

Shale Gas and Oil: Risks and Rewards

5th Smart Grids & Cleanpower Conference
5 June, Cambridge

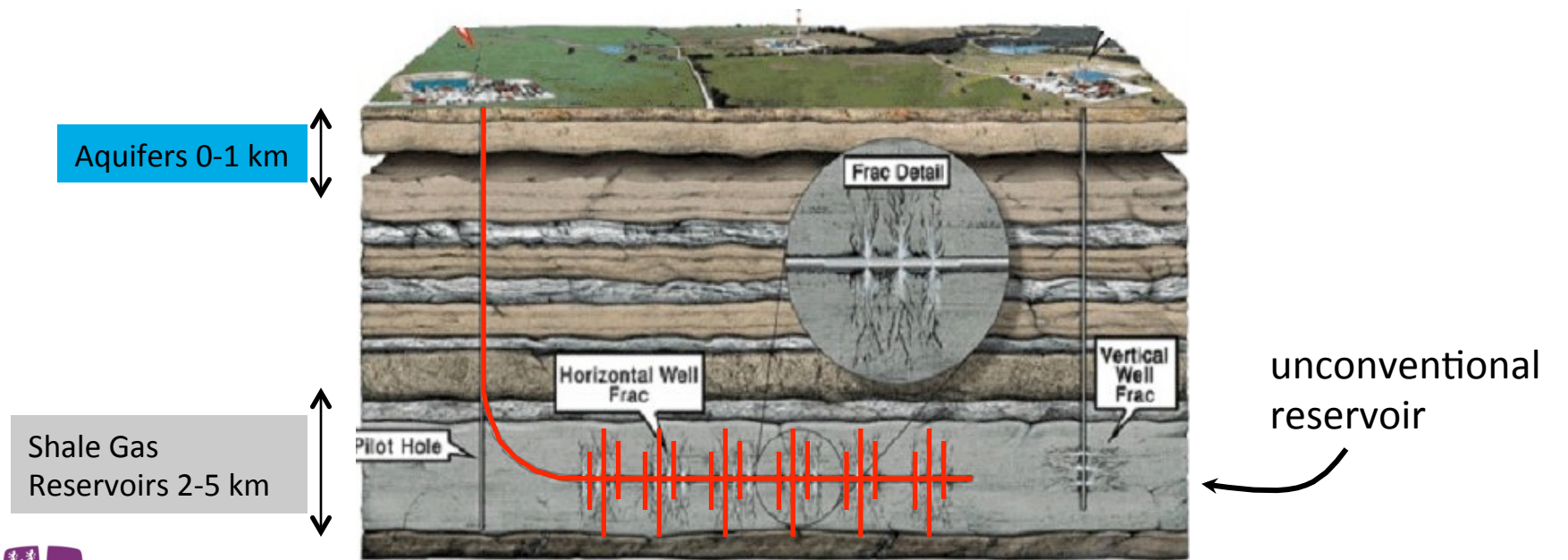
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Prof Richard Davies and Mr Sam
Almond

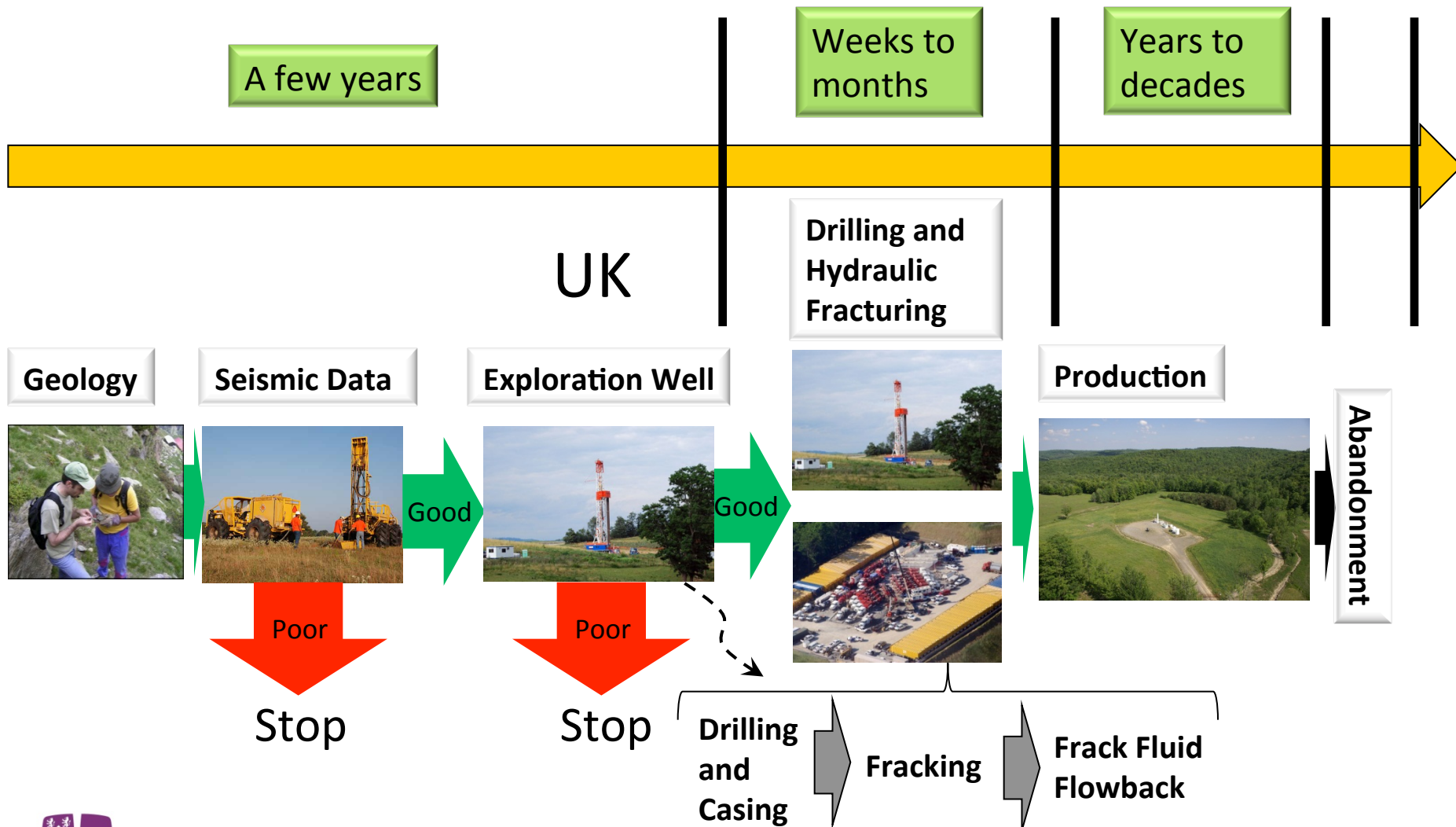
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Shale Gas and 'Fracking'

- Organic matter trapped during the deposition of fine-grained shale rocks.
- Low permeability
- Hydraulic fracturing since 1940, applied with horizontal wells from 1990 onwards (Barnett, Texas).
- Widespread use is new and therefore caution is appropriate

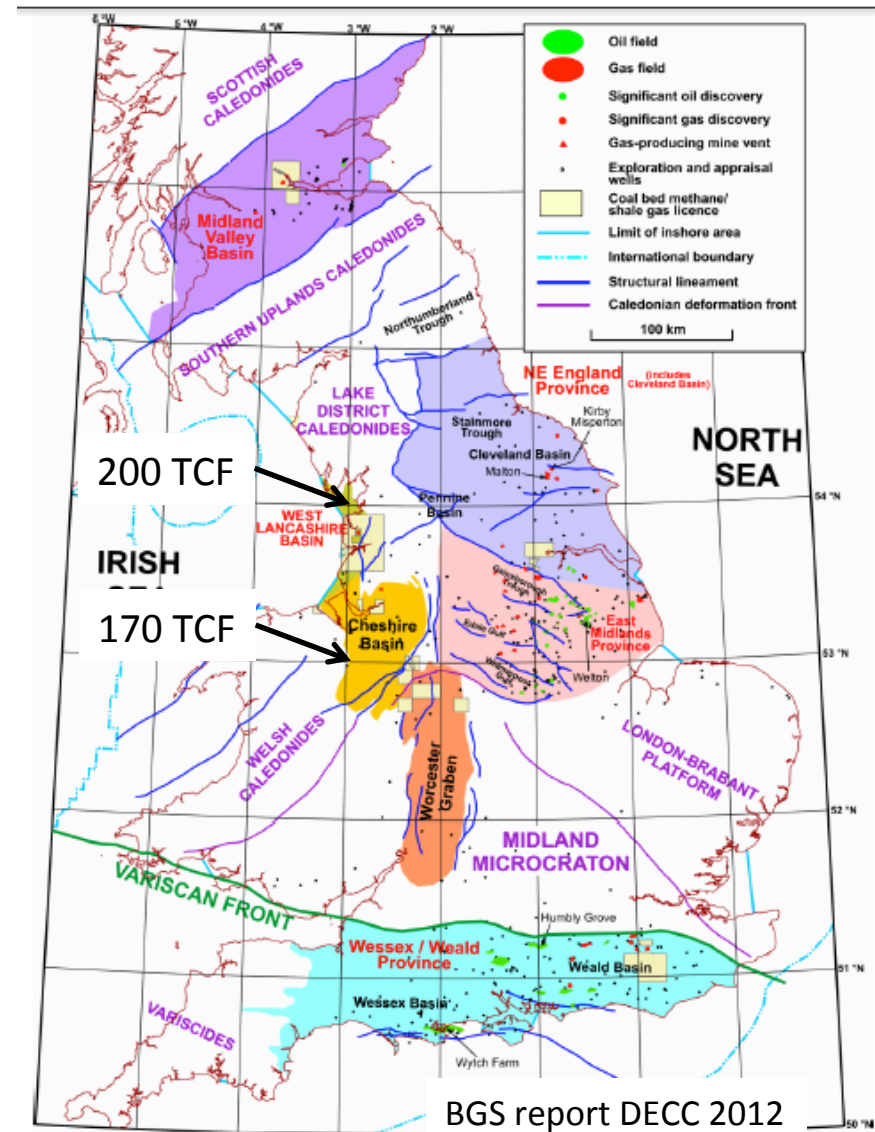


Stages of Development



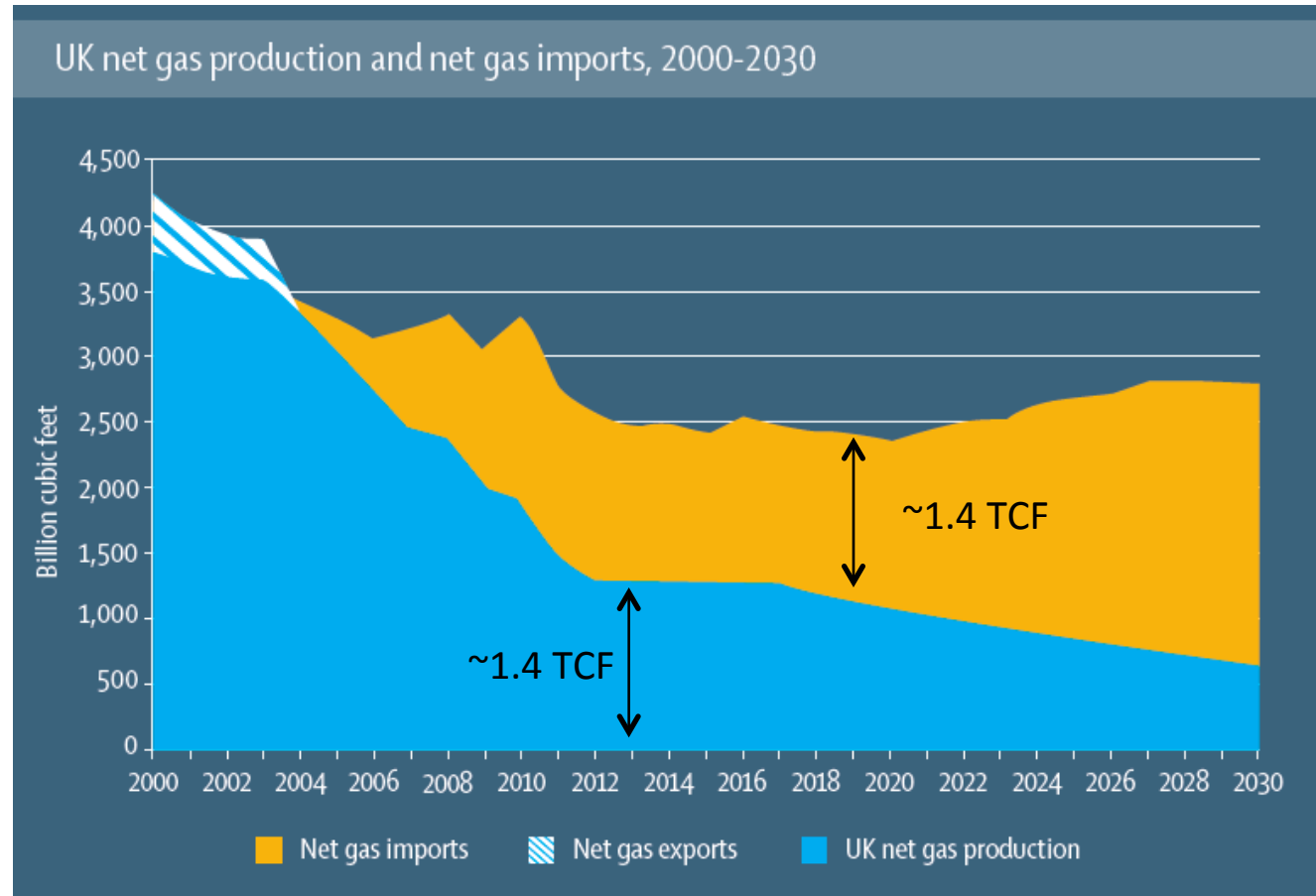
UK : How Much?

- Bowland Shale (Lancashire) alone could be 200 trillion cubic feet (TCF) underground (**resources**) and 10% (20 TCF) recoverable (**reserves**).
- Igas announced 170 TCF (resource) in the Cheshire Basin on Monday 3rd June.
- UK imports 1.4 TCF per year, so in theory the Bowland shale alone could fill our gas gap for decade/s
- **Reserves** depend on social and economic factors as much as geology.
- So we don't know. In the hands of communities, politicians?



How Many Wells?

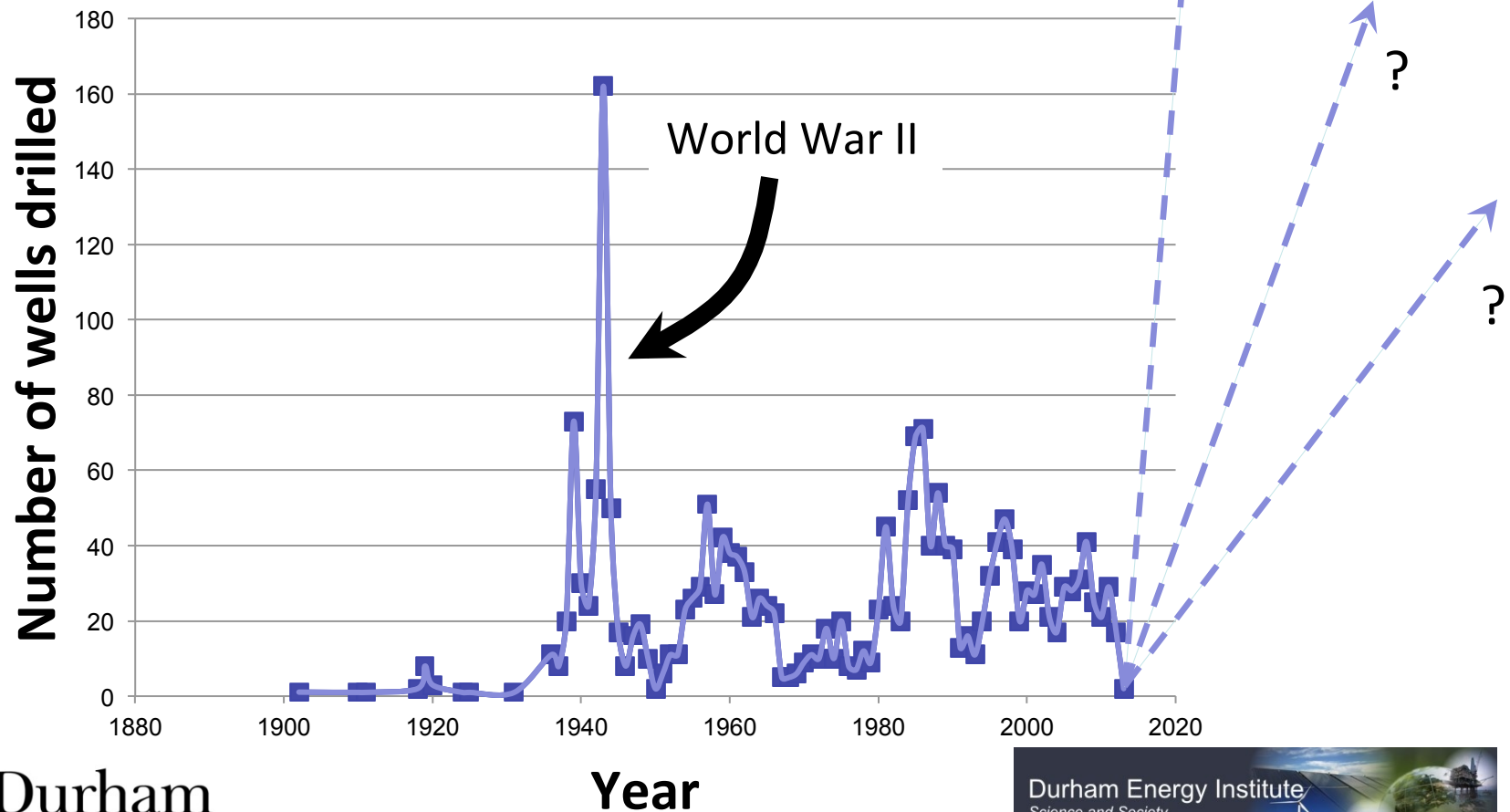
- **4 TCF** shale gas production in USA, **25,000 wells** per year
- So 100s to 1000s of wells required in UK to make a dent on reliance on imports



Source: Department of Energy and Climate Change,
From IoD Report (2013)

History of Hydrocarbon Well Drilling in UK

- The biggest increase in drilling activity since the World War II?
- Development of supply chain

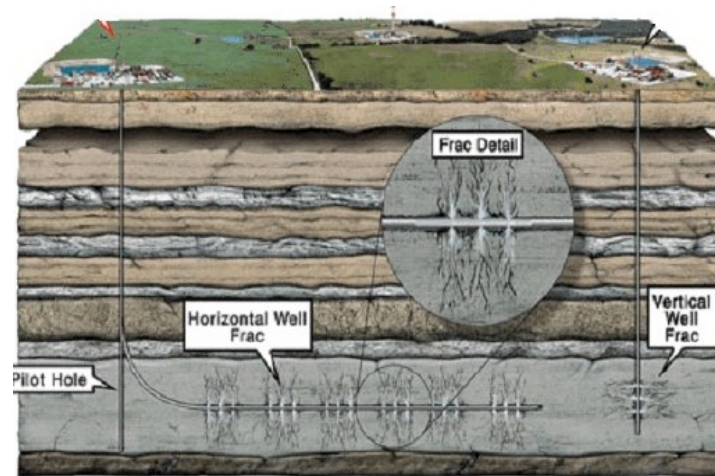
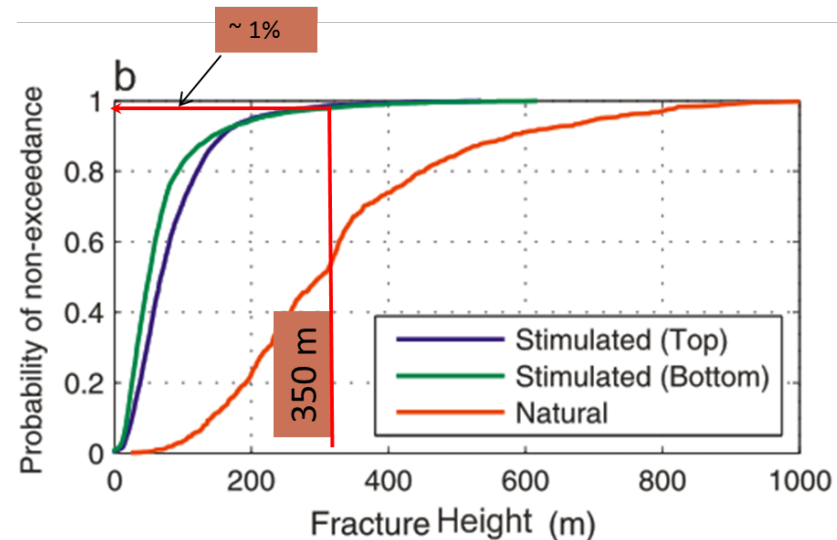


Fracking Issues

- Water contamination
- Earthquakes
- Others?

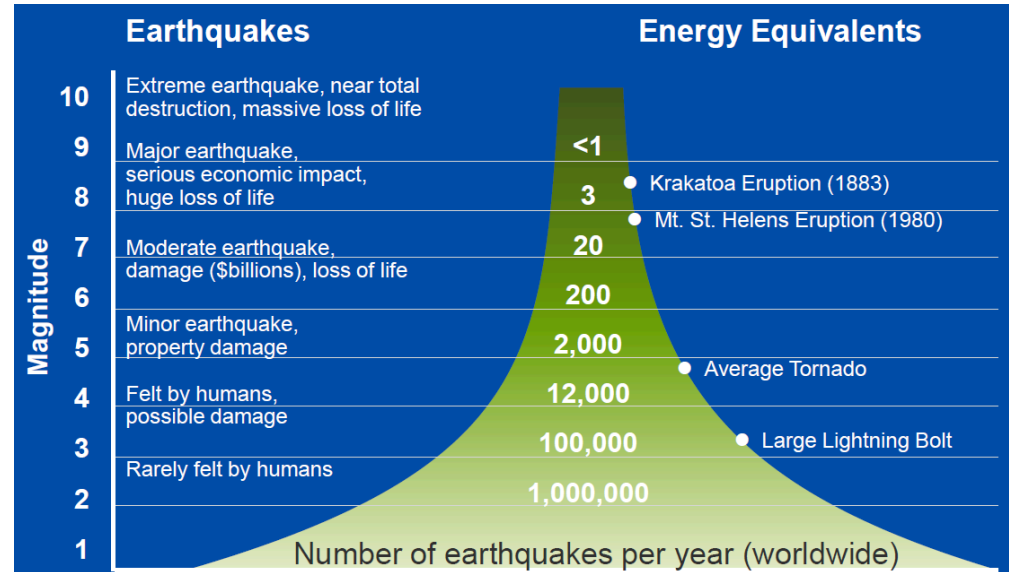
Fracking - Contamination of Drinking Water?

- Barnett shale (Texas)
- 1000s of hydraulic fracturing operations completed
- **Fractures not tall enough to cause contamination of water**



Earthquakes

- Energy due to fracking cannot be felt at the surface
- Three exceptions from 100,000s of fracking operations - including 2.3 M event in UK (April 2011)

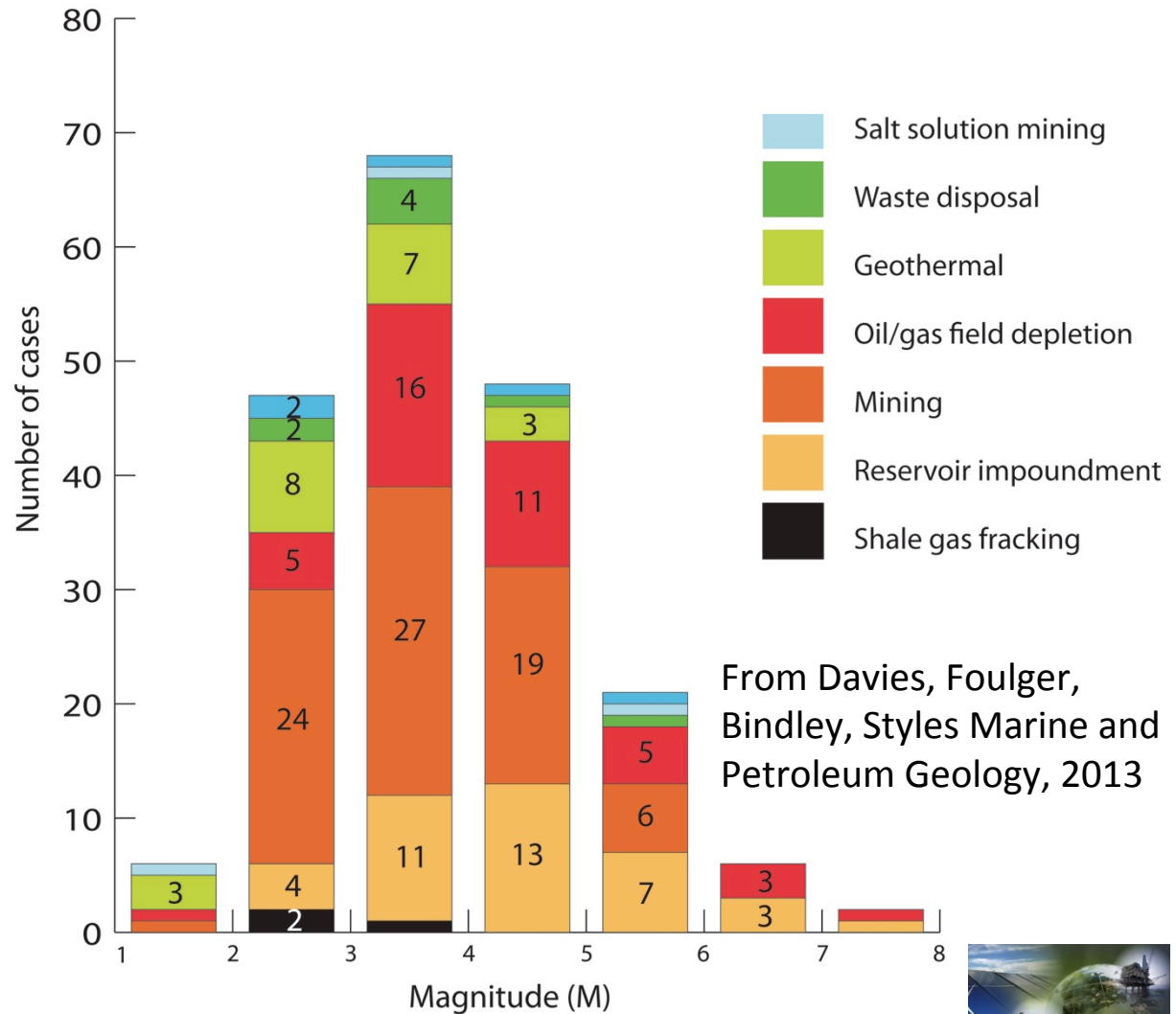


Energy due to fracking



198 Published Examples of Induced Earthquakes from All Known Triggers Since 1929

- Hydraulic fracturing is not significant
- Geothermal, reservoir impoundment, mining and conventional oil and gas are more significant



But - Long Term Legacy

- Wells can leak over time
- Note: lots of wells needed
- Need long term monitoring for leak and resealing if leaks found
- Issue in the USA and Canada and probably [to some extent] in the UK.
- Note: 250,000 abandoned mine shafts vs. 2100 hydrocarbon boreholes in the UK.



Summary

- **Very likely** UK has significant potential in oil and gas from shale.
- How much will be determined by industry gaining a social licence to drill and frack wells, economics etc.
- Fracking **very unlikely** cause of drinking water contamination.
- Fracking causes earthquakes – but very small ones.
- But shale gas and oil development would require a lot of wells.
- **So long term monitoring needed**