate on onshore gas
[33] Chartered Institute of Water and Environmental Management (CIWEM) Hydraulic fracturing (fracking) of shale in the UK
[34] DECC (2012) 'Gas Generation Strategy' paras 5.17 and 5.25
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65654/7165-gas-generation-strategy.pdf
[35] Energy & Climate Change Committee 'The impact of shale gas on energy markets' oral evidence 16th January 2013 Q280
http://www.publications.parliament.uk/pa/cm201213/cmselect/cmenergy/c785-iii/c785iii.pdf
[36] Colborn et al (2012) 'An Exploratory Study of Air Quality near Natural Gas Operations'
http://www.endocrinedisruption.com/files/HERA12-137NGAirQualityManuscriptforwebwithfigures.pdf

Climate Change at the Environment Agency, has acknowledged that this could be a problem, saying in relation to the Lancashire earthquakes: *"we need to understand what is the maximum damage that might be done in such circumstances to a well and the integrity of the casing, whether it would increase the risk of a leak. If there is groundwater in the vicinity, that could be a problem"*[37].

36. Evidence from the US shows that the Lancashire experience is not unique. Several US states have experienced seismic activity following shale gas drilling and fracking in areas where this has not previously happened. Although a causal link has not been proved in all cases, a close correlation between fracking and earth tremors can be seen[38]. According to the US Geological Survey's Earthquake Science Center, in the US at least *"the future probably holds a lot more in induced earthquakes as the gas boom expands"*[39].

Will shale gas cut energy bills?

37. Shale gas advocates say it will lead to big cuts in gas prices, as it has done in the US, but there is great scepticism among experts that this will be the case.

38. Shale gas production costs in Europe are likely to be higher than in the US. The reasons for this include higher population density and associated problems of land availability, the lack of a competitive onshore drilling and services industry and tougher environmental regulation[40]. Such factors led the IEA to conclude that operating costs in Europe will be 30-50% higher than in the US[41].

39. Claims of cheaper gas prices also ignore global market dynamics. Demand for gas is rising fast, particularly from China, India and other emerging economies. This growing demand is likely to soak up new gas supplies, potentially keeping supply constrained and prices high. According to energy expert Professor Paul Ekins: *"UK households and industry would be tied to a highly unpredictable roller coaster of gas prices that are generally high and can spike higher due to volatility"*[42].

40. Overall, Bloomberg New Energy Finance has concluded that *"given conditions in the UK, it is hard to see shale gas coming to market at much below $8 per MMBtu – around the same as the wholesale*

[37] The Times Feb 6th 2012 'Blackpool tremors reopen questions over fracking' http://www.thetimes.co.uk/tto/business/industries/naturalresources/article3310081.ece
[38] See for example http://stateimpact.npr.org/pennsylvania/2011/08/26/how-fracking-causes-earthquakes-but-not-the-one-in-virginia/
[39] Ibid
[40] See Chatham House (2010) 'The shale gas revolution: hype and reality' http://www.chathamhouse.org/sites/default/files/public/Research/Energy,%20Environment%20and%20Development/r_0910stevens.pdf and Florence Gény (2010) 'Can unconventional gas be a game changer in European gas markets?' http://www.oxfordenergy.org/wpcms/wp-content/uploads/2011/01/NG46-CanUnconventionalGasbeaGameChangerinEuropeanGasMarkets-FlorenceGeny-2010.pdf
[41] International Energy Agency (2012) 'Golden Rules for a Golden Age of Gas' op cit p54
[42] Paul Ekins New Scientist 6th December 2012 'The UK's new dash for gas is a dangerous gamble' http://www.newscientist.com/article/dn22594-the-uks-new-dash-for-gas-is-a-dangerous-gamble.html

prices that have been driving up utility bills in recent years"[43]. The IEA's analysis shows that gas prices in Europe will be around 40% higher than today in both 2020 and 2035[44].

Will shale gas improve energy security?

41. Another claim from shale gas advocates is that shale gas will improve the UK's energy security, as we will not have to rely on gas supplies from unstable regions or be heavily dependent on countries such as Qatar. However DECC believes that *"It is still too early to come to firm conclusions on whether shale gas production in the UK or elsewhere in Europe is likely to have a significant effect on … security of supply"*[45].

42. Friends of the Earth believes energy security should be defined more broadly than just about supply and geopolitics, also including price security (providing energy at reasonable prices) and environmental security (achieving emissions targets and minimising other impacts)[46]. In a report for Friends of the Earth, energy security expert Professor Michael Bradshaw concluded that *"the best way to reduce the energy security risks associated with the UK's growing gas import dependence is to hold the course, promote renewable power generation, improve energy efficiency and reduce overall energy demand"*[47].

43. The use of energy in Wales is on a decreasing trend. Since 2005 electricity use (industrial and residential) has decreased by 13%[48] and gas use by 28%[49]. Energy security needs to be viewed in the context of decreasing energy use.

Jobs and local economy

44. The shale gas industry paints an overwhelmingly positive picture of its local economic impact through job creation. A report for Cuadrilla has claimed that shale gas production in Lancashire could create up to 6,500 full-time equivalent jobs in the UK as a whole, with 2,500 of these in Lancashire[50]. However US experience shows that such claims should be treated with scepticism: numbers are

[43] Bloomberg New Energy Finance 31st October 2012 'UK energy policy – a time of consequences' http://about.bnef.com/2012/10/31/bnef-chief-executive-michael-liebreich-vip-comment-uk-energy-policy-a-time-of-consequences/

[44] International Energy Agency (2012) 'Golden Rules for a Golden Age of Gas'op cit p74

[45] DECC evidence to House of Commons Energy and Climate Change Committee inquiry 'The impact of shale gas on energy markets' http://www.publications.parliament.uk/pa/cm201213/cmselect/cmenergy/writev/isg/m01.htm para 2

[46] Bradshaw (2012) for Friends of the Earth 'Time to take our foot off the gas?' http://www.foe.co.uk/resource/reports/time_to_take_our_foot_off.pdf

[47] Ibid

[48] DECC http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=11/stats/energy/sub-national-energy/4820-subnat-auth-electricity-cons-2005-2010.xls&minwidth=true

[49] DECC http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=11/stats/energy/sub-national-energy/3954-subnat-gas-sales-2005-2010.xls&minwidth=true

[50] Regeneris Consulting (2011) 'Economic Imopact of Shale Gas Exploration & Production in Lancashire and the UK' http://www.cuadrillaresources.com/wp-content/uploads/2012/02/Full_Report_Economic_Impact_of_Shale_Gas_14_Sept.pdf

often over-stated[51]; most employment is in the drilling phase, which only lasts around a year[52]; and many jobs go to transient workers who move from one well to another[53].

45. Nor has any estimate been made of potential negative impacts on other economic sectors such as agriculture and tourism. Experience in the US shows that fracking can create problems for local agriculture, including the loss of agricultural land and concerns about water resources[54]. Nationwide Mutual, the largest US farming insurance underwriter, has said that *"from an underwriting standpoint we do not have a comfort level with the unique risks associated with the fracking process to provide coverage at a reasonable price"*[55]. In Australia, local tourism bodies are among the opponents of unconventional gas development[56].

46. Alun Cairns MP has expressed concerns about the potential impact of fracking on the Vale of Glamorgan: *"The Vale is a great place to live and work; and I want it to remain that way. The small rural villages, the fantastic coastline, country roads and a focus on agriculture to the west and the vibrancy of Barry, Wales' largest town to the east, with its own coastline, history and heritage. Any future gas exploration could put this at risk"*[57].

47. Research form the US shows that investing $1 million in renewable energy creates more than two to three times as many jobs as investing the same amount in gas[58]. Government figures show that 20,848 jobs were created in the renewables sector in the UK between April 2011 and April 2012[59] and the renewable energy sector could support 400,000 jobs by 2020[60].

48. Fracking could affect house prices. An estate agent in Poulton-le-Fylde, near one of Cuadrilla's drilling sites, in Lancashire, told the Observer *"There are a lot of properties coming on to the market, and some of the owners are saying they want to get out before prices start dropping"*[61].

[51] See for example Industry Week August 11th 2011 The great debate over shale gas employment figures
[52] Research for Cuadrilla shows that the number of jobs created at around 1,600 in Lancashire and 5,600 in the UK for four years from 2016 to 2019, falling to under 200 from 2022 onwards. Regeneris Consulting Economic impact of shale gas exploration & production in Lancashire and the UK
[53] In Pennsylvania, 70% of gas well drilling jobs go to out-of-state employees. ENR New York March 7th 2011 Hydrofracking Offers Short-Term Boom, Long-Term Bust
[54] Food and Water Watch Fracking and the food system
[55] Nationwide Mutual 13th July 2012 Nationwide statement regarding concerns about hydraulic fracturing
[56] Northern Rivers Echo 31st May 2012 Tourism joins call to halt CSG
[57] http://www.aluncairns.co.uk/2012/07/dismay-over-shale-gas-planning-inquiry-decision/
[58] Investing $1 million dollars in gas creates 5 jobs compared to 13 for wind, 14 for solar and 17 for building retrofits from the same amount of investment. Political Economy Research Institute, University of Massachusetts The economic benefits of investing in clean energy
[59] DECC Renewables Investment and Jobs
[60] Renewable Energy Association April 2012 Renewable energy: made in Britain
[61] The Observer 23rd June 2012 'Worry for homeowners who face the threat of fracking' http://www.guardian.co.uk/money/2012/jun/23/fracking-undermine-value-home

Underground Coal Gasification

49. Another unconventional process starting to receive more attention is Underground Coal Gasification (UCG), which produces 'syngas', a mixture of carbon dioxide, carbon monoxide, hydrogen and methane, which can be used for power generation, chemical feedstocks or processed to produce diesel fuel. Clean Coal Ltd has an exploration licence and is developing proposals for UCG in Swansea Bay, and another company has exploration licences for two UCG projects in the Llwchwr and Dee estuaries[62].

50. The UK Government has said that carbon capture and storage (CCS) will be needed if syngas is to be used for power generation[63]. Although Friends of the Earth believes that CCS is a vital part of the UK's energy future, both for power stations and for energy-intensive industry, we believe that placing blind faith in the ability of industry to deliver CCS which works at scale and which is cost-effective, is extremely risky because:

    - CCS has not yet been demonstrated at scale anywhere in the world, there is no certainty that it will work and commercial deployment is at best still many years' away
    - CCS is not a zero-carbon solution: coal with CCS still has significant carbon dioxide emissions.

51. Friends of the Earth does not see UCG as part of the UK's energy future.

Conclusions

52. Friends of the Earth believes that shale gas and UCG are unconventional and unnecessary

53. To meet our legally-binding climate change targets, Friends of the Earth agrees with the Committee on Climate Change[64] that we must almost totally decarbonise electricty generation by 2030. This is critical not just because electricity generation is a major source of carbon emissions, but because decarbonised electricity will help emissions reduction in heating and transport by allowing a shift from gas and oil respectively.

54. Friends of the Earth Cymru believes that we should move from generating roughly three-quarters of our electricity from fossil fuels currently, to generating all of Wales' electricity from renewable sources as soon as possible (and in any case by 2030).

55. In this context, seeking out new sources of fossil fuels is the wrong direction for UK energy policy, and particularly for Welsh energy policy. Given the inherent risks for the local environment and human health and major scepticism about its impact on energy prices, the exploitation of unconventional hydrocarbon reserves through fracking and UCG is a gamble we don't need to take.

[62] Energy-pedia News 14th January 2013 http://www.energy-pedia.com/news/united-kingdom/new-153070
[63] Environment Agency 'Underground Coal Gasification' http://www.environment-agency.gov.uk/static/documents/Business/UCG_factsheet_16_Aug10.pdf
[64] Committee on Climate Change 2011 The Renewable Energy Review p40

56. If the Welsh Government would like to reserve the ability to exploit these resources in the future while paying due proper regard to the precautionary principle and making good use of the full potential of devolution, the logical strategy is as follows:

    - Given that policy in England is strongly in favour of fracking, and given the existing uncertainties over environmental problems the use of this technology in the UK could cause, the precautionary principle suggests that a more restrictive planning regime would be of considerable benefit to the Welsh environment.
    - Planning law should be modified so as to include the following clauses:

        Planning permission for unconventional gas operations (including test drilling and extraction) will not be granted unless

        - *the planning authority is satisfied that all reasonable scientific doubt that there is any risk of adverse impacts including groundwater contamination has been eliminated*
        - *the proposal will not compromise the planning authority's duties in relation to climate change mitigation and adaptation; and*
        - *the proposal is environmentally acceptable, or it can be made so by planning conditions or obligations.*
    - Should unconventional gas operations proceed safely and with no contamination in England for a number of years[65], consideration could subsequently be given to relaxing the planning regime.
    - This is exactly the sort of learning that devolution is designed to elicit. In a corollary of England learning about the environmental benefits for Wales of charging for carrier bags, Wales could learn about the risk associated with fracking, underground coal gasification and other unconventional gas exploration carried out in England.
    - In the short term we recommend the Welsh Government adopt a moratorium on fracking until sufficient information is available to determine with a high degree of certainty the likely impacts of fracking on the environment.

57. Without prejudice to the above proposals, the Environmental Impact Assessment Regulations (England and Wales) 1999 should be amended to include the requirement for a full EIA to be conducted for each unconventional gas application. Fracking operations exempt themselves by ensuring they have a surface operation smaller than the 1 ha limit (ordinarily they are 0.99 ha) that would make them subject to these Regulations.

[65] Or other criteria to be specified by the National Assembly for Wales