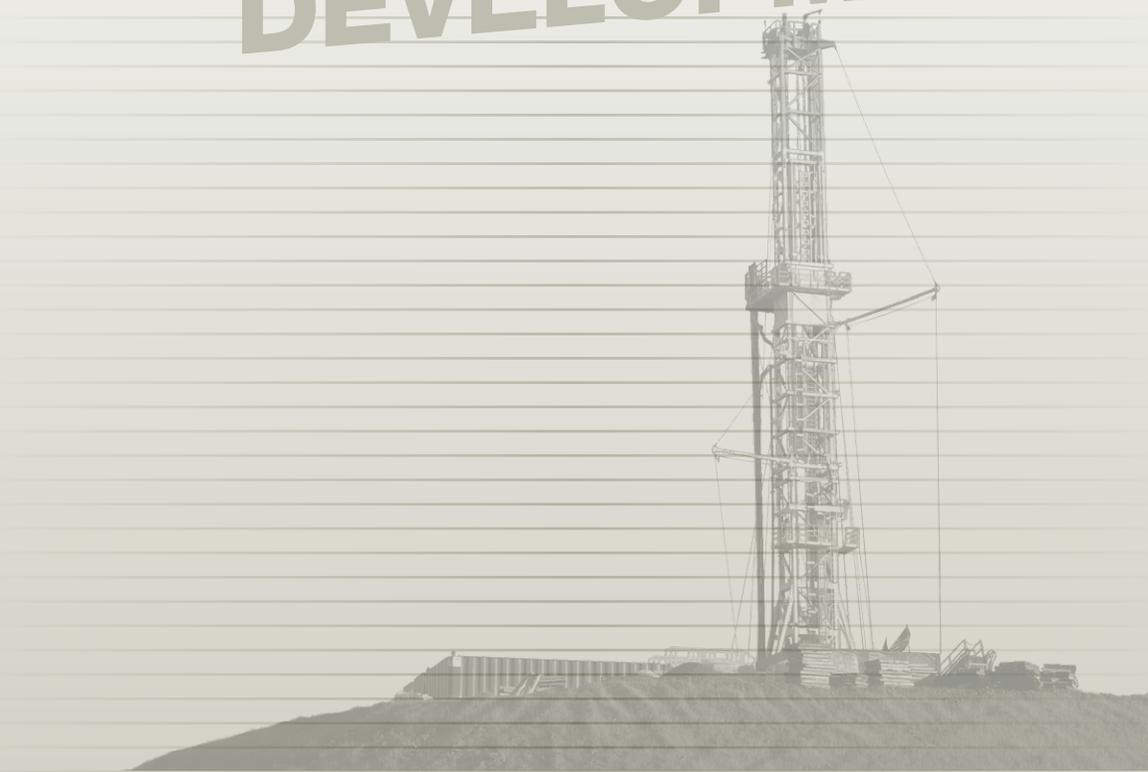


SEPARATING FACT FROM FICTION IN SHALE GAS DEVELOPMENT



A REPORT BY



energy institute

THE UNIVERSITY OF TEXAS AT AUSTIN

Assessing the Real and Perceived Consequences of Shale Gas Development

THE ASTONISHING SURGE in domestic natural gas production, brought on by the widespread use of hydraulic fracturing and horizontal drilling, has transformed the outlook for U.S. energy. Conservative estimates project the use of these techniques in shale gas development will all but assure a clean and affordable natural gas supply for generations to come, creating new jobs and enhancing our nation's energy security.

That sanguine view has been tempered, however, by concerns that hydraulic fracturing may contaminate groundwater and pose other threats to public health. While little evidence exists directly linking the practice to environmental harm, such fears have ignited a controversy that has dominated public discourse on the issue. In fact, some areas have halted shale gas development altogether, at least temporarily.

In response, the Energy Institute at The University of Texas at Austin funded an independent study of hydraulic fracturing in shale gas development to inject science into a highly charged emotional debate.

For this study, the Energy Institute assembled an interdisciplinary team of university experts to examine a broad array of issues associated with hydraulic fracturing in three prominent shale plays – the Barnett Shale, in north Texas; the

Marcellus Shale, in Pennsylvania, New York and portions of Appalachia; and the Haynesville Shale, in western Louisiana and northeast Texas.

The Energy Institute team investigated an array of issues related to shale gas development, including groundwater contamination, toxicity of hydraulic fracturing fluids, surface spills, atmospheric emissions, water use, drilling waste disposal, blowouts, and road traffic and noise.

The goal of this research is to provide policymakers a fact-based foundation upon which they can formulate rational regulatory policies that ensure responsible shale gas development.

FACT-BASED REGULATION FOR ENVIRONMENTAL PROTECTION IN SHALE GAS DEVELOPMENT

For this study, the Energy Institute at The University of Texas at Austin assembled a team of experts with broad experience and expertise, from geology and environmental law to public affairs and communications. In addition to university faculty, the Environmental Defense Fund was actively involved in developing the scope of work and methodology for this study, and reviewed final work products.

Under the leadership of Institute Associate Director Dr. Charles “Chip” Groat, researchers examined three critical areas related to shale gas development:

- Environmental and health effects related to all phases of shale gas development in the Barnett, Marcellus and Haynesville shale plays, including hydraulic fracturing, groundwater contamination and air emissions. Where problems were reported, researchers determined the actual cause of problems, based on a review of scientific and other literature.
- Public perceptions of shale gas development and hydraulic fracturing, as well as the tone of popular media — positive, negative, or neutral.
- State and federal regulations related to shale gas development, including an analysis of individual states’ capacity to enforce existing regulations.



Dr. Charles “Chip” Groat

“Our mission is to alter the trajectory of public discourse in a positive manner, as exemplified in our credo — good policy based on good science.”

Dr. Raymond L. Orbach
DIRECTOR, ENERGY INSTITUTE
THE UNIVERSITY OF TEXAS AT AUSTIN

The following pages provide an overview of key findings from the Energy Institute’s study.

For the complete report visit:
www.energy.utexas.edu

Scientific Investigation into Groundwater Contamination and Other Environmental Impacts

THE PUBLIC DEBATE OVER hydraulic fracturing in shale gas production has been marked by fears that the process will contaminate groundwater. Concerns also have been raised that underground methane releases are contaminating water wells.

Though little scientific evidence exists to support such claims, policymakers in some areas have banned the practice, and others have imposed moratoriums on shale gas

development until additional research is conducted.

For this report, the Energy Institute research team focused on reports of groundwater contamination and other environmental impacts of shale gas exploration and production in states within the Barnett, Marcellus and Haynesville shales.

KEY FINDINGS:

- Researchers found no evidence of aquifer contamination from hydraulic fracturing chemicals in the subsurface by fracturing operations, and observed no leakage from hydraulic fracturing at depth.
- Many reports of groundwater contamination occur in conventional oil and gas operations (e.g., failure of well-bore casing and cementing) and are not unique to hydraulic fracturing.
- Methane found in water wells within some shale gas areas (e.g., Marcellus) can most likely be traced to natural sources, and likely was present before the onset of shale gas operations.
- Surface spills of fracturing fluids appear to pose greater risks to groundwater sources than from hydraulic fracturing itself.
- Blowouts — uncontrolled fluid releases during construction or operation — are a rare occurrence, but subsurface blowouts appear to be under-reported.

Regulation of Shale Gas Development

RESEARCHERS SURVEYED federal and state laws and regulations related to shale gas development in 16 states that have or are expected to have shale gas production. This analysis covered all major phases of the shale gas lifecycle — exploration, well siting, drilling and fracturing, production, well plugging, and site closure.

The research team also examined several exemptions of shale gas development from federal environmental laws, including the Resource Conservation and Recovery Act, the Comprehensive Environmental, Response, Compensation, and Liability Act, the Clean Water Act, and the Safe Drinking Water Act.

KEY FINDINGS:

- Primary regulatory authority for shale gas is at the state level, and many federal requirements have been delegated to the states.
- Most state oil and gas regulations were written well before shale gas development became widespread.
- Some states have revised regulations specifically for shale gas development, with particular focus on three areas of concern:
 - > disclosure of hydraulic fracturing chemicals
 - > proper casing of wells to prevent aquifer contamination
 - > management of wastewater from flowback and produced water
- Gaps remain in the regulation of well casing and cementing, water withdrawal and usage, and waste storage and disposal.
- Regulations should focus on the most urgent issues, such as spill prevention — which may pose greater risk than hydraulic fracturing itself.

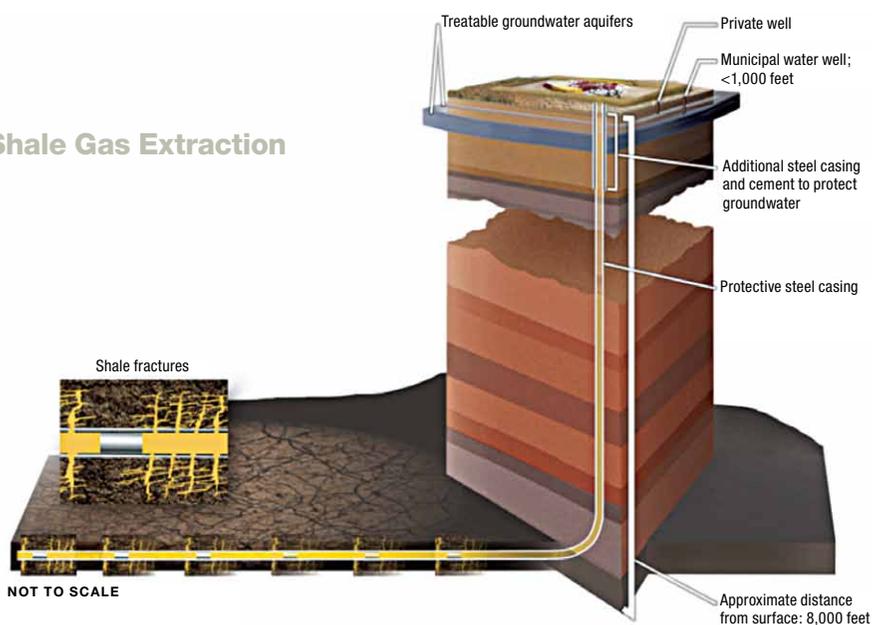
Enforcement of State Regulations

RESEARCHERS ALSO REVIEWED state agencies' enforcement capabilities, including a review of staff responsible for conducting inspections and attorneys supporting enforcement. The review covered violations recorded, enforcement actions, field sampling, and monitoring.

KEY FINDINGS:

- Enforcement capacity is highly variable among the states, particularly when measured by the ratio of staff to numbers of inspections conducted.
- Most violations recorded are of the type associated with conventional gas drilling rather than being specific to hydraulic fracturing and shale gas production.
- Enforcement actions tend to emphasize surface incidents more than subsurface contaminant releases, perhaps because they are easier to observe.

Shale Gas Extraction



Graphic by Chesapeake Energy

Public Perception of Shale Gas Development

ENERGY INSTITUTE researchers analyzed print, broadcast and online news media coverage of shale gas development in the Marcellus, Haynesville, and Barnett shale areas. They found that the tone of media coverage has been overwhelmingly negative in all forms of media. Roughly two-thirds of the articles and stories examined were deemed negative, a finding that was consistent nationally and at local levels.

Researchers also found that less than 20% of newspaper articles on hydraulic fracturing mention scientific research related to the issue. Similarly, only 25% of broadcast news stories examined made reference to scientific studies, and about 33% of online news coverage mentioned scientific research on the issue.

Tone of Media Coverage

	Negative	Neutral	Positive
National Newspapers	64%	25%	12%
Local Newspapers	65%	23%	12%
National Television & Radio	64%	19%	18%
Local Television	70%	27%	3%
Online News	63%	30%	7%



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