

Science and technology issues of shale gas/oil in UK

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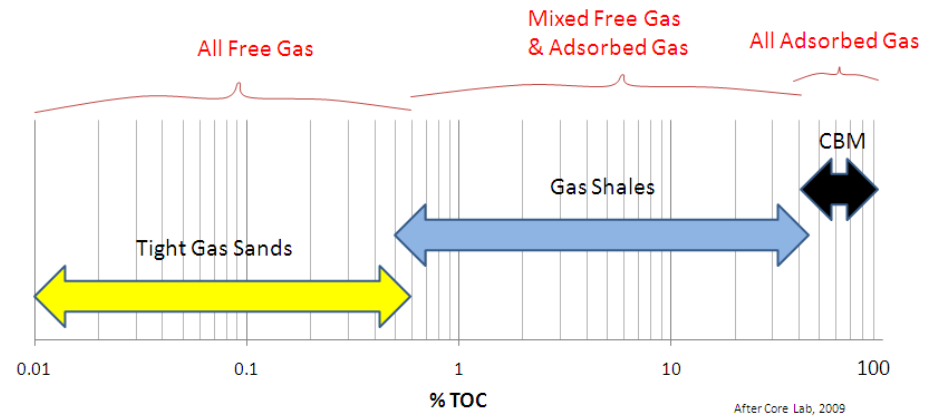
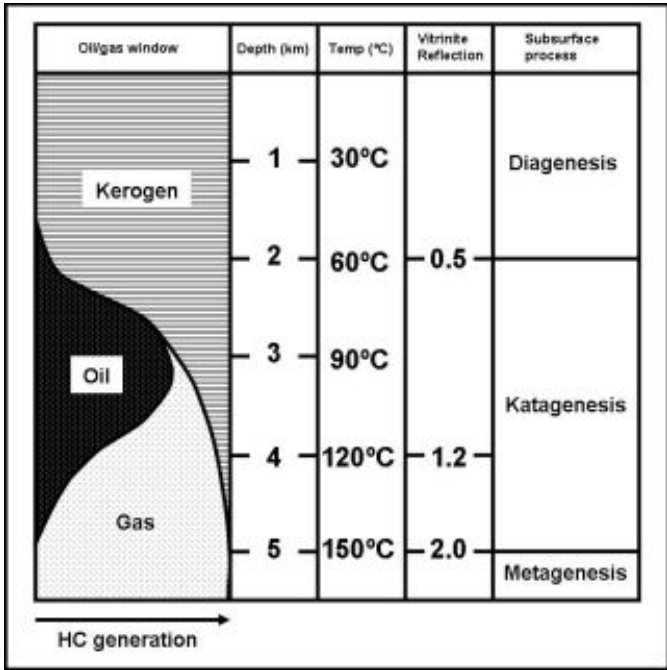
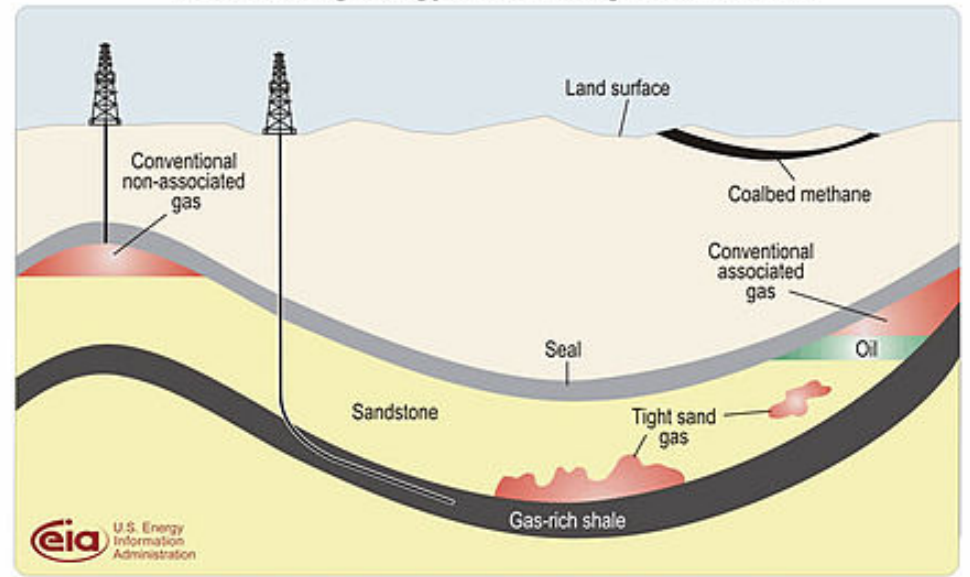
*Hampshire resident
and property owner*

*Countryside – walker,
bird watcher, etc.*

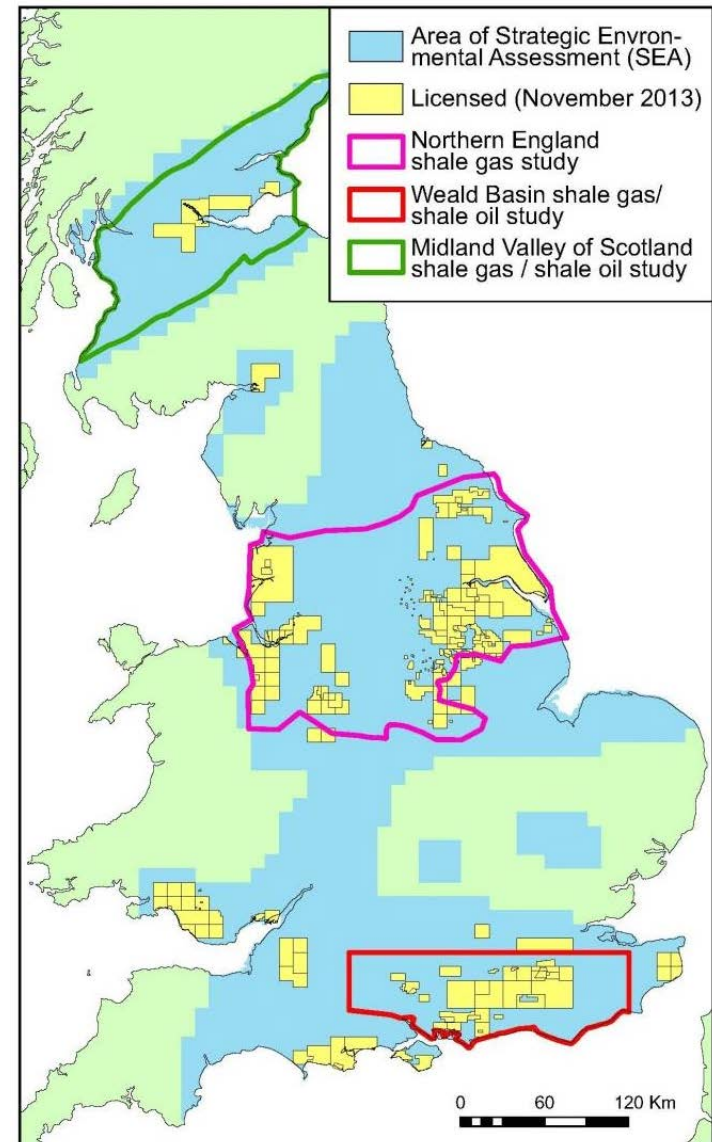
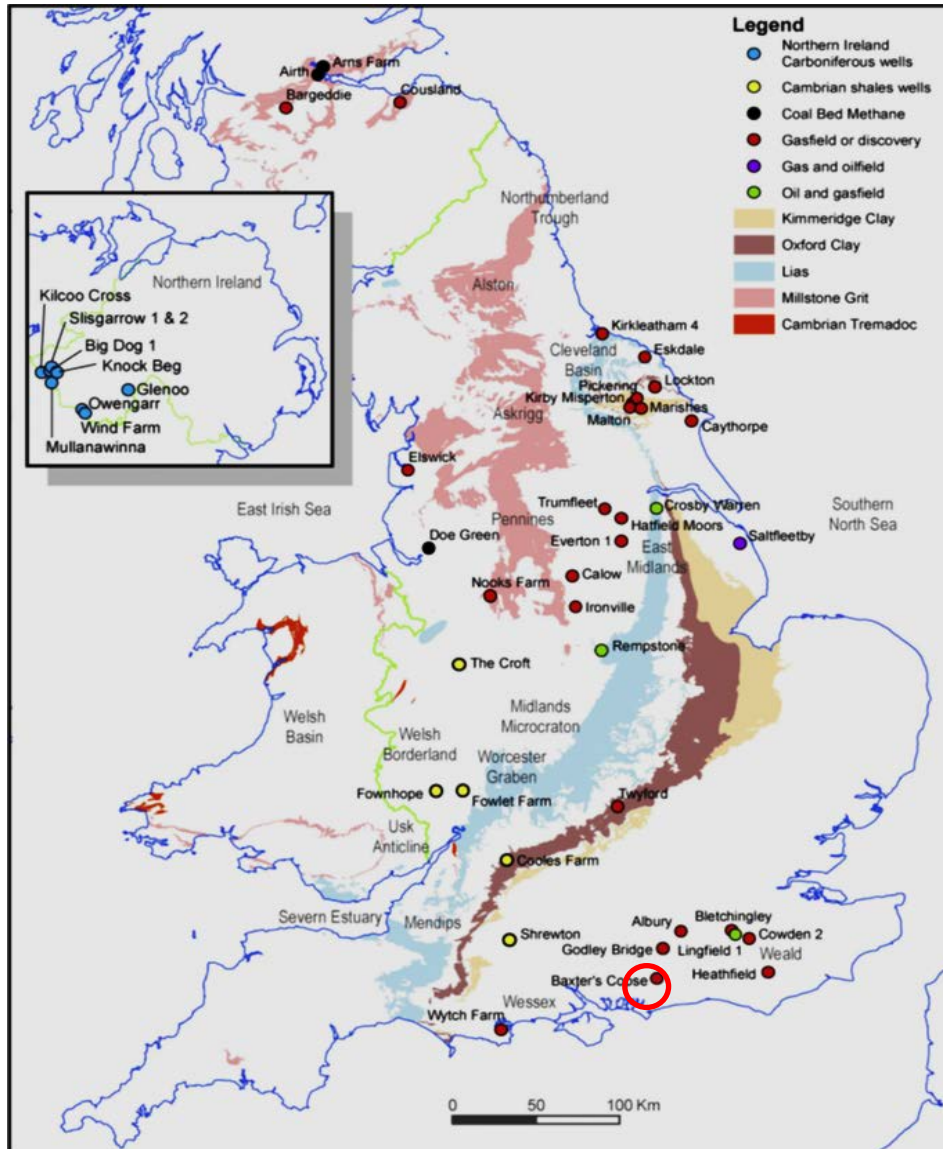
Conventional v Unconventional



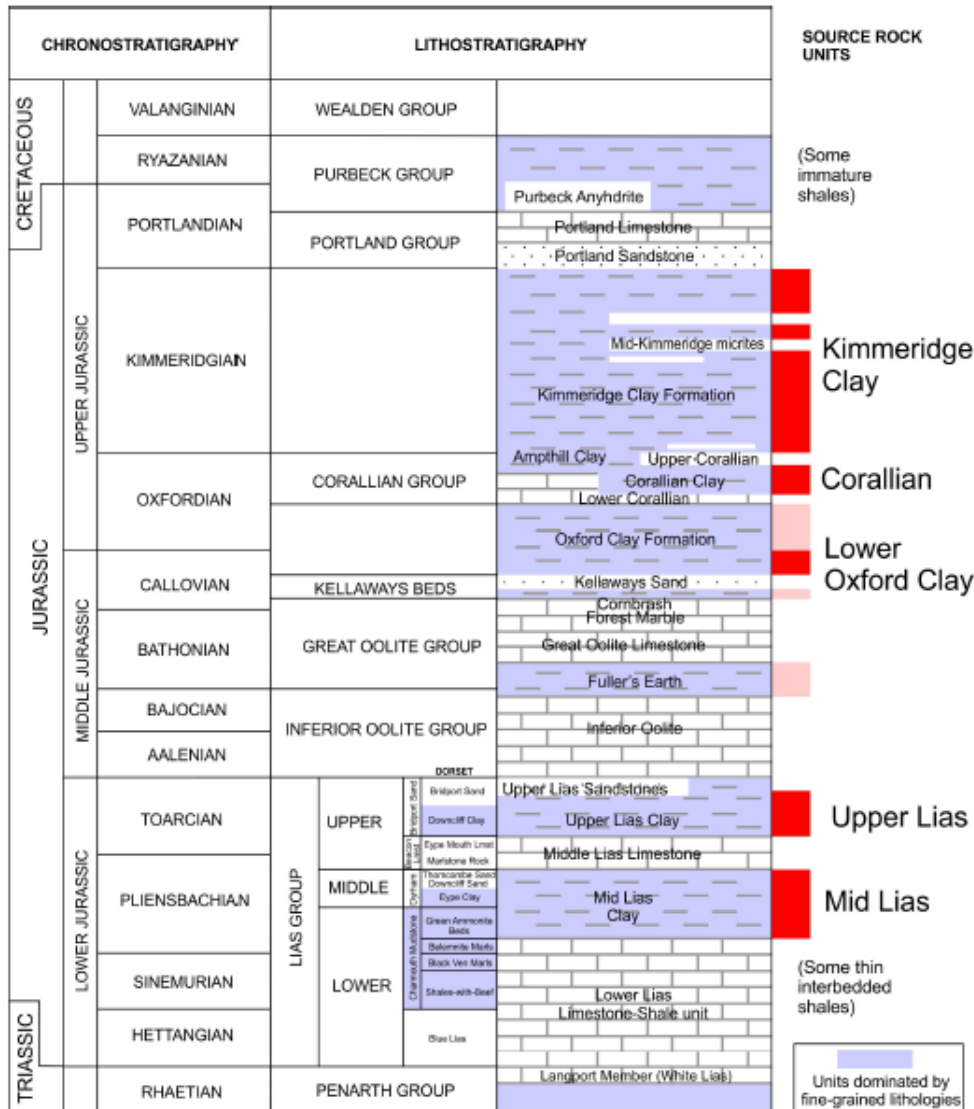
Schematic geology of natural gas resources



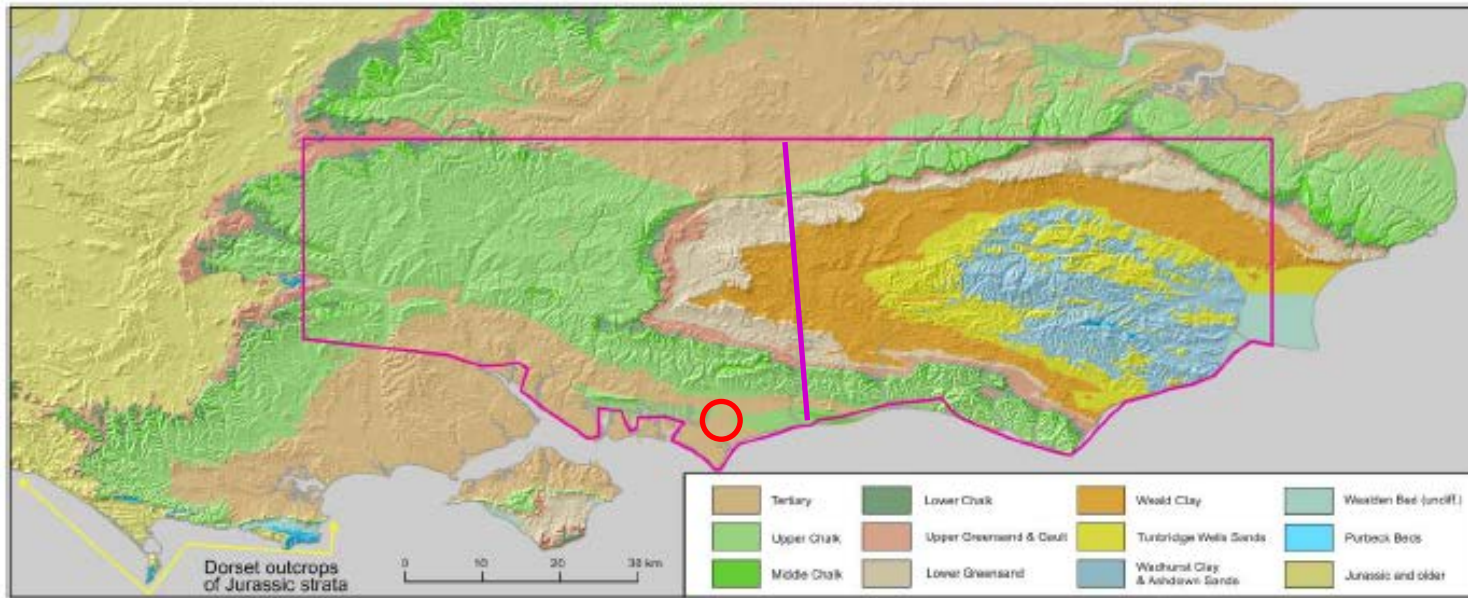
Shale Gas/Oil horizons in S Britain



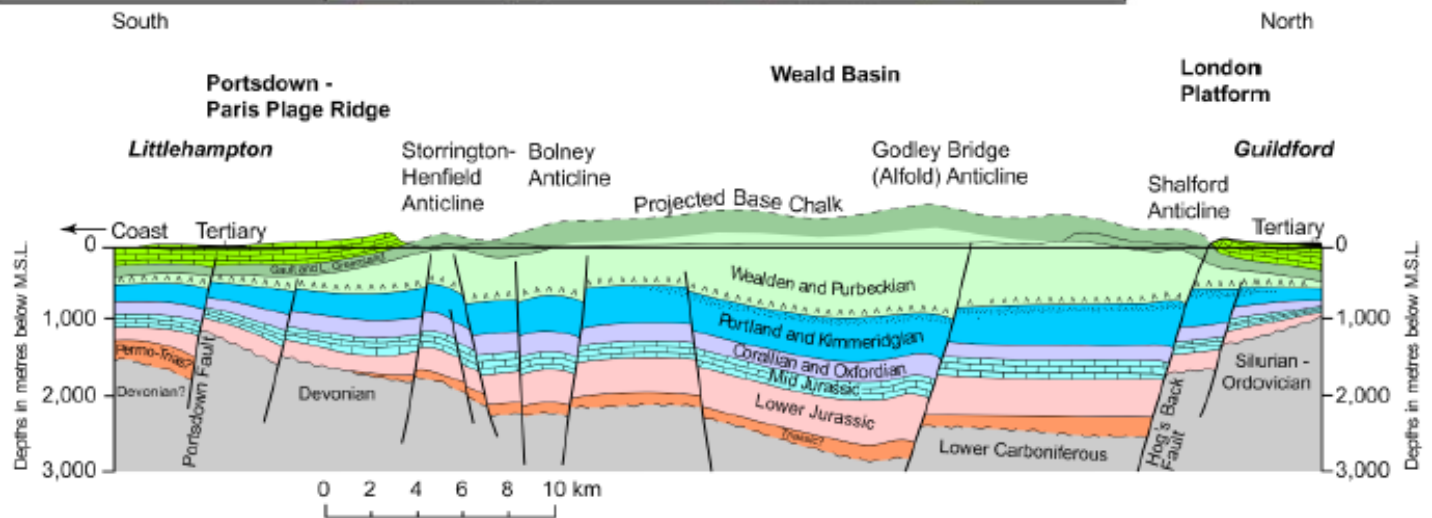
Shale Gas/Oil horizons in S Britain



Geological setting

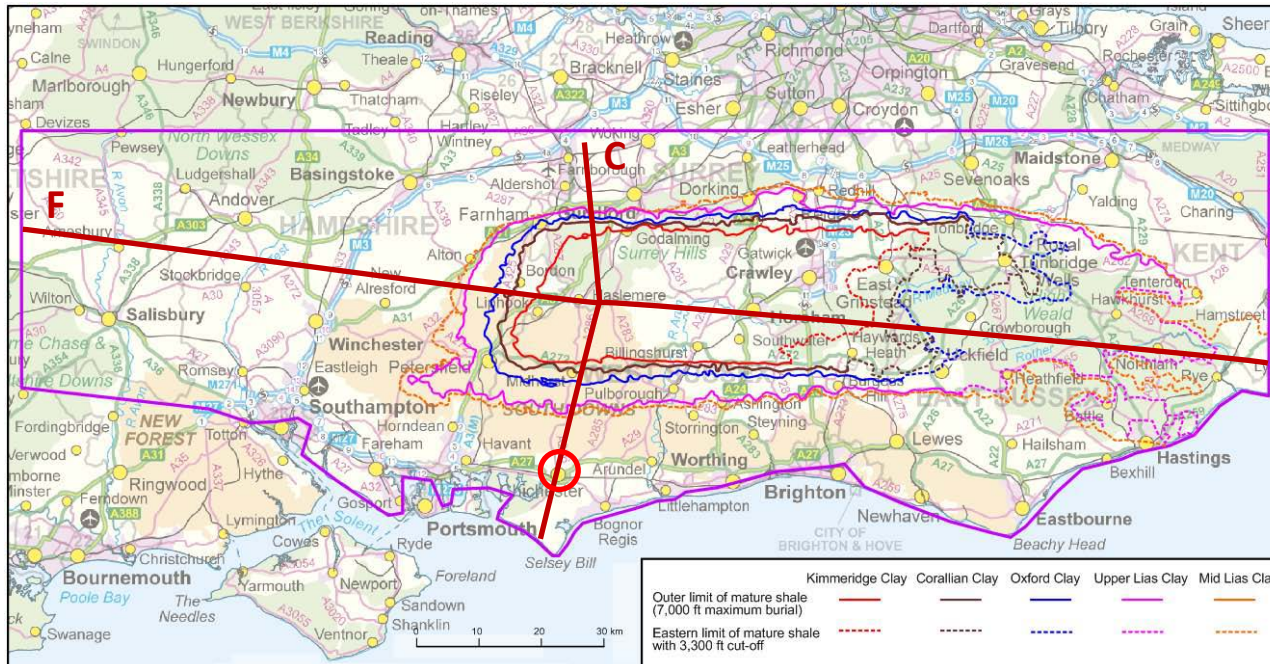


Geological map of southern Britain including the Weald study area (from BGS 1:50,000 mapping).



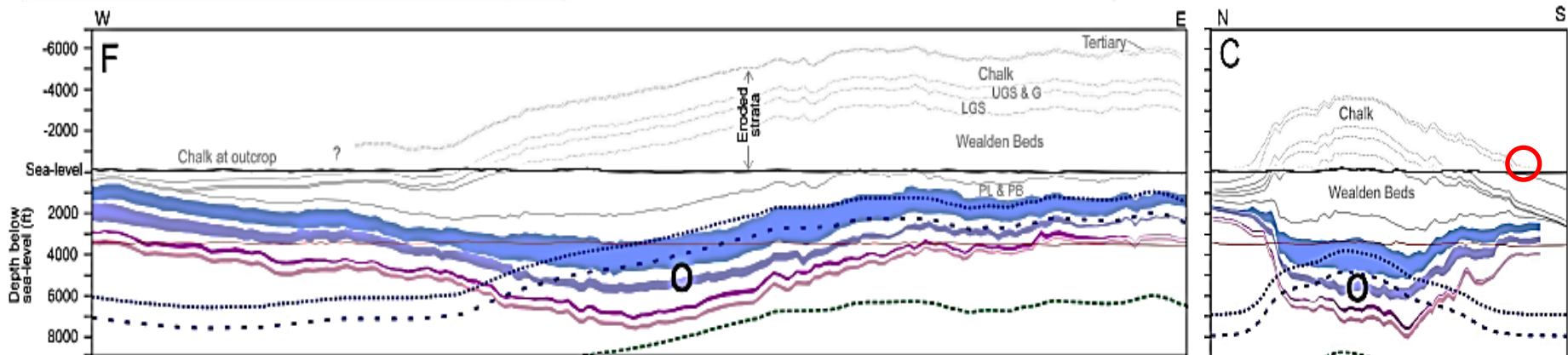
Simplified N-S geological cross-section through the central Weald Basin (from Butler & Pullan 1990).

Where is Shale oil/gas?



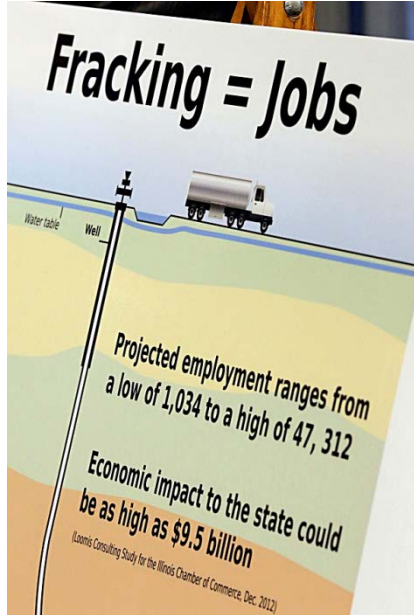
BGS Weald report:

- No significant Jurassic shale gas potential in the Weald Basin;
- Significant volume of oil-mature shale present in the centre of the basin;
- The estimated oil-in-place is 4.4 billion bbl oil or 0.59 billion tonnes.

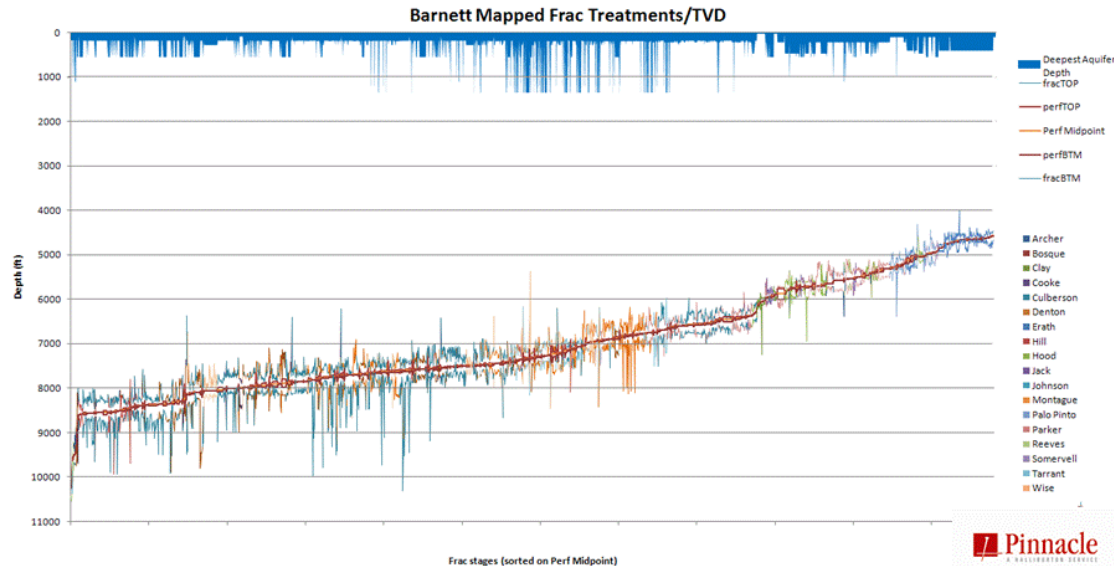
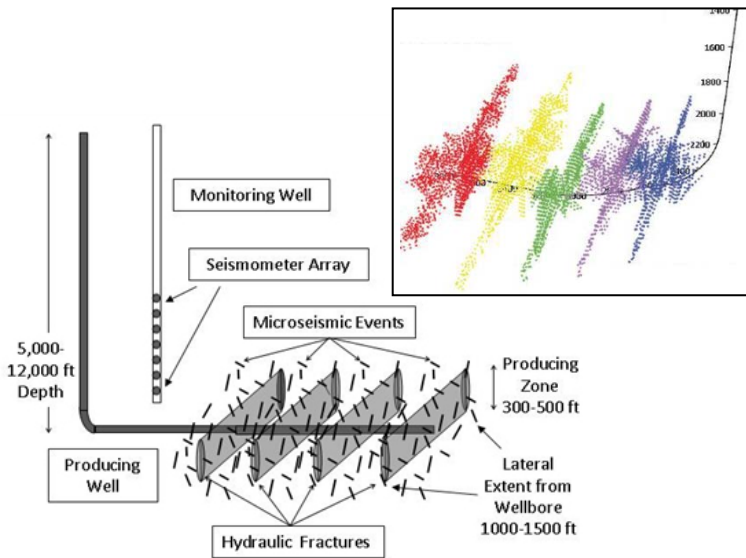
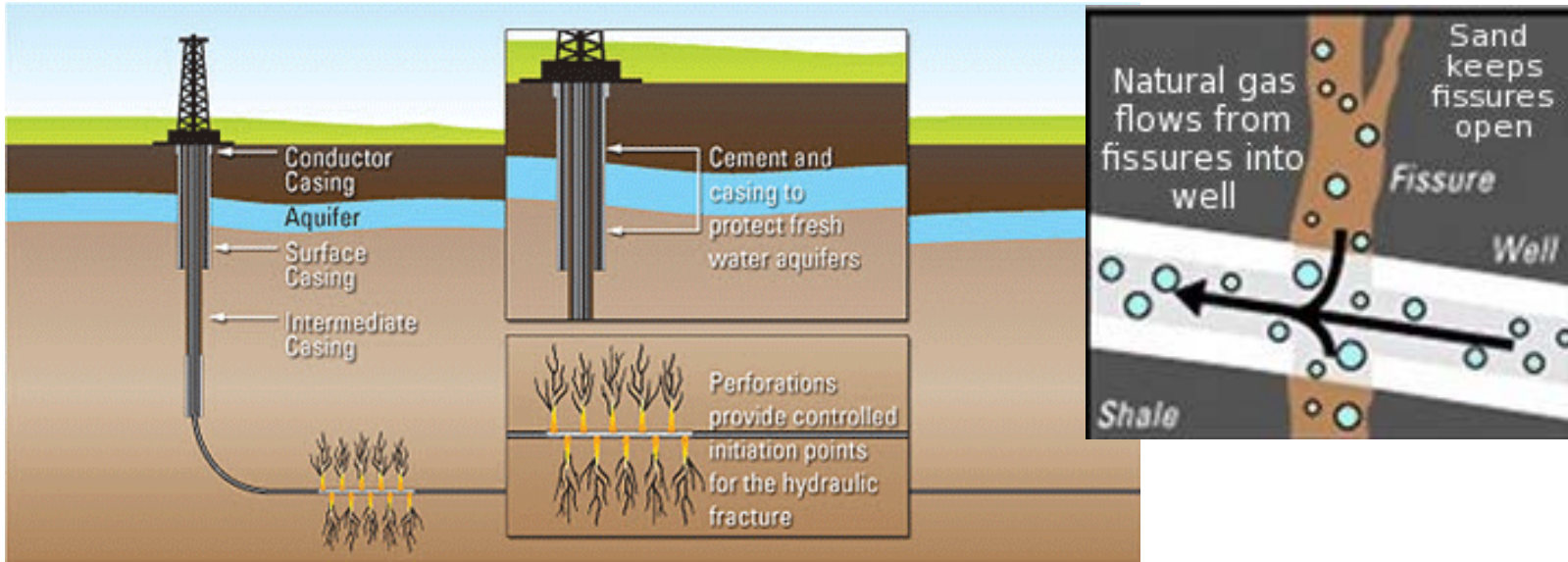


Main Issues

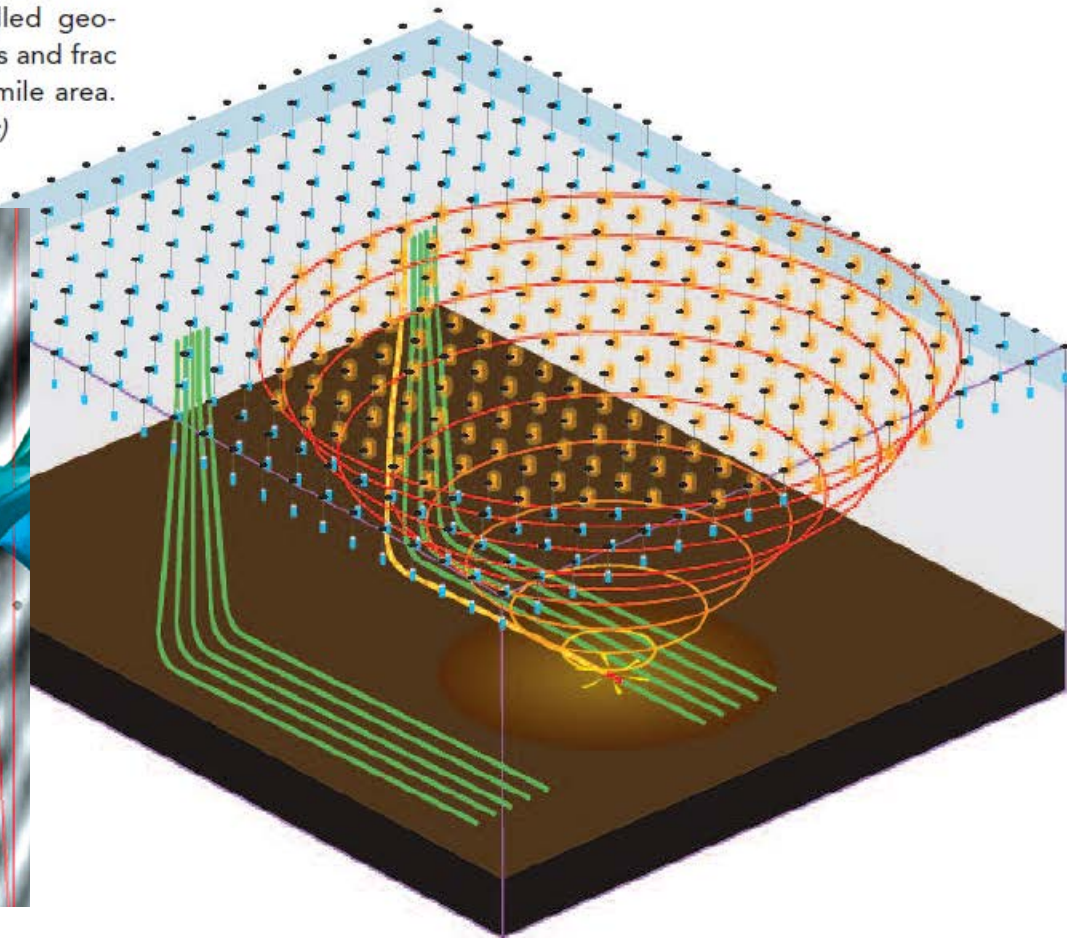
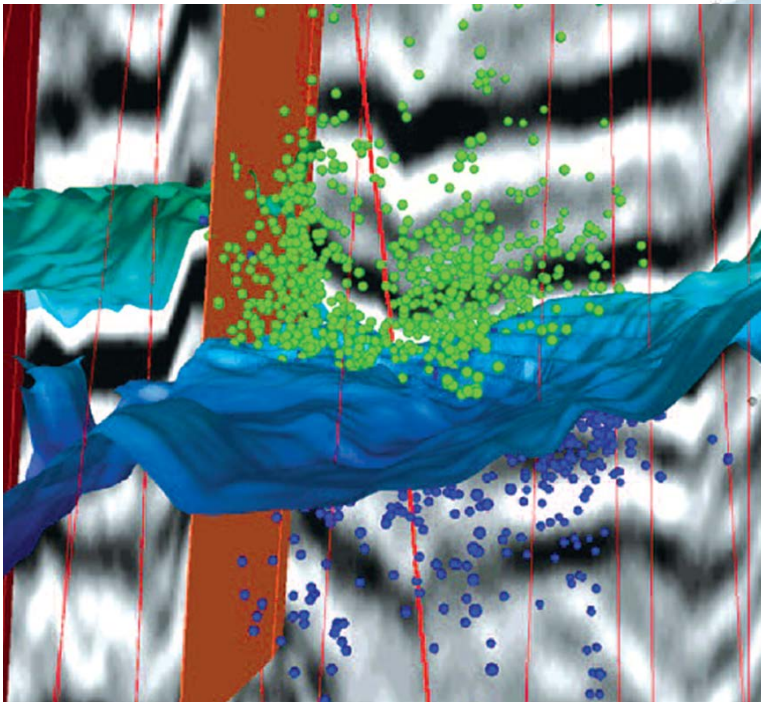
- What is “Fracking”
- Issues
 - Surface disruption
 - Earthquakes
 - Water usage
 - Groundwater contamination
 - Leaking wells
 - Strategic importance



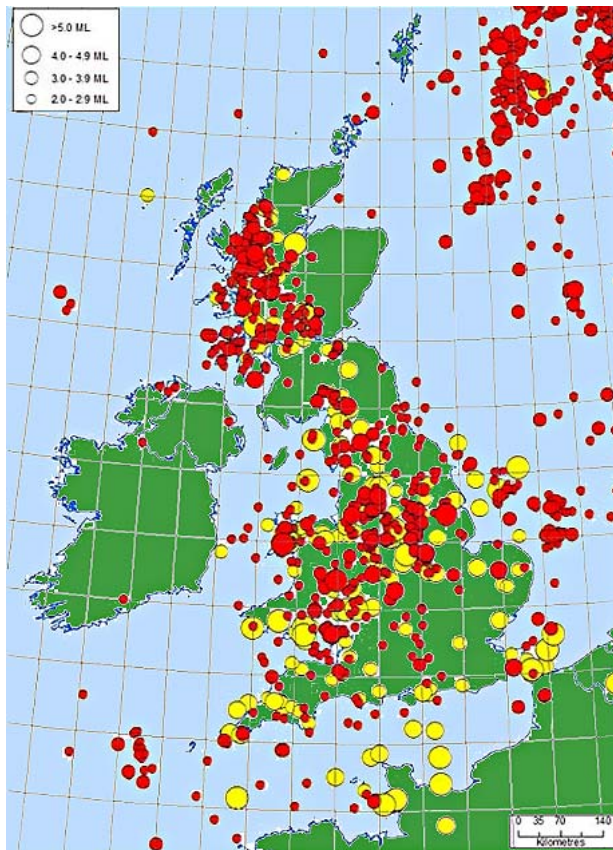
Fracking



MicroSeismic's Buried Array™ service uses a series of permanently installed geophones to monitor multiple wells and frac operations over a 500-plus sq mile area. *(Image courtesy of MicroSeismic)*

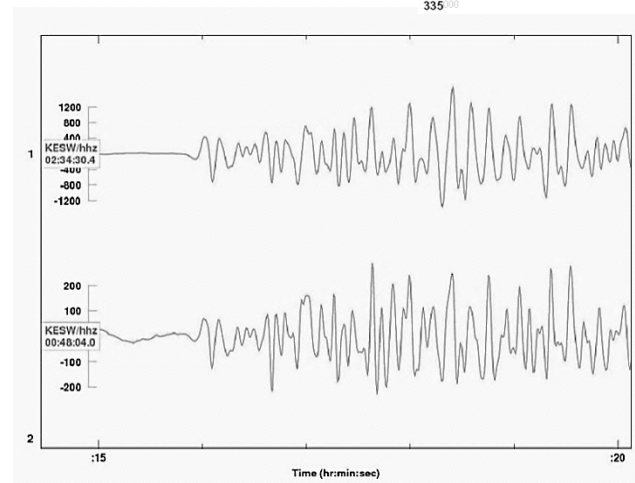
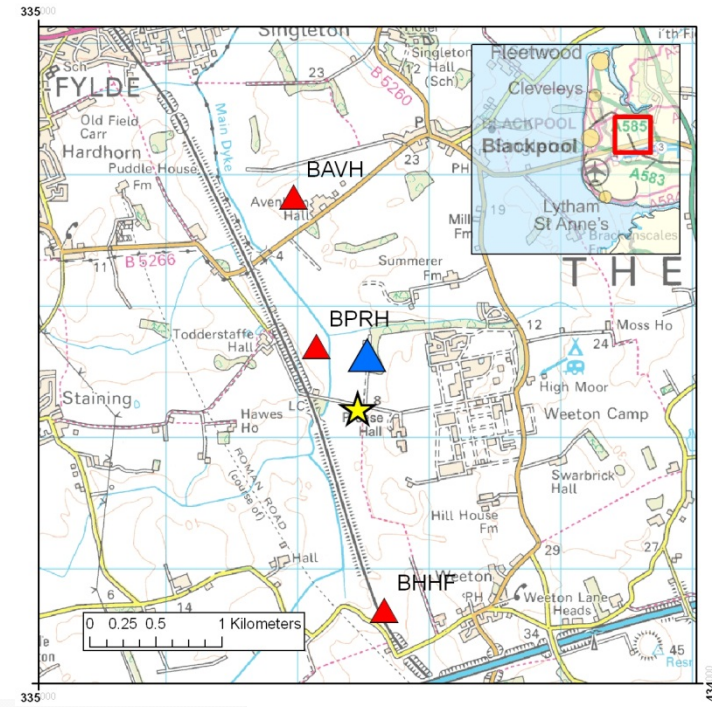


Earthquakes



<http://www.bgs.ac.uk/discoveringGeology/hazards/earthquakes/UK.html>

Epicentres of Blackpool earthquakes (yellow star). The location of the Preese Hall drill site is shown by the blue triangle. The red triangles show in locations of temporary monitoring stations installed by BGS



1 April (M 2.3) and 27 May (M 1.5) earthquakes were both very similar. - close to fracking site and at similar shallow depth).

“Fracking site”

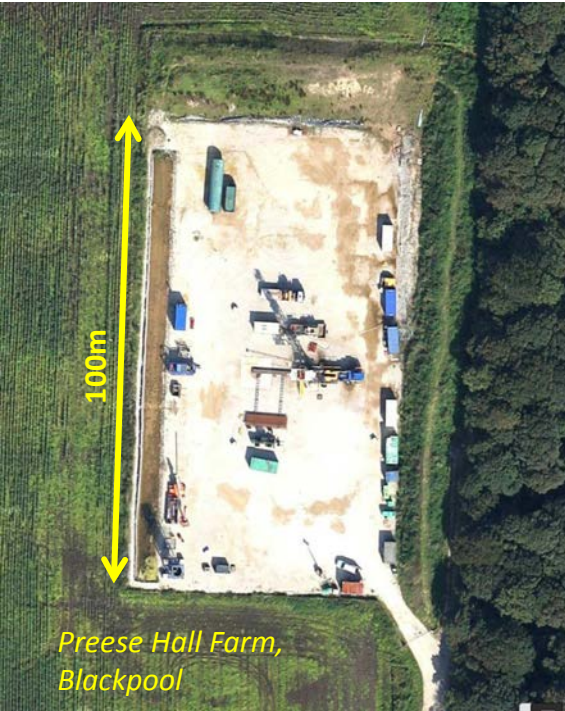
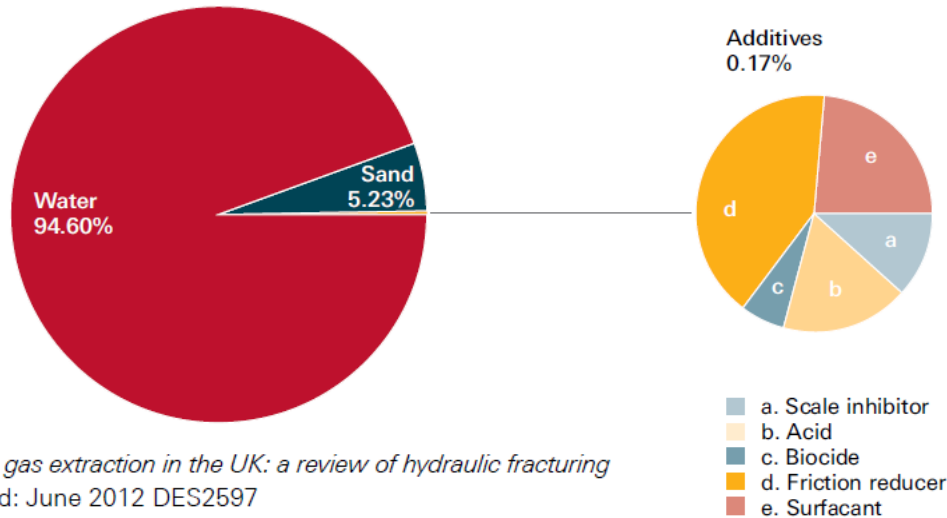


Figure 3 Typical composition of fracturing fluid by volume (source: British Geological Survey)

The 0.17% of chemical additives may include scale inhibitor to prevent the build up of scale on the walls of the well; acid to help initiate fractures; biocide to kill bacteria that can produce hydrogen sulphide and lead to corrosion; friction reducer to reduce friction between the well and fluid injected into it; and surfactant to reduce the viscosity of the fracturing fluid.



Shale gas extraction in the UK: a review of hydraulic fracturing
Issued: June 2012 DES2597

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Wyoming's stiff wind, a speedy left turn and a top-heavy load tipped over a semitrailer at a busy Casper intersection, spilling 160 gallons of fluid used in hydraulic fracturing. The ... spill snarled traffic ... for nearly five hours.



"Chemical Spill Outside Buckingham Palace In Central London Injures Nine"



How Much Is 5 Million Gallons?

The 5 million gallons of water needed to drill and fracture a typical deep shale gas or oil well is equivalent to the amount of water consumed by:

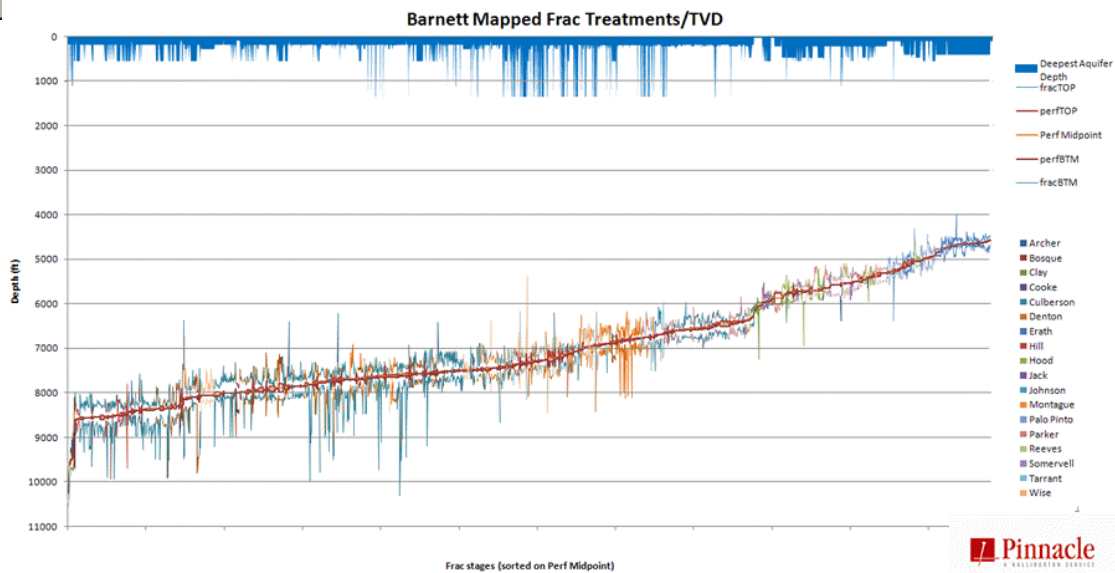
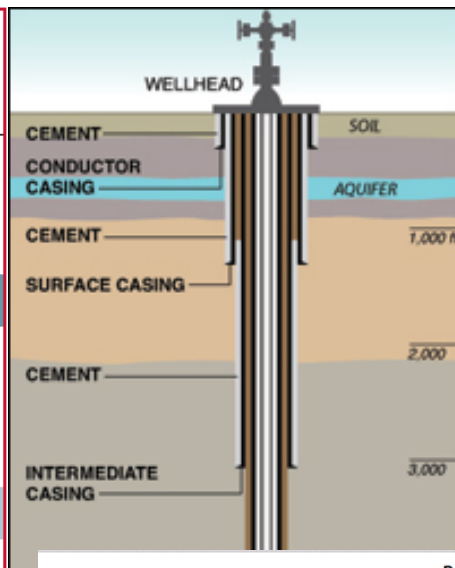
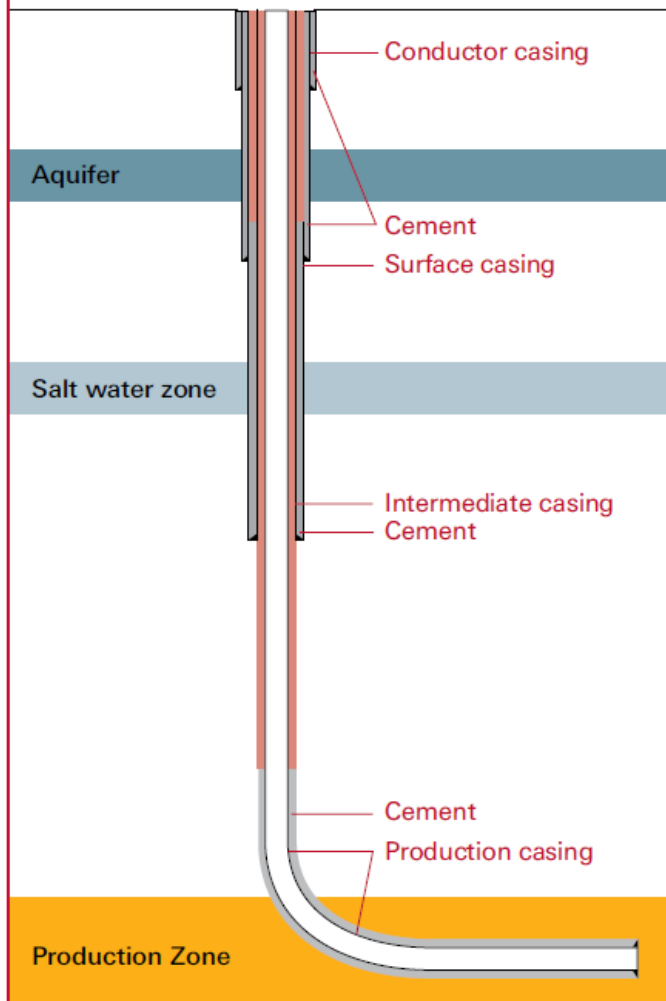
- **New York City** in approximately **6.3 minutes**
- A 1,000 megawatt coal-fired **power plant** in **10.8 hours**
- A **golf course** in **22.5 days (in USA?)**
- **6.75 acres of corn** in a season

Source:



Well casing

Figure 4 An example of a shale gas well design (DoE 2009)



Strategic importance of oil and gas

Chart 1.1.2: UK production of primary fuels 1970 to 2012

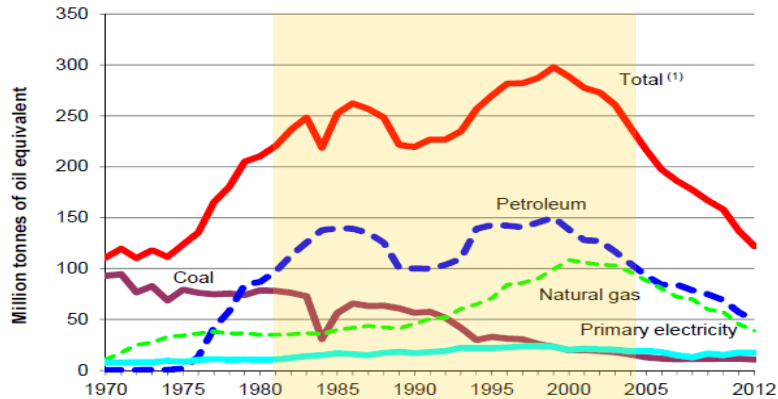


Chart G.1: Net exports of fuel 2003 to 2012

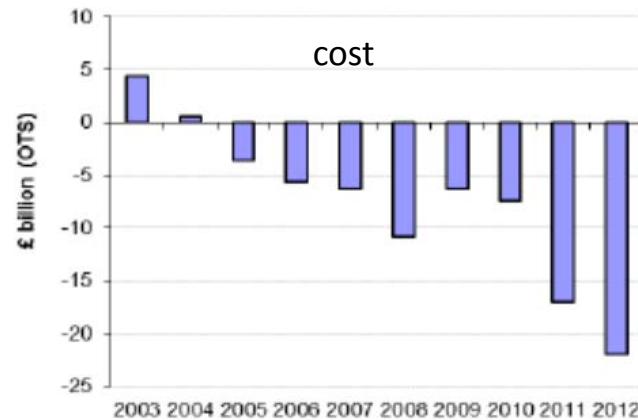
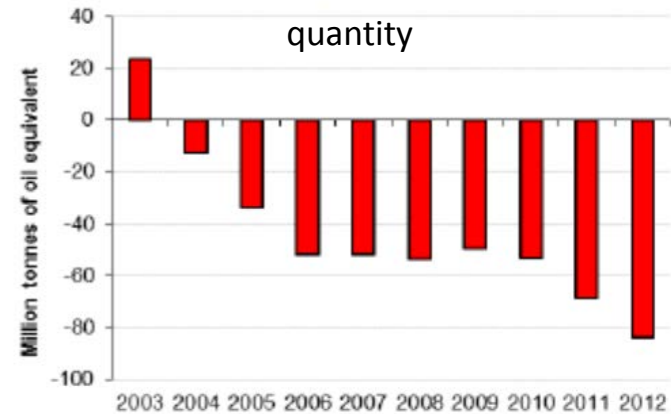
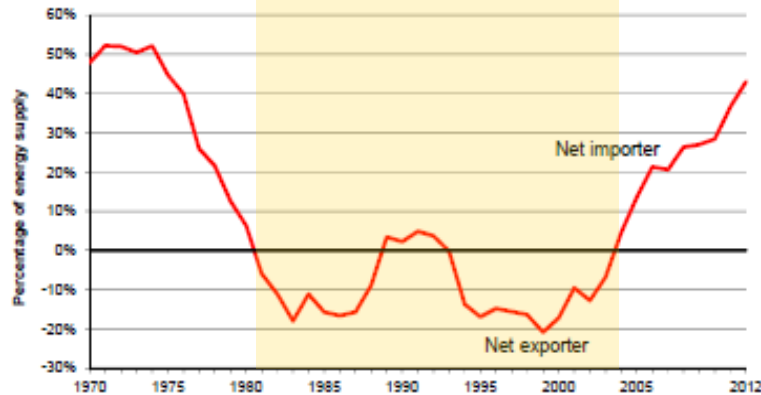


Chart 1.1.3: Net import dependency 1970 to 2012

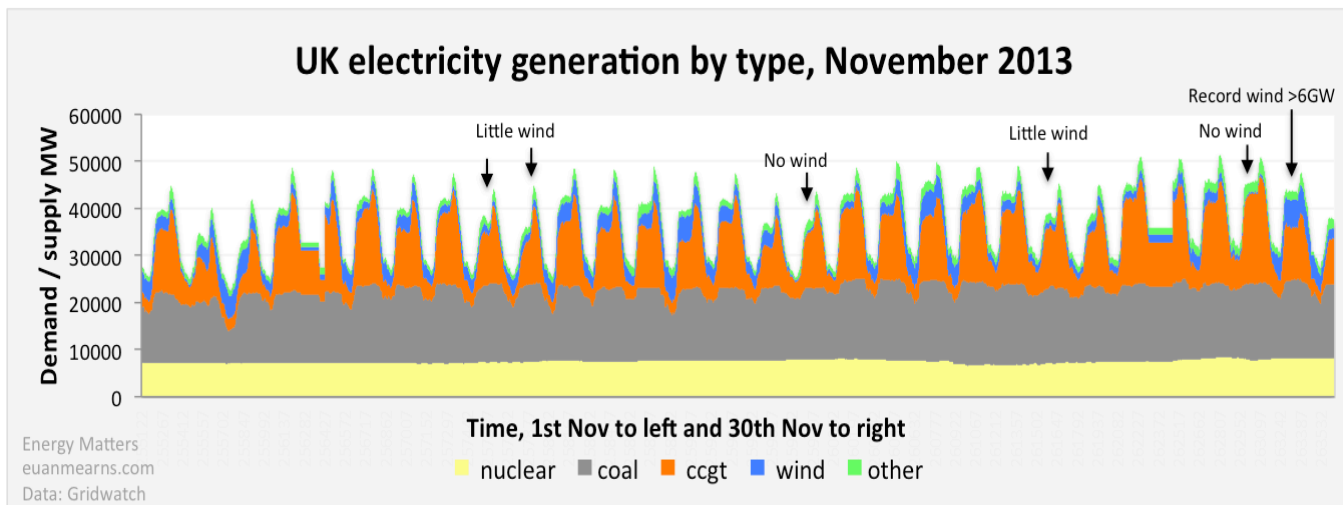
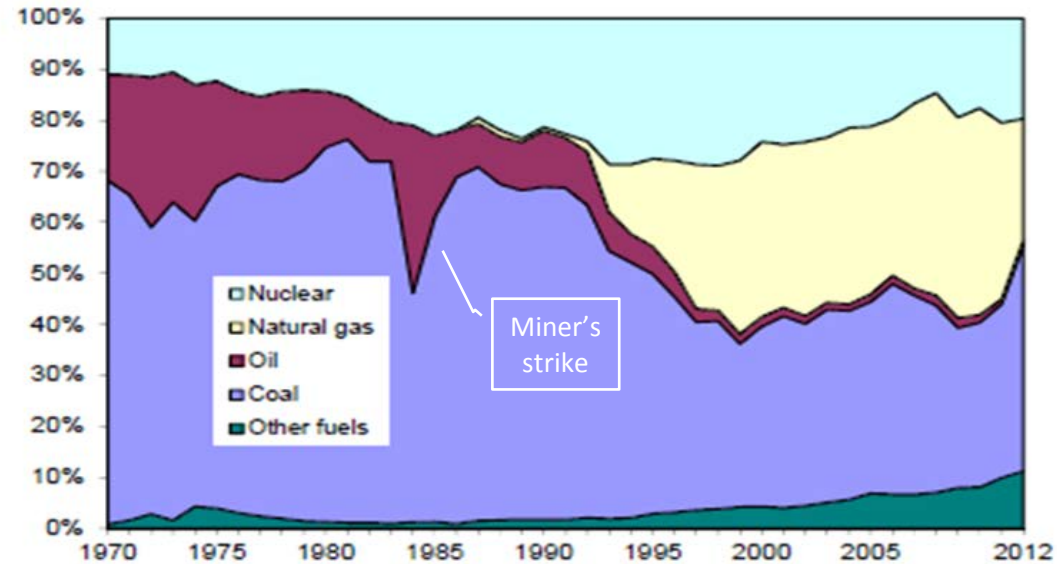
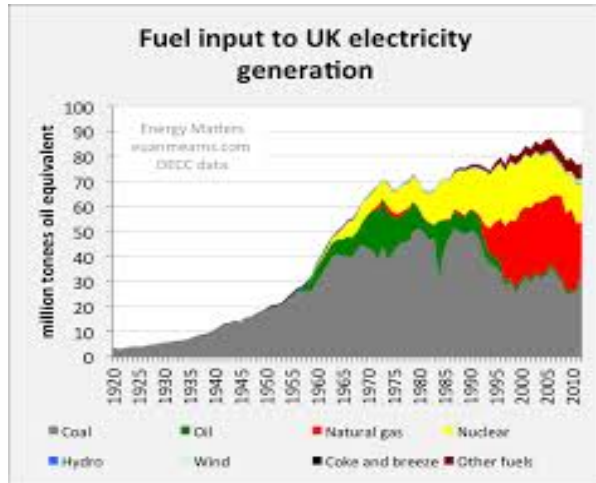


Source:

Digest of United Kingdom Energy Statistics 2013



Oil and gas in electricity generation

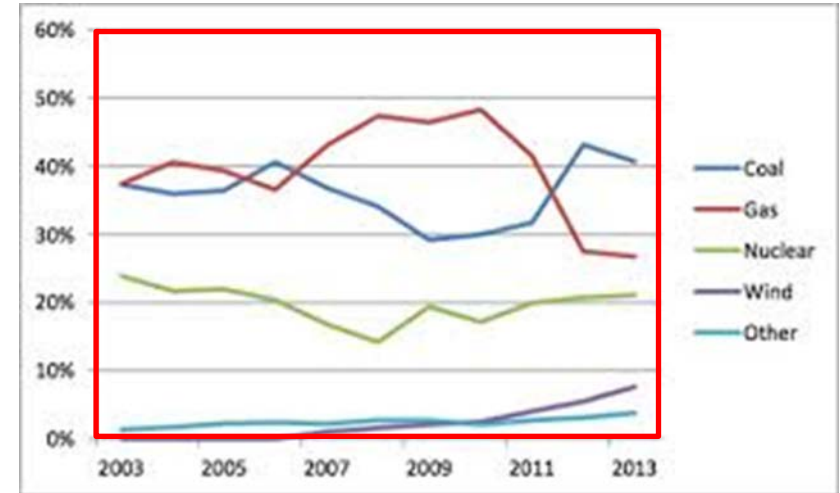
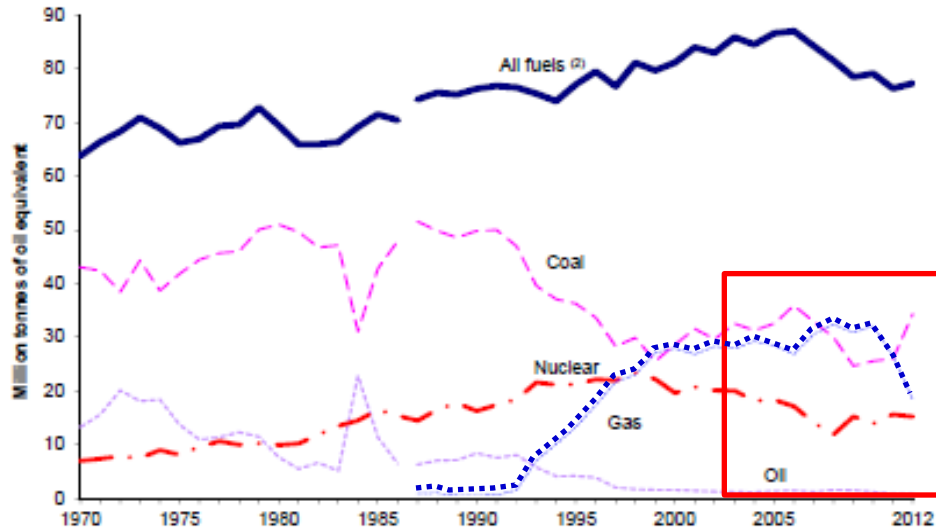


Meeting
peak demand

Source:
Digest of United
Kingdom Energy
Statistics 2013



Gas v Coal in Electricity generation



5.1.1 Fuel input for electricity generation

Million tonnes of oil equivalent

	Total all fuels	Coal	Oil (1)	Natural gas (2)	Electricity			Coke and breeze	Other fuels (4)
					Nuclear	Natural flow hydro (3)	Wind (3)		
2010	79.17r	25.56	1.18	32.12	13.93	0.31	0.88	-	5.19r
2011	76.38r	26.03	0.78r	26.41r	15.63	0.49	1.36r	-	5.69r
2012	77.37	34.33	0.78	18.41	15.21	0.45	1.79	-	6.40

Switch back to coal has largely negated development of wind generation in terms of "carbon footprint"

Source:

Digest of United Kingdom Energy Statistics 2013



Department of Energy & Climate Change

Royal Society Report (June 2012)

http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/projects/shale-gas/2012-06-28-Shale-gas.pdf

UKOOG “Onshore Oil and Gas in the UK” (October 2013)

<http://www.ukoog.org.uk/elements/pdfs/UKOOG%20Onshore%20Oil%20and%20Gas%20in%20the%20UK.pdf>

UKOOG “UK Onshore Shale Gas Well Guidelines” (February 2013)

<http://www.ukoog.org.uk/elements/pdfs/ShaleGasWellGuidelines.pdf>

DECC “The Unconventional hydrocarbon resources of Britain’s onshore basins – Shale Gas” (2012)

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66172/uk-onshore-shalegas.pdf

BGS/DECC “Bowland Shale Study” (July 2013)

<https://www.gov.uk/government/publications/bowland-shale-gas-study>

BGS/DECC “Weald Shale Study” (May 2014)

<https://www.gov.uk/government/publications/bgs-weald-basin-jurassic-shale-reports>