Shale gas and fracking: Introducing the key issues

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http://www.sgr.org.uk/

• Presentation to local councillors in Wakefield, 7th April 2015.
• Main references are listed in full in:

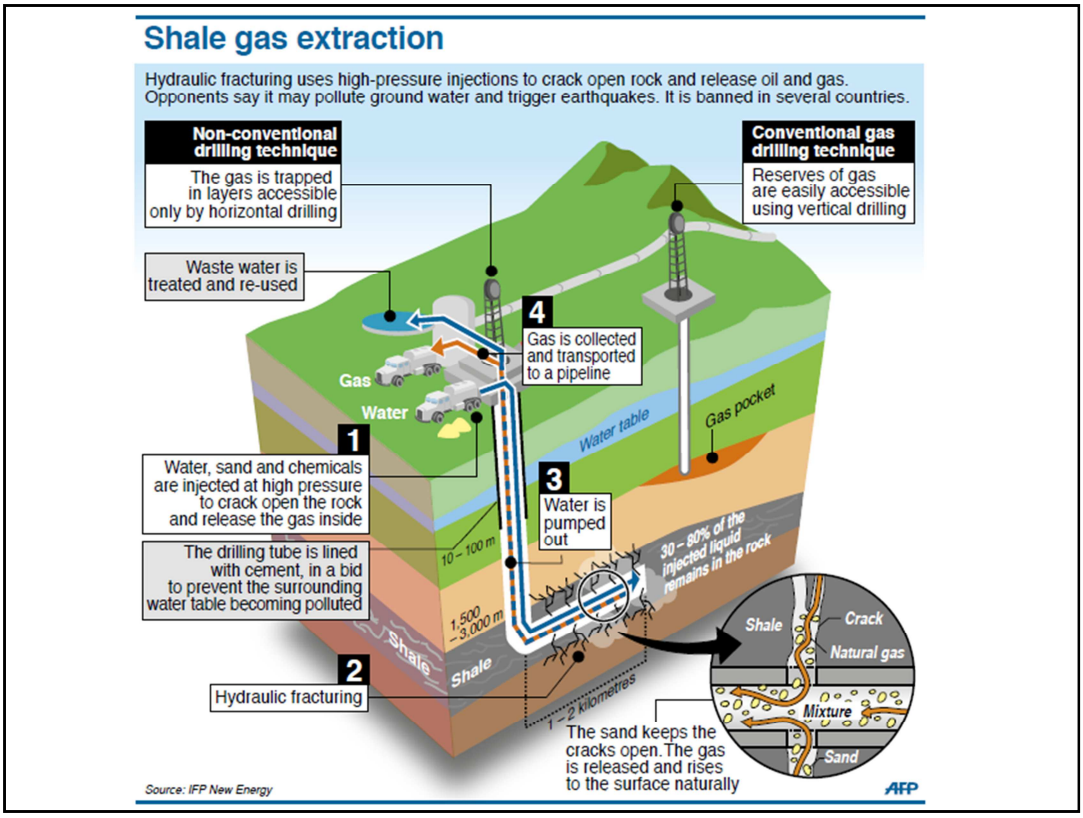
Harrison et al (2014). Shale gas and fracking: examining the evidence. Scientists for Global Responsibility/ Chartered Institute of Environmental Health. http://www.sgr.org.uk/publications/shale-gas-and-fracking

Harrison and Parkinson (2015). Shale gas and fracking. SGR Newsletter, no 43. http://www.sgr.org.uk/resources/shale-gas-and-fracking-examining-evidence-febmar-2015

• Additional references are provided in text.
• Virtually all source data is from academic, industry or governmental sources.

Key issues

- Local environmental/ health impacts
  - Well established impacts
  - Contested impacts
- Climate change
- Socio-economic issues
- Alternatives to shale gas/ fracking



• Typically 35% of frack fluid is recovered from process and treated at surface – but proportion varies hugely depending on well characteristics

• Diagram from IFP New Energy – it can be downloaded from:
Medact (2015). http://www.medact.org/news/new-report-health-fracking-the-impacts-opportunity-costs/

What's new?

- Fracking for shale gas is recent technique:
  - Very high water use
  - Very high pressure injection
  - Horizontal drilling
  - Wider range of synthetic chemicals
- Technical term:
  - High Volume Hydraulic Fracturing (HVHF)
- Only 1 test well drilled in UK so far

• Hydraulic fracturing has been used for conventional gas wells for longer – but volumes and pressures of water are much less

Local environmental/ health impacts

Start with impacts which are least contested

Water use

- Fracking for shale gas is water intensive
  - 40 to 100,000 times more than for conventional gas
- Typical US well-pad uses:
  - 50 to 170 million litres of water
  - UK test well at lower end of range
- Increased competition with households, agriculture, other industries and local ecosystems

Well-pad is typically 6 wells (but can be a lot more)
Figures from: International Energy Agency (2013); Tyndall Centre (2011)

Vehicle movements

- Water and waste water transported to and from site
- Waste water needs off-site treatment
  - Some radioactivity
- Each well-pad will require 14 to 51 vehicle movements **per day** for up to 3 years
- Impacts: noise; air pollution; road accidents
- Heavy equipment installation and use adds to these impacts

Figures: AMEC (2013)

Seismicity

- Fracking can lead to ‘mini-earthquakes’
  - Too small to cause property damage at surface
  - Large enough to damage well – and cause leakage
- UK generally more fractured geology than US
- Preese Hall, Lancashire: 2011
  - Only fracked well in UK to date
  - 2 mini-earthquakes after fracking fluid entered natural fault – led to well shut down

Chemical use

- Numerous synthetic chemicals used in the fracking process
  - Incl. silica, anti-friction agents, biocides, anti-corrosion chemicals
- 1,000 to 3,500 tonnes used in well-pad
- Often little data on health/ ecological effects
  - Commercial confidentiality has been used to prevent full disclosure

• Few chemicals used in exploration; many (and more toxic) chemicals used in production
• Full disclosure promised in UK but yet to be tested
• Figures: Tyndall Centre (2011)

Contamination of water, land, air

- Potential routes
  - 'Well integrity failure' – i.e. leaks in well
  - Well-pad leaks/ spills of wastewater, chemicals, gas
  - Leaks/ spills during transport
- Failure rates of fracking wells higher
- Numerous US studies showing some contamination
  - Includes low level radioactive chemicals/ heavy metals released from natural geological sources

Regulation

- Multiple regulators
  - Health and Safety Executives; environment agencies; local government
- Widespread calls from academia, industry etc for industry-specific regulation
  - Need for baseline studies
- Concerns about lack of resources, use of self-regulation, and regulatory gaps
- Additional tax revenues for councils may create conflict of interests

Climate change

Direct carbon pollution

- About 80% of fossil fuel reserves need to 'stay in the ground' to reach global carbon targets
- Natural gas use releases *at least* 9 times more carbon pollution than renewable energy
  - over full lifecycle
- Shale gas pollution even higher
  - High uncertainties in post-production gas leakage rates

Figures from: Leaton et al (2013); Barnham (2014)

Indirect effects on climate change

- Potential diversion of investment away from renewable energy/ energy efficiency
- Erosion of carbon reduction targets
  - e.g. delays in setting UK's 2030 carbon targets
- Without global restrictions on carbon pollution, new fossil fuels resources – e.g. shale gas – will **add to** global emissions
  - From DECC report

Socio-economic effects

Employment etc

- Estimates for economic benefits/ employment for any industry are highly uncertain
- Industry estimates tend to be higher than academic estimates
- Potential for jobs in renewable energy industries/ energy efficiency industries tends to be higher than fracking

Public opinion

- Recent government opinion polling:
  - 75% support renewables
  - 40% support nuclear
  - 25% support fracking
- Large policing bills for fracking protests

Figures (rounded to nearest 5%) from: DECC (2015).
https://www.gov.uk/government/collections/public-attitudes-tracking-survey

Alternatives to fracking/ shale gas

- Home energy conservation
  - Expanded programmes of loft/ wall insulation, efficient boilers etc
  - Chronically underfunded but cheapest option
- Commercial/ industrial energy conservation
- Electric heat pumps
  - Air/ water/ ground
  - Electricity from renewable energy
- Biogas
  - From agricultural waste, landfills etc

• Home energy conservation also tackles fuel poverty and is labour intensive, creating more jobs

Conclusions

- Local environmental/ health impacts
  - Some clear problems, lots of risks
  - Strong joined-up regulation essential
- Climate change
  - High risk of undermining efforts on carbon pollution
- Calls for a moratorium on fracking
- Energy conservation/ renewables are generally better options