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PAS Local Planning Authority Workshop

Planning Applications for Shale Gas & Oil

Wednesday 23rd 10am to 4.30pm, London

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Onshore oil and gas

Role of OGA with other regulators

New Licensing

Regulating seismicity

Hydraulic Fracture Plan



UK Onshore Oil and Gas

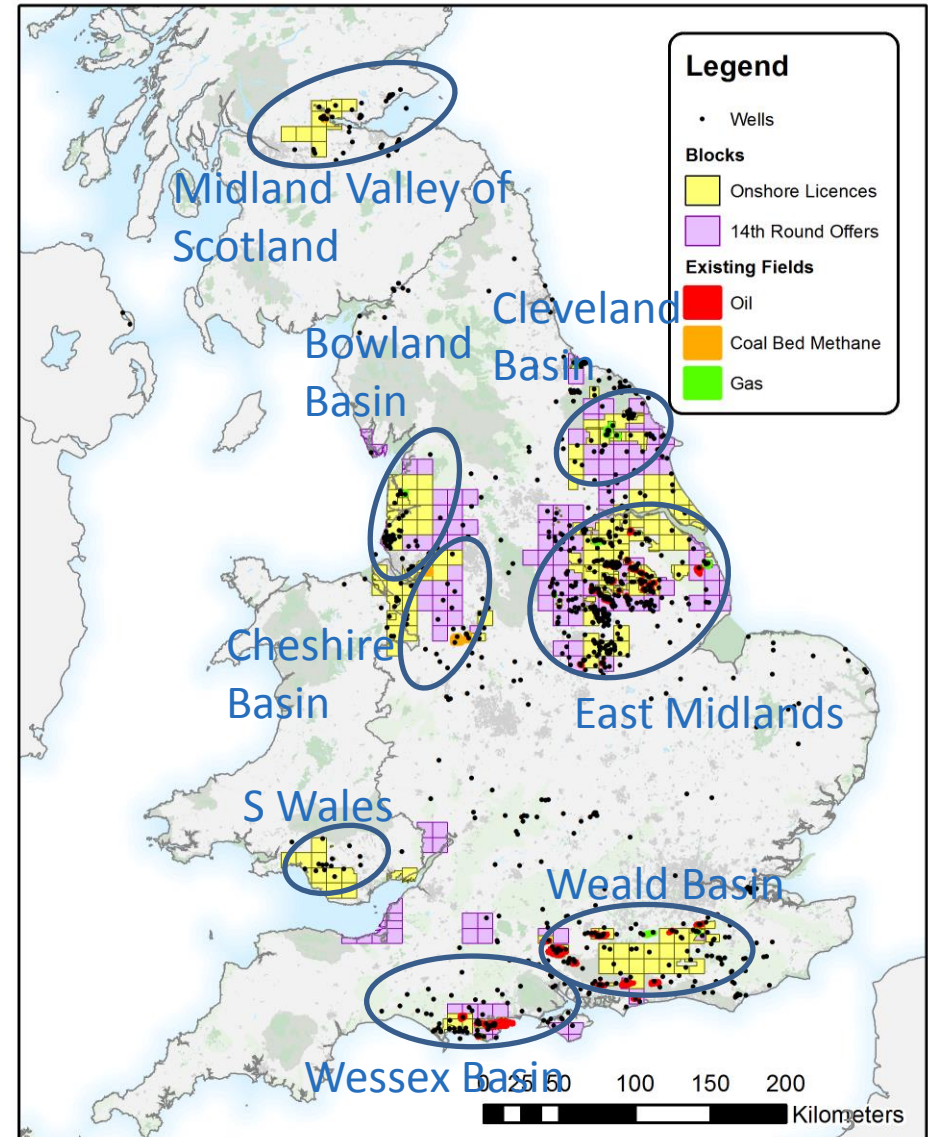
Over 2,100 wells drilled

Producing fields

- 30 Oil fields
- 8 Gas fields
- 2 Coalbed Methane fields

2014 Onshore Production

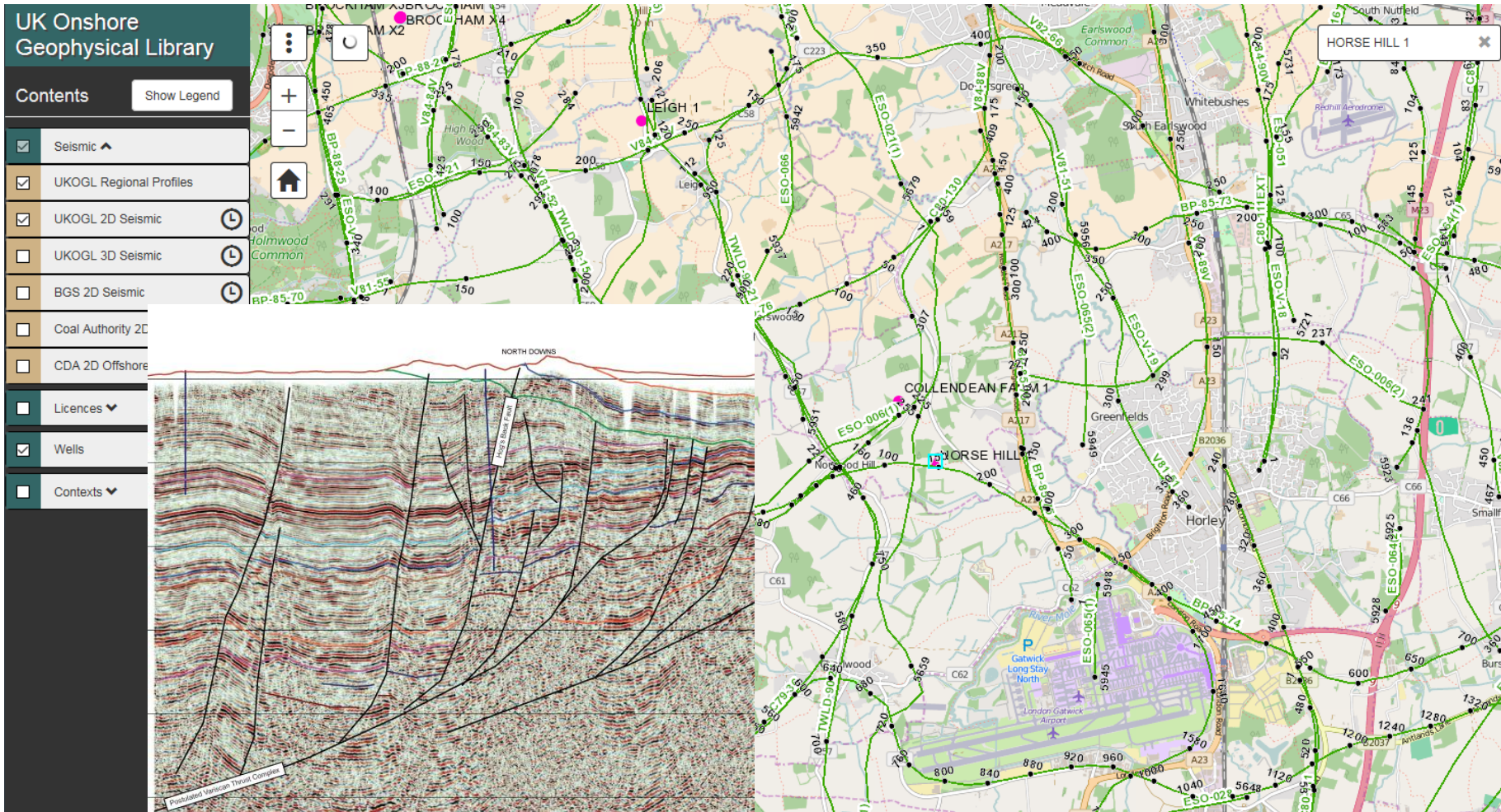
- 943,400 cubic meters oil
- 47 million cubic meters gas





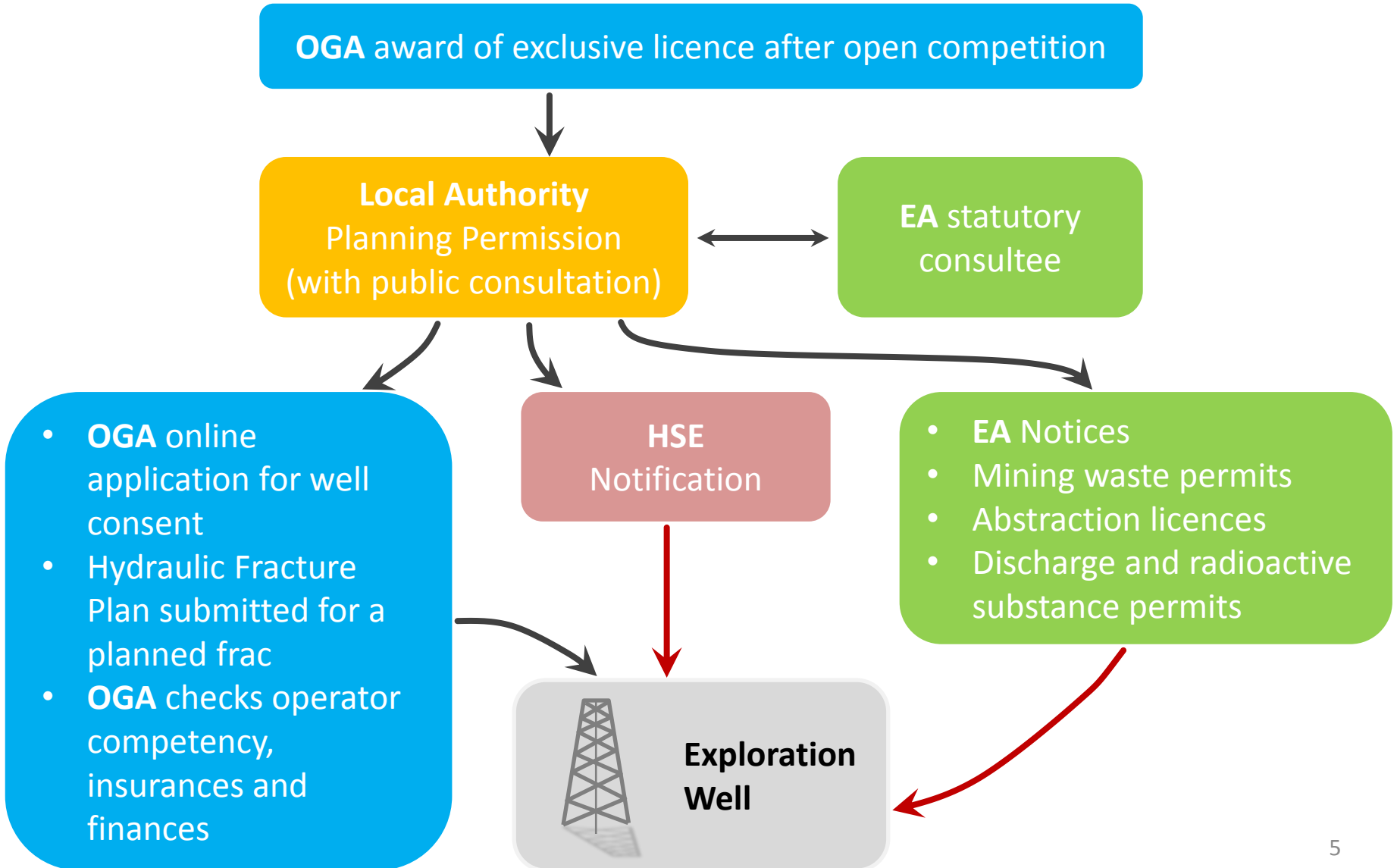
UK Onshore Geophysical Library

www.ukogl.org.uk





Regulatory Regime in England





Petroleum Exploration and Development Licence (PEDL)

- A PEDL grants exclusive rights “**to search and bore for and get petroleum**” in all the various stages of oil and gas exploration, appraisal; production and eventually abandonment of the wells.
- **Licences do not give permission for operations**, only grant exclusivity to licensees within a defined area.
- **Drilling, fracking or production require local planning permission, Access agreement(s) with relevant landowner(s), Environment Agency permits, HSE scrutiny and DECC well consent before any operations can commence**
- PEDL licence covers conventional oil and gas, tight gas, coalbed methane (CBM), mine vent gas, oil shale and **shale gas**. A PEDL licence does not allow for underground coal gasification (UCG) or CO₂ sequestration.



Licence Rounds

- To apply for a licence, the applicant submits information and later is interviewed by an expert panel who consider the **Geotechnical Analysis** and their proposed **Work Programme**, the minimum amount of work that the Applicant must carry out if the licence is not to expire at the end of its Initial Term. Their technical analysis and work programme are assessed against a published marks scheme.
- Only companies with the necessary **Operator Competency** and **Environmental Sensitivity** are considered for award. OGA must also be confident that any company that receives a licence will continue in sound financial health for the foreseeable future (**Financial Viability**) and has adequate **Financial Capacity** to cover its share of the proposed Work Programme.



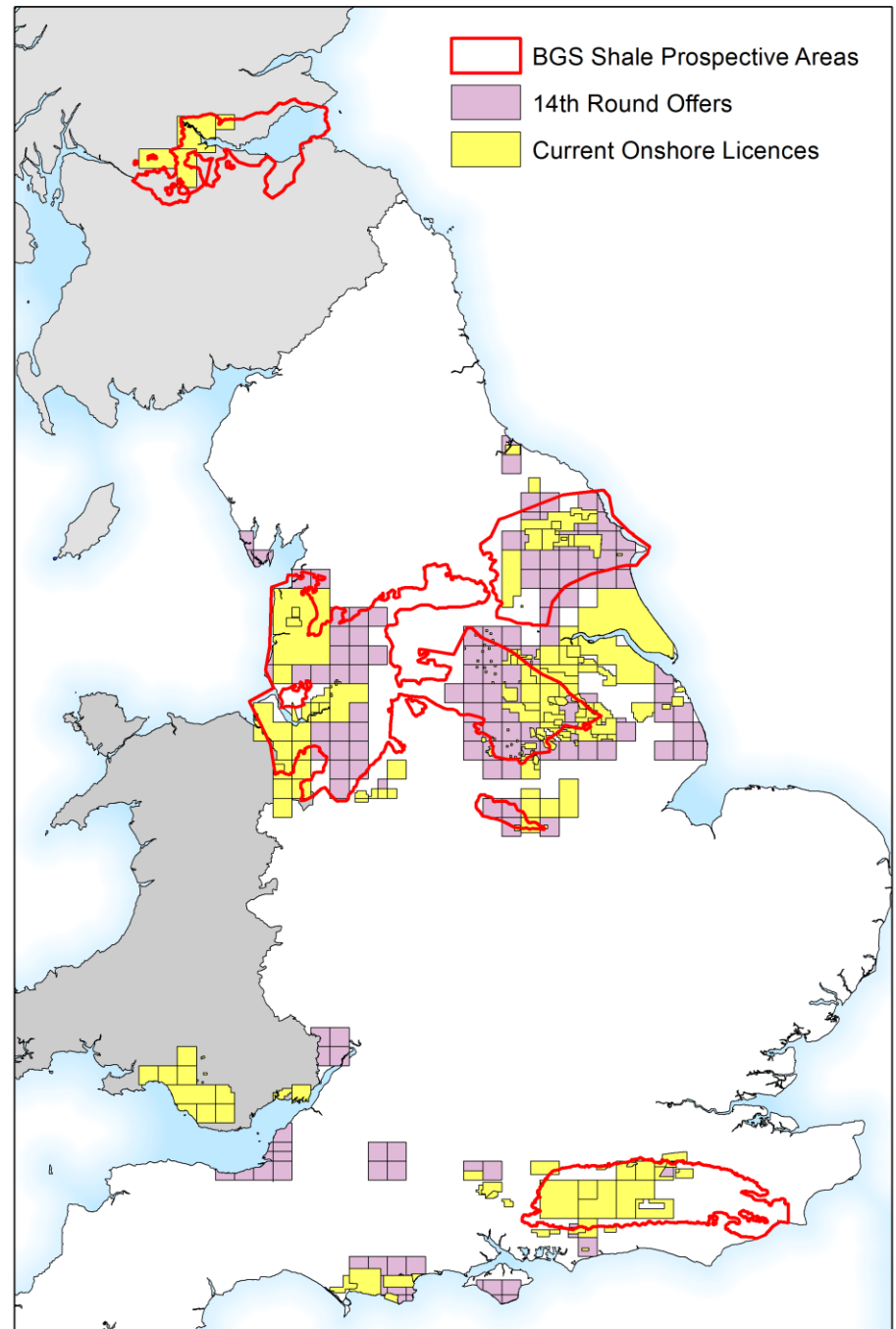
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14th Round

Total Work Programme:

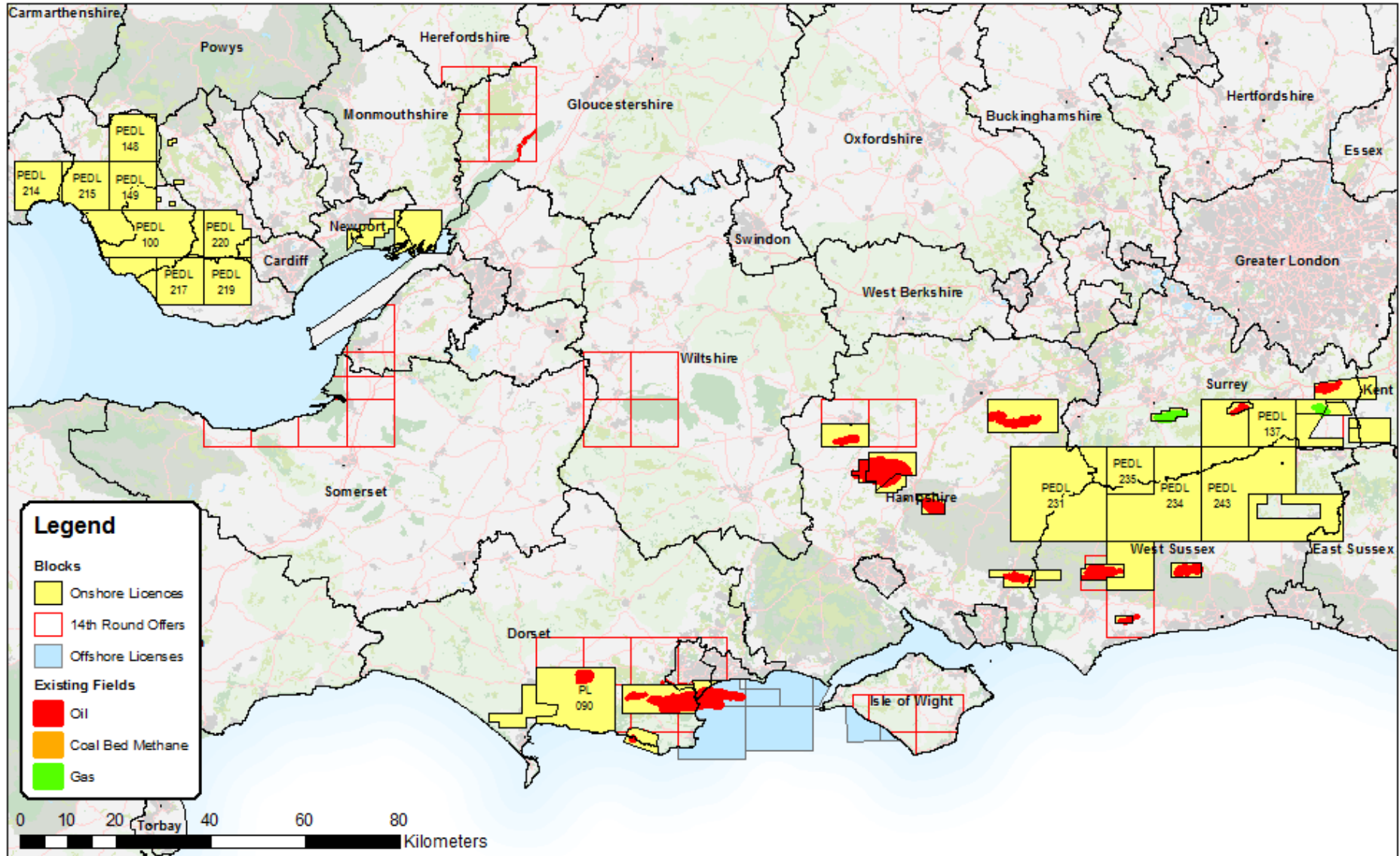
- 58 Drill or Drop wells
- 40 Firm vertical wells
- 14 Firm hydraulically fractured horizontal wells
- Over 2,100 km of 2D
- Over 2,000 km² of 3D

No offers in Scotland or Wales



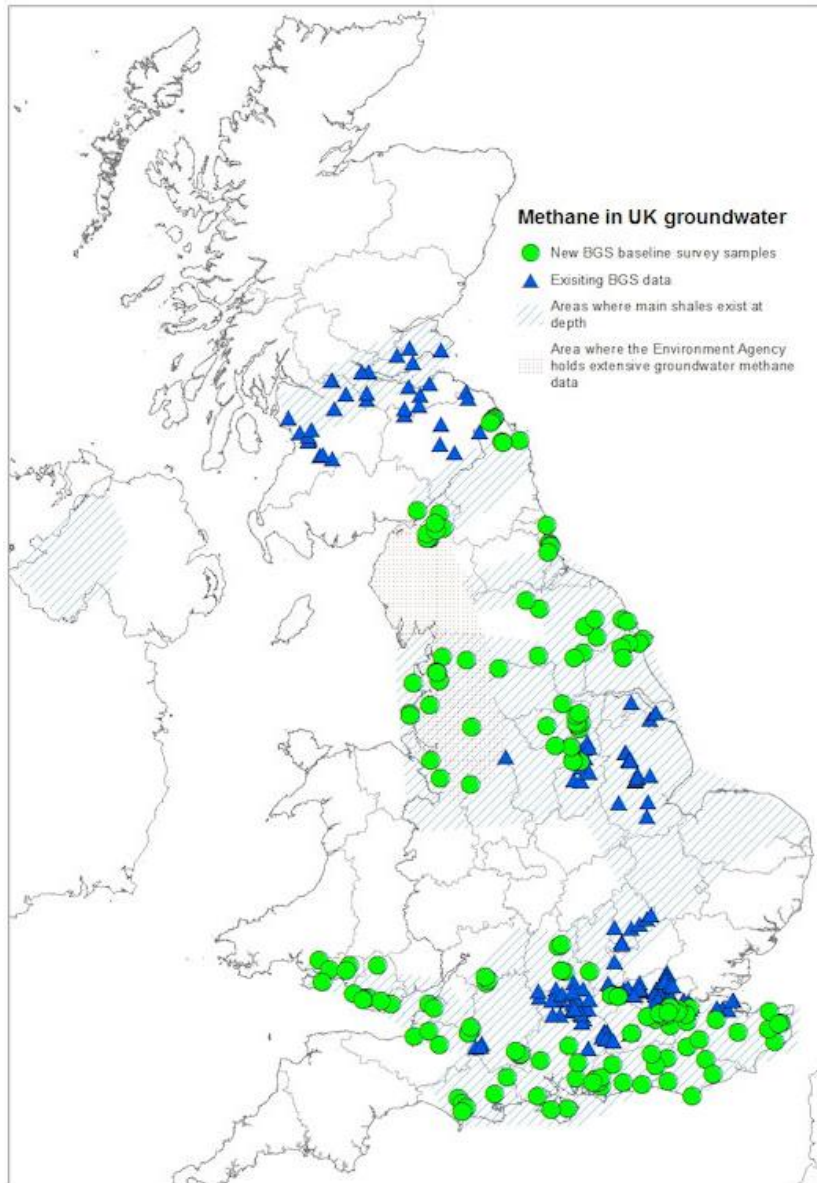


Existing and 14th Round Offers





BGS Methane Baseline Monitoring



How does methane get into groundwater?

Methane in groundwater is derived from two main sources:

- *biogenic* methane, which is bacterially produced, and is often associated with shallow anaerobic groundwater environments, such as peat bogs, wetlands, lake sediments and landfills, although it is detectable in nearly all groundwater.
- *thermogenic* methane, which is formed during thermal decomposition of organic matter at depth under high pressures, and is often associated with coal, oil and gas fields.

In the UK most methane in groundwater is likely to be biogenic in origin, although thermogenic contributions may be locally important where gases have migrated from depth or there is slow release from previously buried, low permeability, organic-rich rocks.

Dissolved gas and stable isotope analysis of groundwater samples can be used to identify the different sources and potential origin of methane.

(http://www.bgs.ac.uk/research/groundwater/quality/methane_groundwater.html)

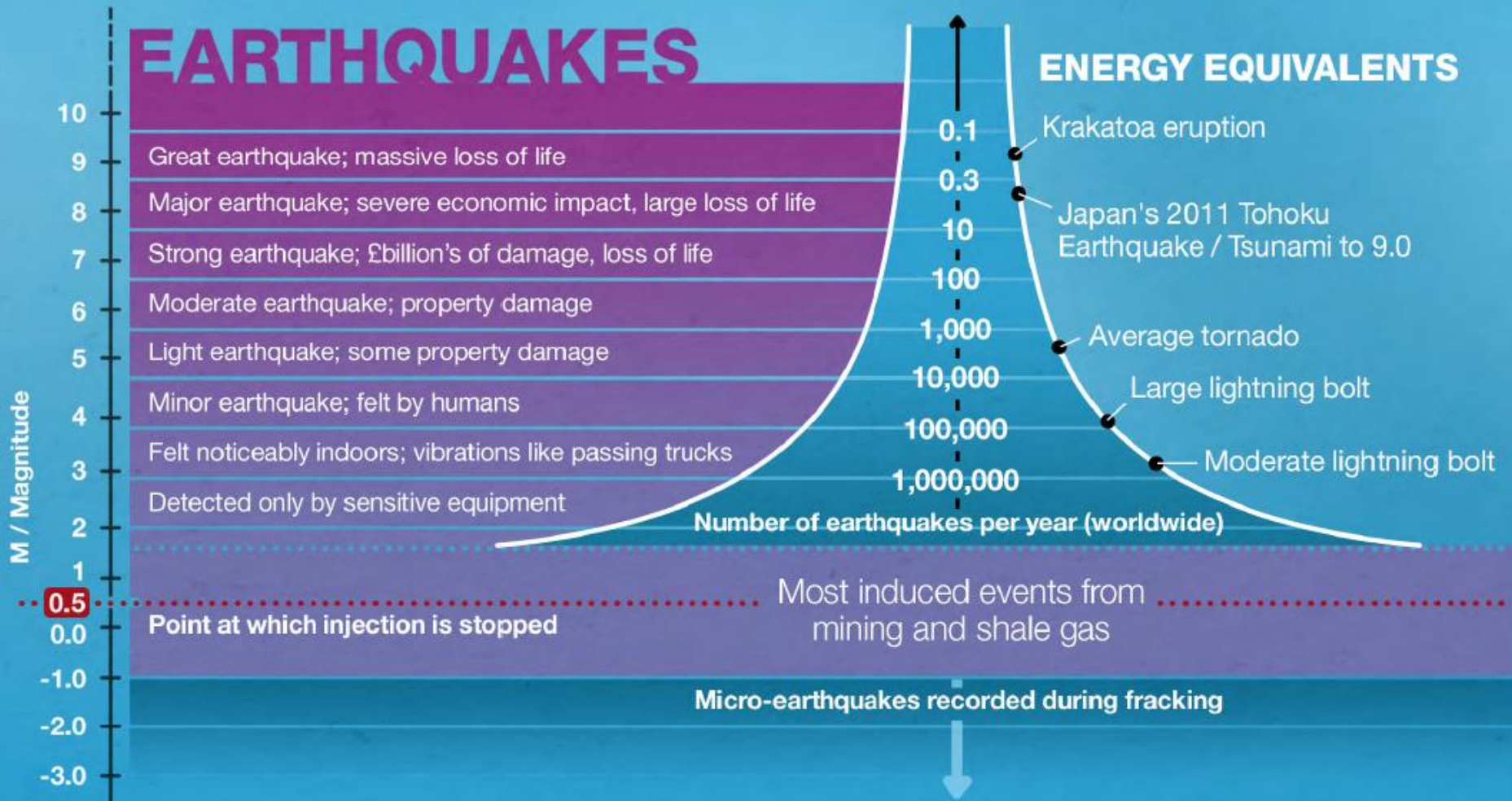


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Frac-induced seismicity and the Hydraulic Fracture Plan (HFP)



Richter Earthquake Magnitude



log scale – a whole number increase represents a tenfold increase in measured amplitude

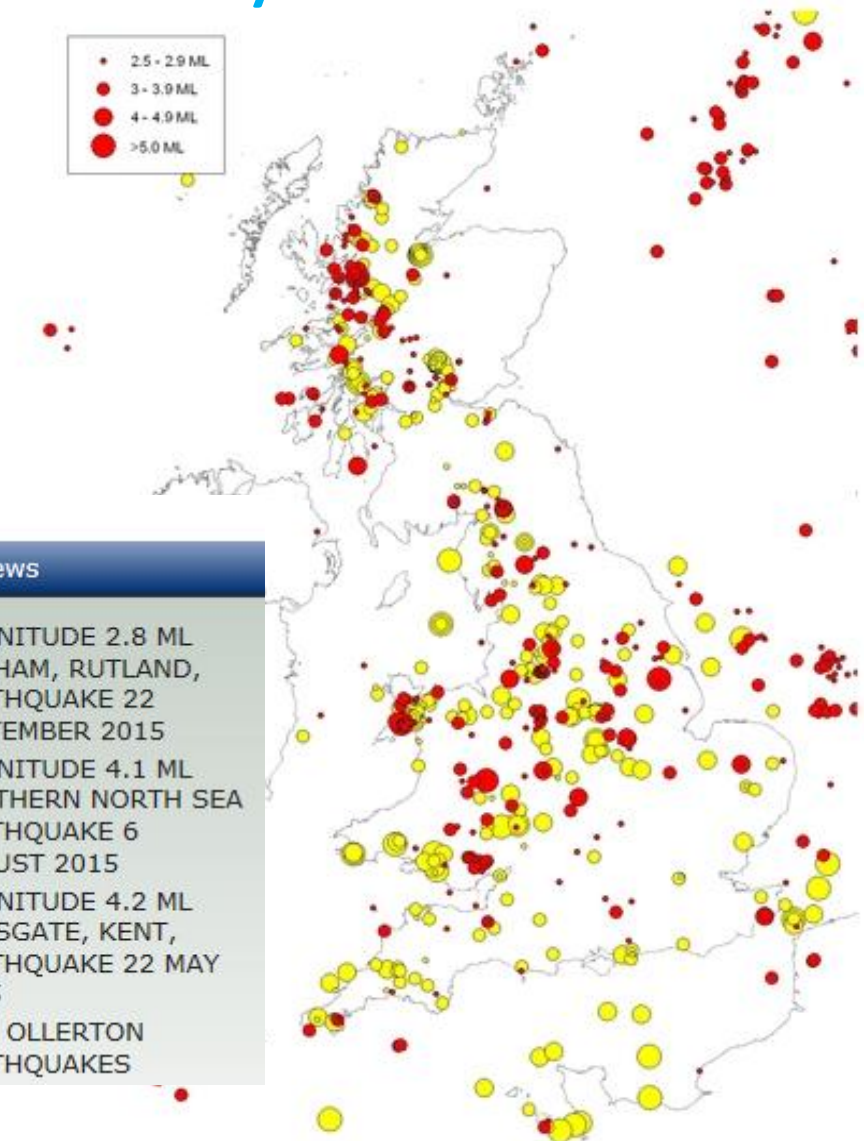


BGS Historical Seismicity

| Date | Depth | Mag | Region |
|------------|-------|-----|------------------------|
| 2008/02/27 | 17.8 | 5.2 | MARKET RASEN,LINCS |
| 2007/04/28 | 5.3 | 4.3 | FOLKESTONE,KENT |
| 2002/09/22 | 14.0 | 4.7 | DUDLEY,W MIDLANDS |
| 2001/10/28 | 14.4 | 4.1 | MELTON MOWBRAY,LEICS |
| 2000/09/23 | 14.4 | 4.2 | WARWICK,WARWICKSHIRE |
| 1999/03/04 | 19.0 | 4.0 | ARRAN,STRATHCLYDE |
| 1994/02/15 | 7.3 | 4.0 | NORWICH,NORFOLK |
| 1990/04/02 | 14.1 | 5.1 | BISHOP'S CASTLE,SHROPS |
| 1986/09/29 | 23.3 | 4.1 | OBAN,STRATHCLYDE |
| 1984/08/18 | 21.0 | 4.3 | LLEYN PENIN,NW WALES |
| 1984/07/29 | 21.2 | 4.0 | LLEYN PENIN,NW WALES |
| 1984/07/19 | 20.7 | 5.4 | LLEYN PENIN,NW WALES |
| 1979/12/26 | 4.5 | 4.7 | LONGTOWN,CUMBRIA |
| 1976/11/03 | 2 | 4.5 | WIDNES |
| 1975/11/27 | 11 | 4.1 | KINTAIL |
| 1974/08/10 | 22 | 4.4 | KINTAIL |

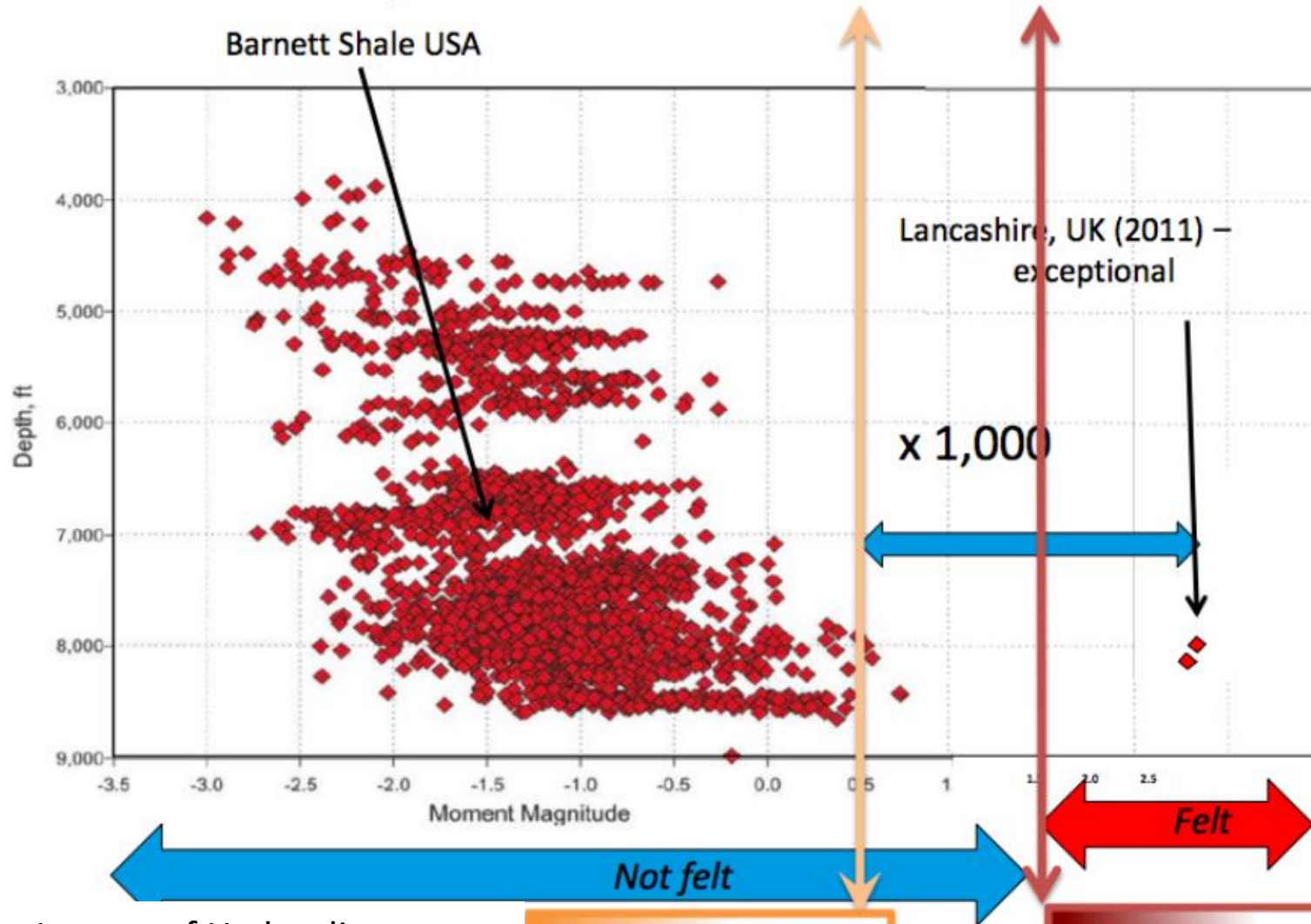
Latest News

- ▣ MAGNITUDE 2.8 ML OAKHAM, RUTLAND, EARTHQUAKE 22 SEPTEMBER 2015
- ▣ MAGNITUDE 4.1 ML SOUTHERN NORTH SEA EARTHQUAKE 6 AUGUST 2015
- ▣ MAGNITUDE 4.2 ML RAMSGATE, KENT, EARTHQUAKE 22 MAY 2015
- ▣ NEW OLLERTON EARTHQUAKES





Frac-induced seismicity



(after Impact of Hydraulic Fracture Job Parameters on Seismicity, Warpinski et al, 2012)

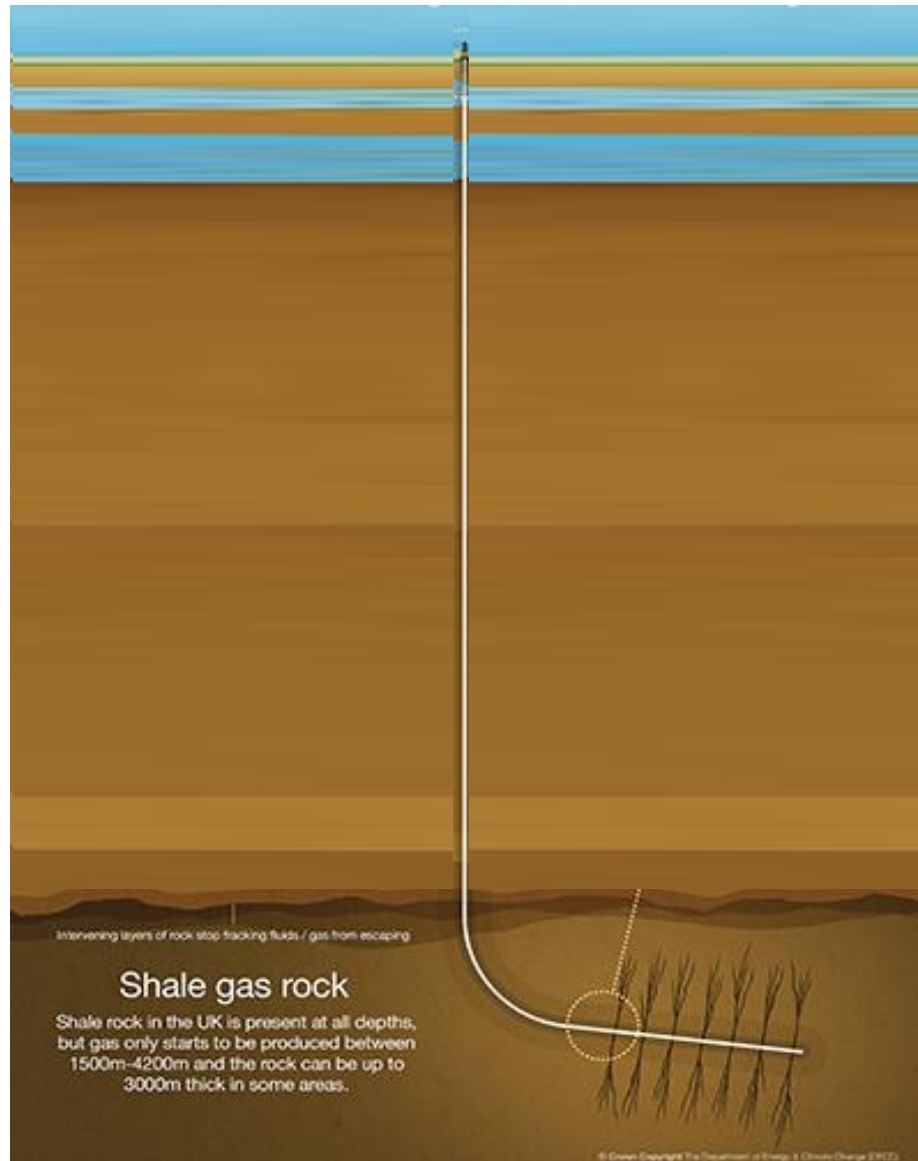
Our Threshold for caution

Our Threshold for Action



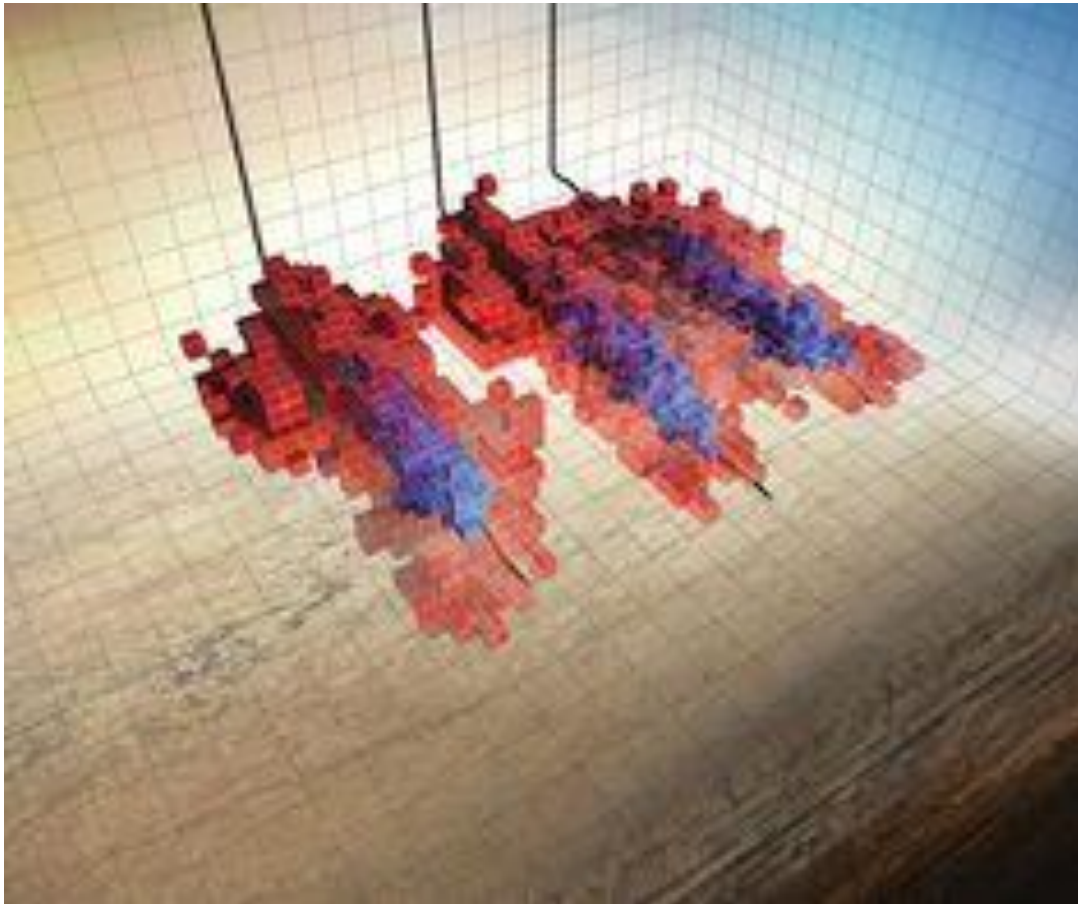
Hydraulic Fracture Plan

- 1) A depth structure map showing **mapped faults** near the well and along the well path, with a summary assessment of faulting and formation stresses in the area and the risk that operations could reactivate existing faults.
- 2) Information on the local background seismicity and assessment of the risk of induced seismicity.
- 3) Summary of the **planned operation**, including perforation stages, pumping pressures and volumes and predicted extent at each stage.





Stimulated Rock Volume

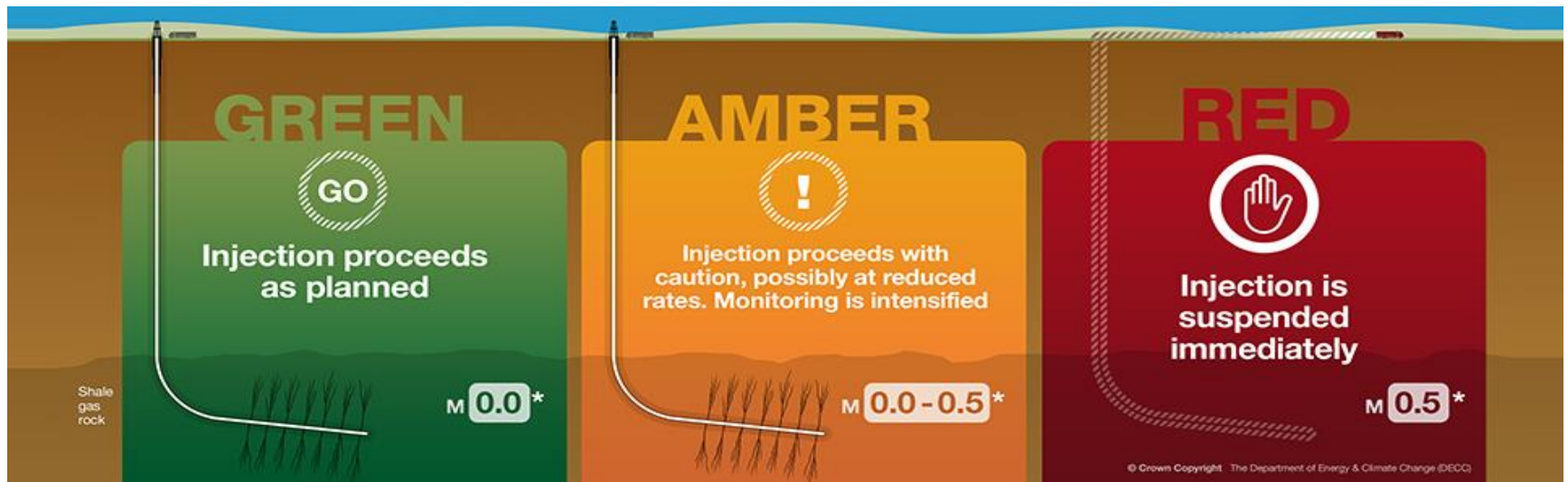


4) Proposed method for monitoring fracture height to **identify where the fractures are** within the target formation and ensure that they are not near the EA permitted boundary



Hydraulic Fracture Plan

5) A description of proposed **real-time traffic light scheme** for seismicity





- Long history of onshore oil and gas
- OGA role
- PEDL award only grants exclusivity no consent
- Hydraulic Fracture Plan
- Reduce risk of induced seismic events using Traffic Light System



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Thanks!