

REGULATORY OPTIONS & CHALLENGES IN HYDRAULIC FRACTURING

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August 4, 2010



Source: Devon Energy



What is Shale?

- Shale: sedimentary rock formation that is predominately made of clay-sized particles and can produce oil and gas
- Often viewed as unconventional reservoir due to low-permeability
- Shale gas well first produced in 1821 in Fredonia, NY



Source: Lvklock

Importance of Shale

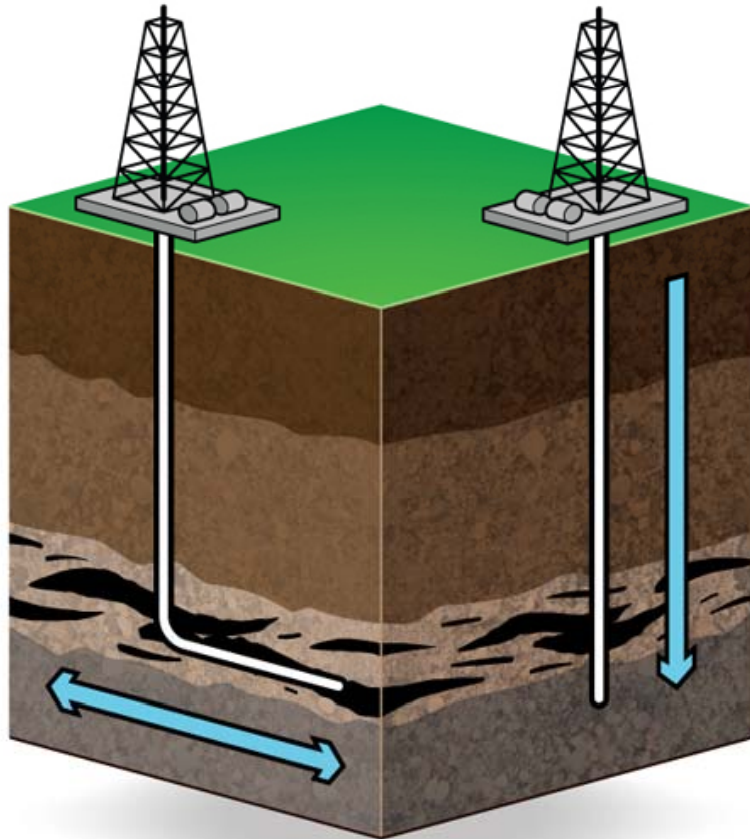
- Reduction in dependency on foreign resources
 - Increase in onshore energy production
 - Over 100 years of domestic gas reserves
 - Expansion with international affairs
- Reduction in carbon dioxide (CO₂) emissions
 - Minimize greenhouse gases
- Uses the least amount of water per unit of energy produced compared to other energy sources

Shale Gas Plays



Source: Energy Information Administration based on data from various published studies.
Updated: March 10, 2010

Vertical vs. Horizontal Drilling



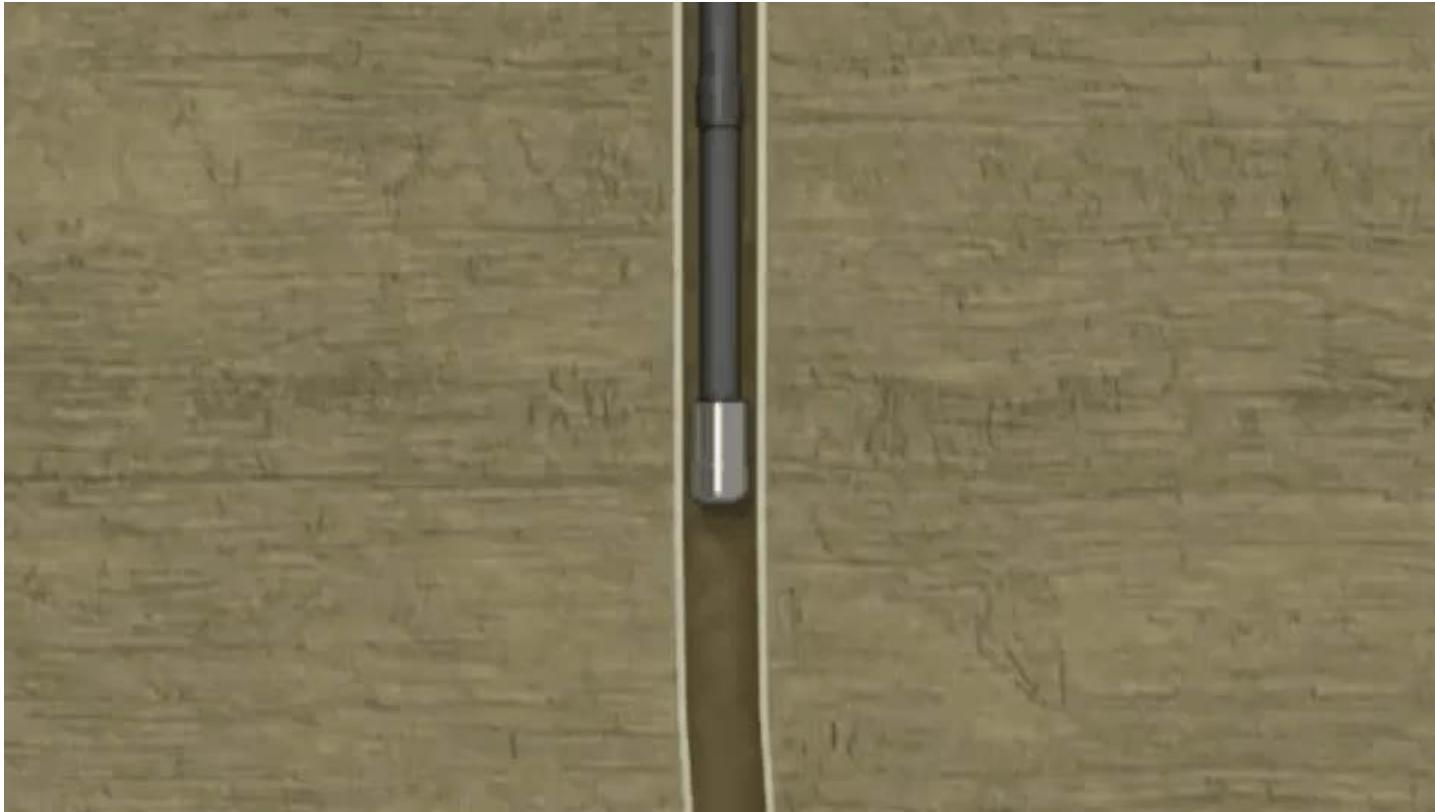
James Provost.com

- Vertical Drilling: Wellbore drilled straight down into target formation
- Horizontal Drilling: wellbore drilled vertically to kick-off depth, then angled to 90° and extends through target formation

Hydraulic Fracturing

- Used to increase natural gas flow
 - Creates fractures in underground formations
 - Uses mixture composed of 99% water and sand and 1% additives
- Produces more than 600 trillion cubic feet of natural gas
- In more than 1 million wells in the United States
 - Over 90% of natural gas wells
- Process of casing and cementing used to protect groundwater

Hydraulic Fracturing Using Horizontal Drilling



What Proponents Are Saying

- Method has been used for over 60 years
 - Currently used in over 90% of natural gas production
 - Water cannot penetrate into groundwater sources
- Disclosure of chemicals challenges proprietary rights
- More stringent regulations would cause an economic decline

Challenges of Hydraulic Fracturing

- Amount of water used
 - Range from 2 – 8 million gallons per injection
 - Lack of recoverability
- Failure of state regulations on construction
 - Possible leakages
 - Well Blowouts
- Environmental concerns
 - Air emissions
 - Water pollution

Well Blowouts



Source: Taylor

- Barnett Shale (1997-2006)
 - 14 blowouts at Wise County
 - 4 at Denton County
- Marcellus Shale (June 2010)
 - 1 blowout in Pennsylvania
 - 1 blowout in West Virginia

Air Emissions



Source: Offshore May

- Incidents have discovered benzene, arsenic and lead
- 50 of 300 air samples exceeded TCEQ standards for long-term health risk

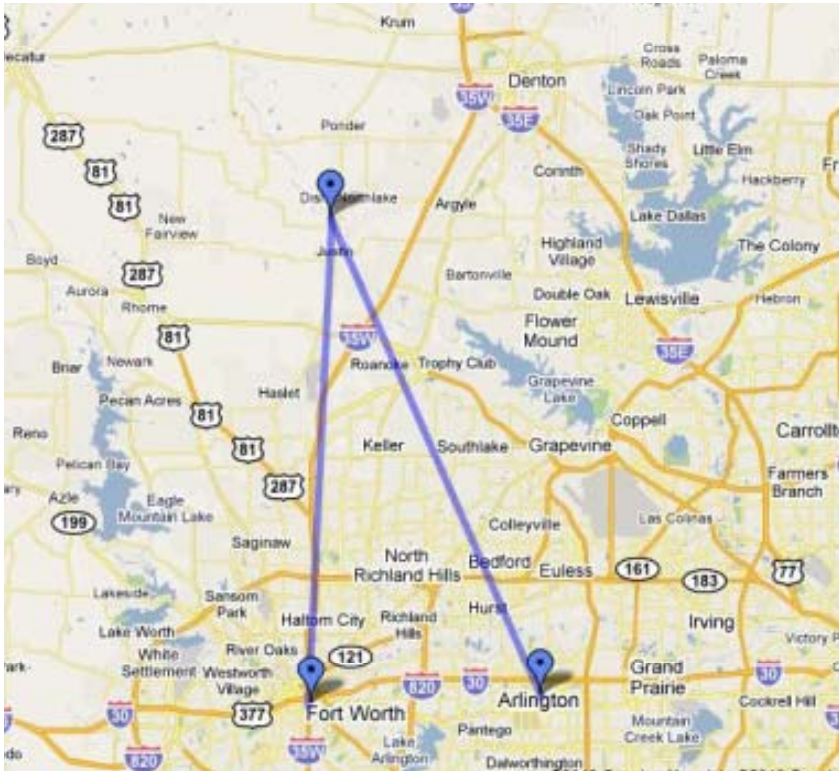
Water Pollution



Source: Louanne McConnell
Fatora

- DISH County, TX
 - Water contaminated with arsenic, barium, chromium, lead and selenium
- Dimock, PA
 - Water discolored
 - Sources are able to be ignited

DISH, TX



Current State Regulation Conditions

- According to the Water Contamination Center taken from the U. S. Department of Energy, of the states surveyed in May 2009
 - 21 of 33 states have no regulations specific to hydraulic fracturing
 - 0 states require that the volume of fluid left underground after fracturing be recorded
- Hydraulic fracturing is exempted from Safe Drinking Water Act as specified through Energy Policy Act 2005

Current Federal Legislation

- Legislation in Place
 - Clean Air Act
 - Clean Water Act
 - Safe Drinking Water Act
 - Energy Policy Act of 2005
- Fracturing Responsibility Awareness of Chemicals (FRAC) Act (Introduced in 2009)
 - Proposes disclosure of chemicals through Internet
 - Remove exemption from Safe Drinking Water Act

Policy Alternatives

- No Hydraulic Fracturing
- State Regulation of Hydraulic Fracturing
- National Regulation of Hydraulic Fracturing
- Development of New Technology
- Combination of State and National Regulation

Policy Recommendations

- Regulation of hydraulic fracturing under Safe Drinking Water Act
- National Oversight and State Regulation
 - Disclosure of chemicals used in fracturing process to national and state regulatory agencies
 - Improvements on emergency response plans
 - Set reference for water quality
 - Develop better water efficiency and recovery

Acknowledgements

- American Society of Mechanical Engineers (ASME)
 - Robert Rains
 - Kathryn Holmes
 - Paul Fakes
 - Melissa Carl
- IEEE-USA
 - Erica Wissolik



Questions?



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