



# **Fact-based Regulation for Environmental Protection in Shale Gas Resource Development**

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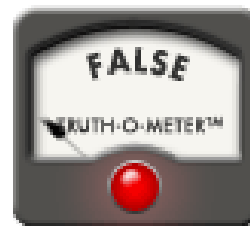
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- A self-funded initiative by the Energy Institute at the University of Texas at Austin and managed by Chip Groat (<http://www.energy.utexas.edu/>)
- Focus on:
  - Marcellus Shale (Northeast U.S.)
  - Barnett Shale (Texas)
  - Haynesville Shale (Louisiana)
- Environmental issues being addressed
  - Water quality impacts – majority of effort
  - Seismic impacts
  - Air quality impacts

- Time line: April to Oct. 2011, draft in Dec. 2011, final in Feb. 2012
- Senior Researchers:
  - UT Jackson School of Geosciences
  - UT and University of Tulsa Law Schools
  - UT School of Communication
  - Environmental Defense Fund, Texas Office
- Report audience: regulators, elected officials, industry, NGO's, and the public

# Objectives

- Comprehensive review of hydraulic fracturing for shale gas production from an environmental, regulatory, legal and public perception viewpoint
- Some of the claims about shale gas effects attributed to hydraulic fracturing may be overstated, not based on good science, or related to processes other than hydraulic fracturing



# Methods

- Review technical literature on shale gas impacts
- Review current regulations and records of violations
- Review claims in media
- Conduct interviews of selected policymakers and regulatory authorities
- Evaluate results of review geographically
- Develop guidance for fact-based policy and regulation development
- Communicate results and guidance to promote fact-based regulations

- Whether hydraulic fracturing for shale gas production has resulted in contamination of ground water and polluted water wells is a very controversial issue
- Quotes from opponents of shale gas and from industry

**“Shale gas development clearly has the potential to contaminate surficial groundwater with methane, as shown by the large number of incidences of explosions and contaminated wells in Pennsylvania, Wyoming, and Ohio in recent years”**

Robert Howarth, the David R. Atkinson Professor of Ecology & Environmental Biology at Cornell University, in a formal written submission to the EPA, 2010

**“... shale gas development has clearly contaminated groundwater and drinking water wells with methane...”**

Robert Howarth, the David R. Atkinson Professor of Ecology & Environmental Biology at Cornell University, in a formal written submission to the EPA, 2010



**“there is considerable anecdotal evidence from the US that contamination of both ground and surface water has occurred in a range of cases”**

Wood et al (2011), Tyndall Center at the University of Newcastle, UK

**“there have been over a million wells hydraulically fractured in the history of the industry.... not one reported case of a freshwater aquifer ever having been contaminated from hydraulic fracturing”**

Rex Tillerson, Chairman of Exxon Mobil Congressional Testimony, 2010

**“the hydraulic fracturing process is safe, already well regulated by the various States” and that “the hysterical outcry over this process is completely unjustified”**

Michael Economides, Professor of Chemical and Biomolecular Engineering, University of Houston, Congressional Testimony

- The study deconstructs similar statements
- Semantic issue: industry defines fracking narrowly and the public includes all related activities in its understanding (for example, truck rolling over and spilling flowback)
- The fundamental problem: science has not kept pace with shale gas development

# Example: methane contamination

- Groundwater saturated in methane is in a significant number of water wells overlying the Marcellus Shale and the Barnett Shale
- Gas accumulations coincident with shale gas drilling led to an explosion in Dimock, PA
- Occurrence of high methane in Dimock water wells documented by PA DEP (state regulators)
- High methane later confirmed by Duke study (Osborne et al. 2011)

# Example: methane contamination

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- Widespread methane contamination of groundwater has been known above Marcellus and Barnett shales for decades prior to shale gas drilling
- PA DEP has investigated ~ 70 “stray gas” incidents over last 20 years as well as a number of explosions, most not near shale gas wells.
- A USGS pre-shale gas study of 200 water wells in West Virginia found that 10% of wells had dangerous levels of methane
- In Texas natural gas has been recorded (by water well drillers) in water wells underlain by the Barnett shale before any shale gas related fracturing took place

- Conclusion: causation of groundwater contamination by shale gas activity has not been demonstrated
- Other topics considered:
  - Blow outs
  - Contaminants such as acrylonitrile and 2-BE
  - Shale-aquifer direct connection through faults
  - Atmospheric emissions
  - Seismic events
  - Several others

# Environmental Impacts: Preliminary Findings

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- Leakage associated with hydraulic fracturing of shale formations at depth has not been observed
- Long-term, cumulative risks associated with hydraulic fracturing after gas production has ceased cannot be fully evaluated with existing information
- Blowouts are rare and their impacts can be remediated with standard approaches
- Water quality problems widely ascribed to shale gas well drilling are more apparent than real



# Media Content and Public Perception

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- Assessment of news coverage and public perception by Matt Eastin (UT School of Communications)
- Media coverage from June 2010 through June 2011; search of keywords (Lexis-Nexis and Factiva databases, local archives); ranking of tonality (positive = benefits, etc; negative = pollution, etc) – 60-70% negative
- “Knowledge assessment” survey of 1,473 respondents currently living in the 26 counties that cover or touch on the Barnett shale

# Regulations

- Review of state and federal regulations (Hannah Wiseman) – many states have updated their regulations but gaps remain in some states in dealing with
  - Risks of surface spills
  - Well casing and cementing
  - Water withdrawal and use
  - Wastewater disposal
- Inventory of state enforcement of shale gas development regulations, statistics on violations – mostly on 4 states (LA, MI, NM, WY + TX, PA, NY)
- Many violations are procedural
- Emphasis is on surface spills and other surface issues easier to identify and assess