

Hydraulic fracturing and its impact

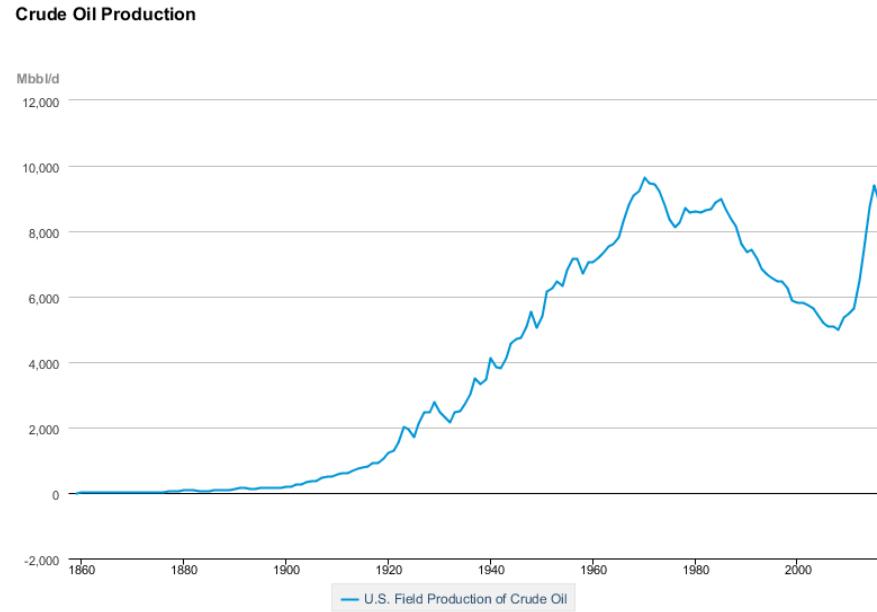


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US Total Oil Production



Production by state

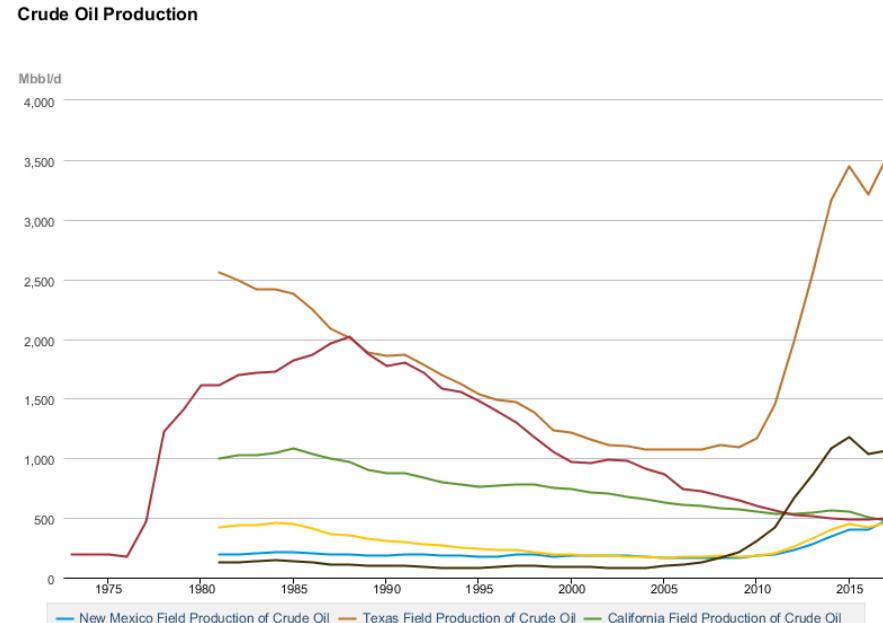
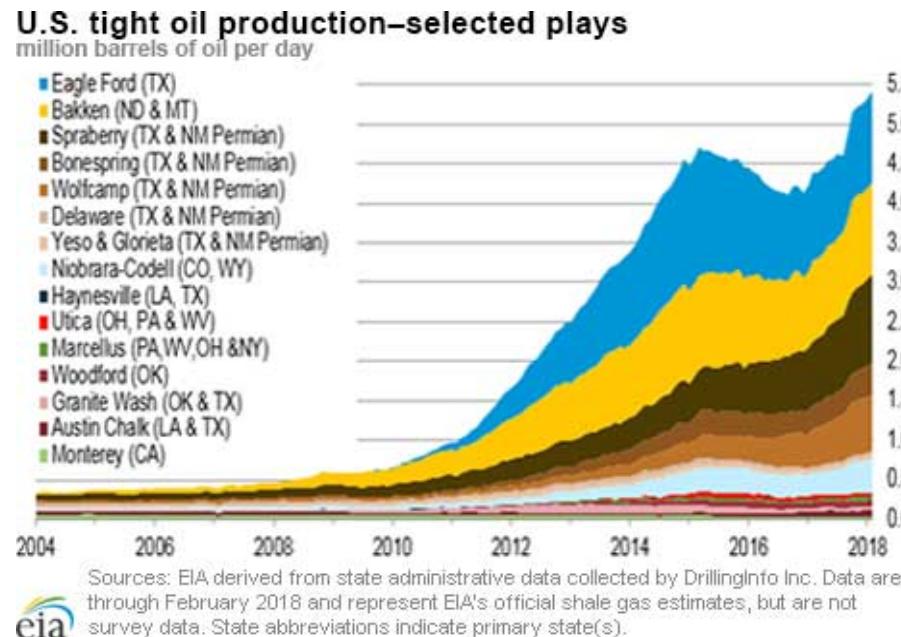
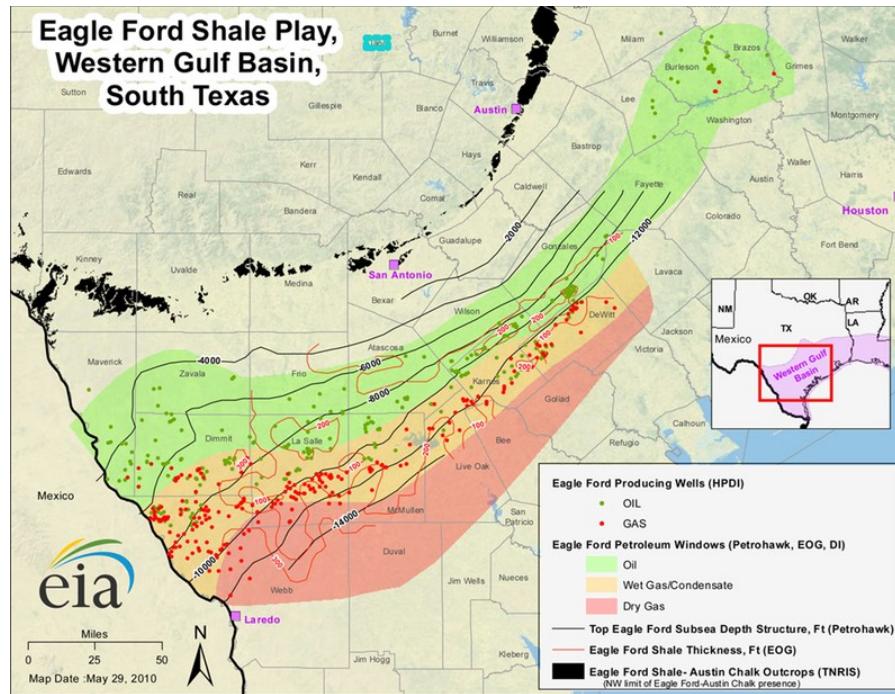


Image Source: EIA

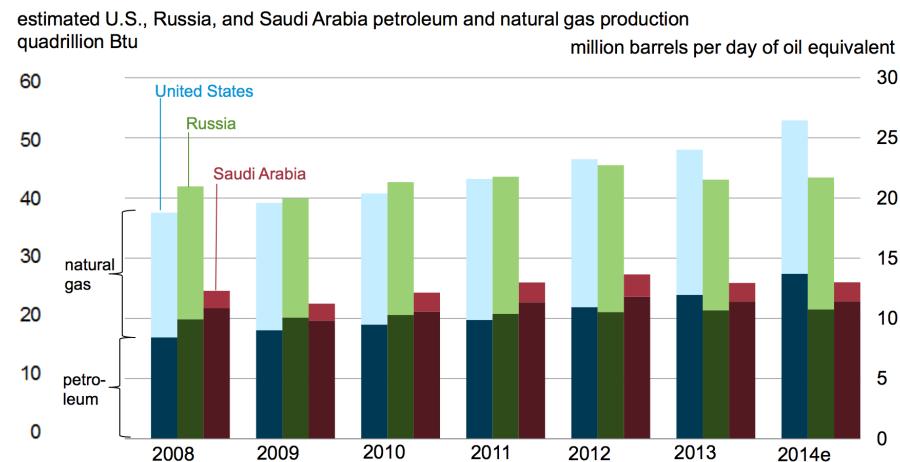
Production by play



Eagle-Ford Shale

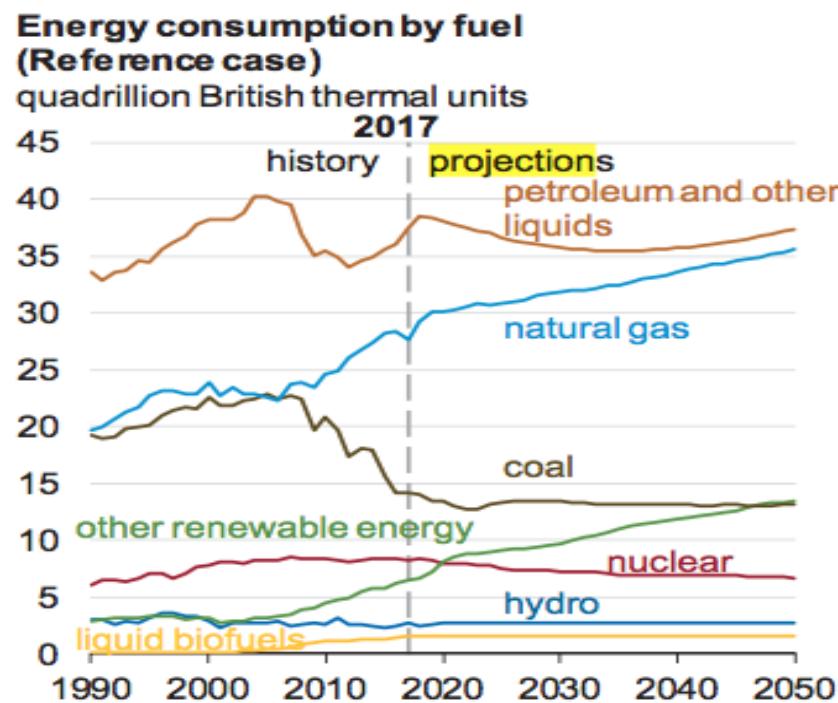


US, Russia, Saudi Arabia equivalent oil production



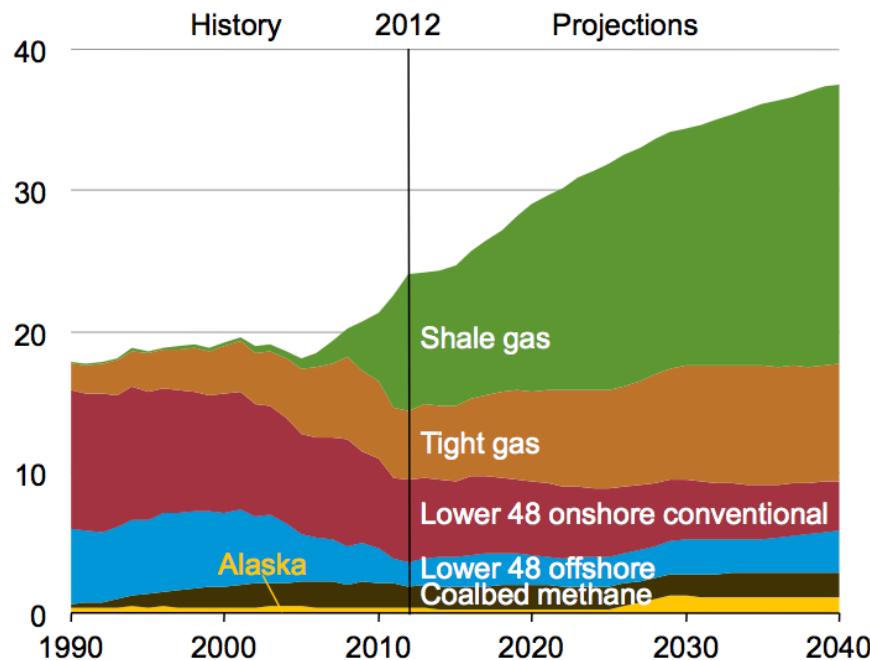
Source: EIA

Total energy use projection



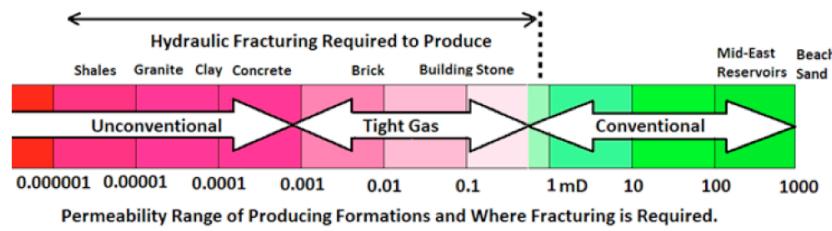
Source: EIA

Natural gas by source



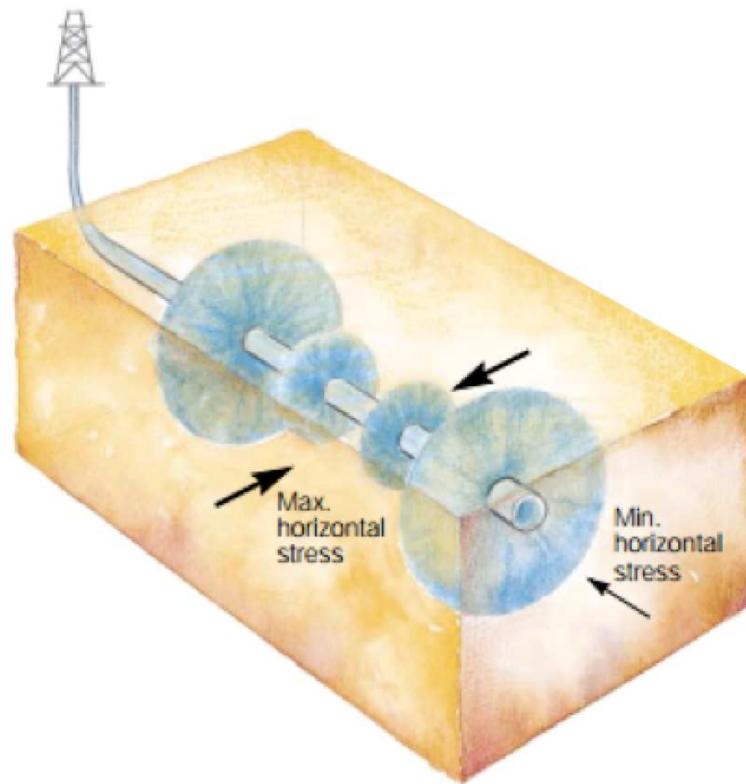
Source: EIA

Shale



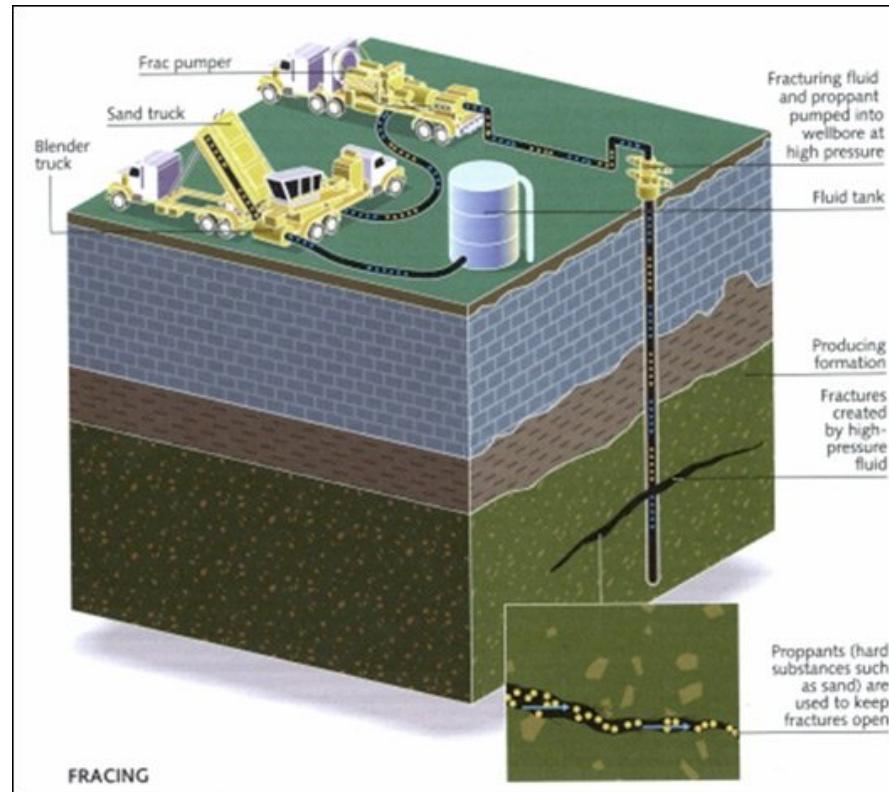
Source: George King, Hydraulic Fracturing 101

Hydraulic fracturing



Source: George King, Hydraulic Fracturing 101

Frac pump trucks



Source: Jon Olson

Barnett frac job in progress

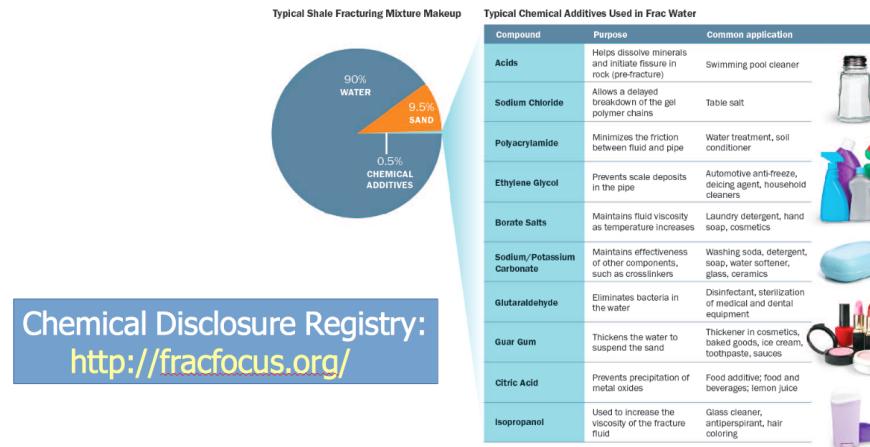


Source: Jon Olson

Is it safe?

- Groundwater contamination
- Earthquakes (induced siesmicity)

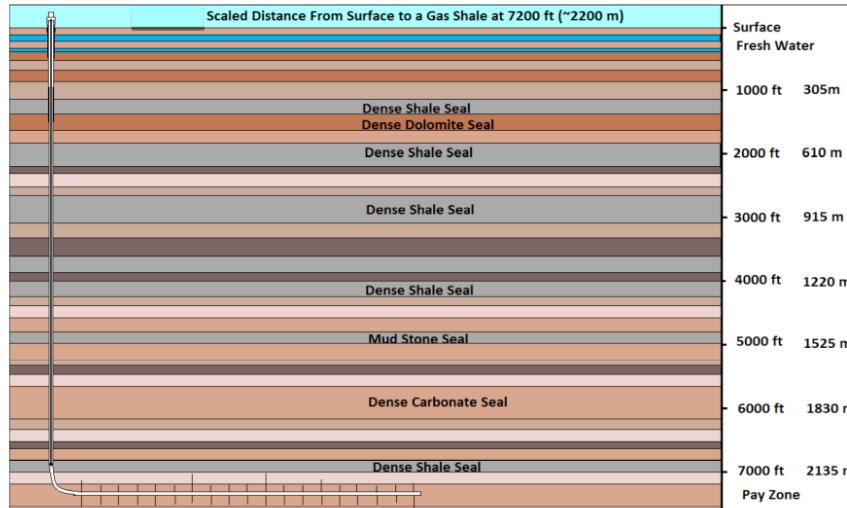
Fracturing fluids



Chemical Disclosure Registry:
<http://fracfocus.org/>

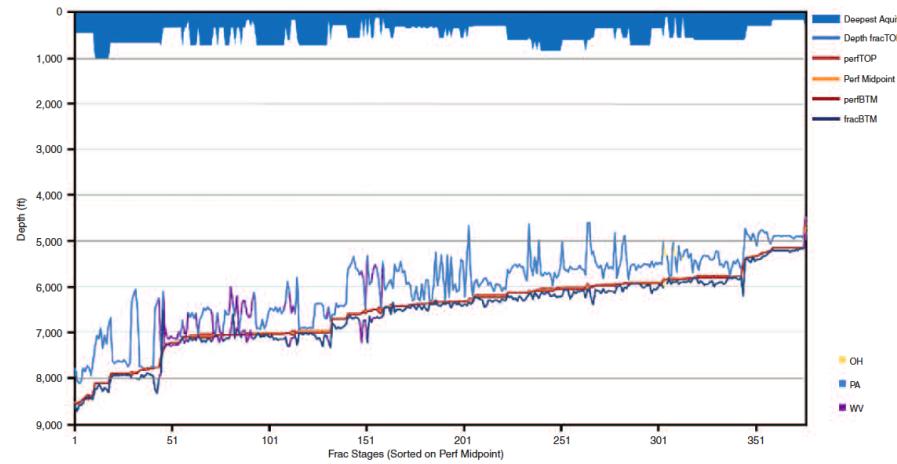
Source: DOE, GWPC: Modern Gas Shale Development in the United States: A Primer (2009).

Groundwater separation



Source: George King, Hydraulic Fracturing 101

Marcellus mapped fracture treatments

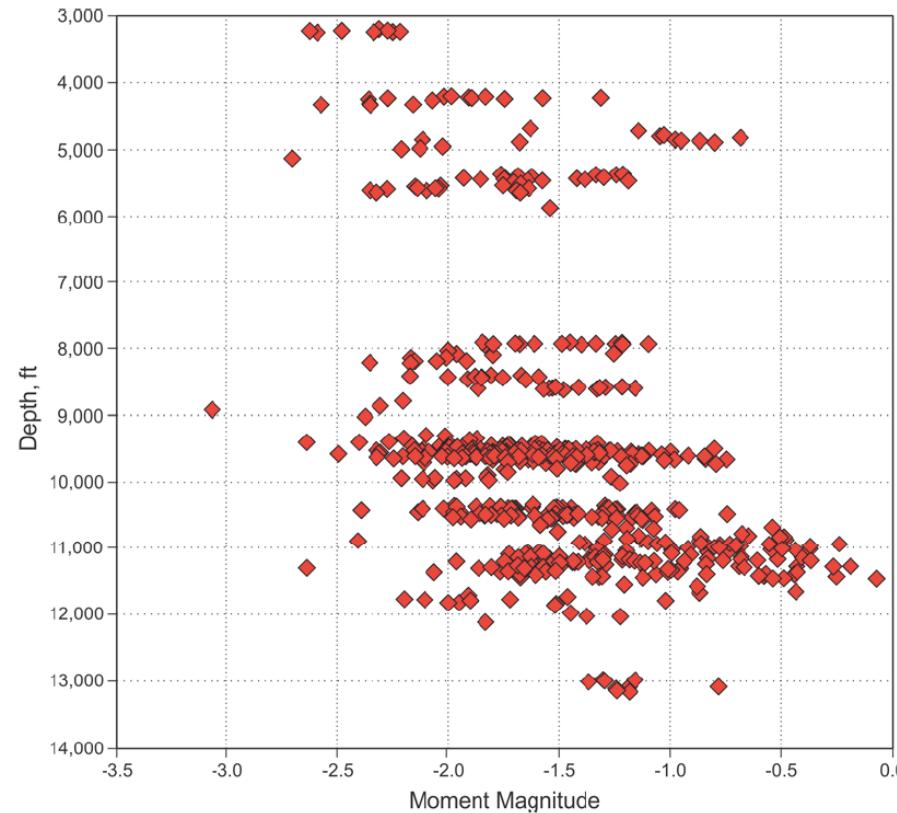


Source: Fisher, K. Data Confirm Safety of Well Fracturing. The American Oil and Gas Reporter. July 2010

Does hydraulic fracturing produce earthquakes?



Eagle-Ford moment magnitude



Source: Warpinski, N.R., Du, J. Zimmer, U. Measurements of Hydraulic-Fracture-Induced Seismicity in Gas Shales. SPE Conference on Hydraulic Fracturing Technology. SPE 151597. February 2012.