

### What is fracking?

Hydraulic fracturing (fracing), is the process of pumping a mix of water and sand with a minor component of chemical additives, generally under high pressure, into an oil or gas well to crack the rocks in a buried target zone. Fracing is performed by oil and gas service companies during the completion of an oil or natural gas well to increase the well's productivity. Trillions of cubic feet of natural gas and hundreds of millions of barrels of oil have been produced from these wells, powering many sectors of the nation's economy.

Frac job in progress. ▶



Devon Energy

### Why is fracking necessary?

For an oil or natural gas well to be productive, hydrocarbons must flow through the rocks in which they are contained (the reservoir) into the well and up to the surface. Much of the remaining oil and gas resource in the United States resides in "tight" formations, from which oil and natural gas will not flow unless the rock in the targeted zone is fractured to enable the flow of fluids into production wells. Today, fracing in the target zone of the well, often combined with horizontal drilling, is currently the most effective method to achieve this increased flow. More than 50% of the natural gas, and a growing percentage of the oil, produced in the United States today comes from fraced wells. Because of fracing, oil production is increasing in the U.S. after decades of decline. Similarly, natural gas production and reserves in the U.S. are rising sharply, after decades of flat production rates.

### What have we learned from 60 years of fracking?

More than 1 million "frac jobs" have been conducted in oil and gas wells in the U.S. since 1947, and fracing has been one of the most common well-completion operations for the past several decades. Casing and cementing programs are designed by engineers and other professionals to isolate freshwater aquifers from fraced zones that are generally thousands of feet deeper. These casing and cementing programs, generally required by oil and gas regulatory agencies administered by the states, have performed as designed in millions of oil and natural gas wells already drilled in the U.S.

From this high level of frac activity in dozens of regions around the country, only two credible incidents of groundwater contamination have been documented. Both appear to have been related to escape of fluids at shallow depths because of near surface casing failure and were not caused by upward leakage through overlying rock layers from the hydraulic-fracturing process itself. On occasion, trucks hauling frac fluids can leak or be involved in accidents, and produced fluids stored in earthen holding tanks can, on rare occasions, breach. Such incidents, although unfortunate and avoidable if adequate precautions are taken, are local and can be contained and cleaned up.

### Fracking controversy: real or contrived?

The rapid expansion of tight-sand gas plays (in Colorado, Wyoming, and Texas) and shale-gas and shale-oil plays (in Texas, Oklahoma, Arkansas, Pennsylvania, New York, North Dakota, and Montana) have brought industry activities into areas and communities where there is little history of energy development. Media accounts have reported methane occurrences in domestic water wells. Images of flaming faucets have led to widespread but unfounded assumptions that the methane was introduced into domestic water wells by the activity of nearby fracing operations. There is concern about the quantity of water required for, and produced from, fracing. Individual hydraulically fractured wells use anywhere from 1 to 10 million gallons of water.

## Reality check

In all but two cases, careful, objective, scientific inquiry has refuted the claims of groundwater contamination by methane caused by hydraulic fracturing. Methane occurs naturally in water wells in many areas of the country, and in thousands of instances the presence of methane gas in water wells was documented long before fracing of oil or natural gas wells occurred in the area. Similarly, there have been recent claims that chemicals used in frac “makeup water” have appeared in freshwater aquifers. With only two documented exceptions, extensive investigations by state, federal, university, and private entities have not revealed convincing evidence of such occurrences in subsurface settings. Water used for frac operations is generally obtained from nearby wells, lakes, and streams. Although a substantial amount of water is used in hydraulic fracturing, it is a one-time use, and the amount is considerably less than that required in other ongoing uses, such as agriculture, municipalities, and heavy industry. Operators must follow state laws in the acquisition and use of water, and they are currently working to reduce their water needs. Some of the water used in fracing returns to the surface, along with saline water that is already present in the producing rock formation. That “returned” water must be disposed of properly, generally in deep wells drilled specifically for that purpose. Operators are increasingly recycling that returned water so that it can be reused in other frac jobs.

## AASG statement

The state geologists that constitute the Association of American State Geologists (AASG) have followed the recent controversy carefully. Several state surveys have been actively engaged in investigations of allegations of contamination caused by fracing. Key points of AASG’s position on fracing are:

- AASG encourages a balanced, independent, fact-based approach to controversies regarding resource development.
- AASG recognizes the importance and abundance of oil and natural gas resources that can be recovered if, and only if, the target interval is fraced.
- AASG maintains that state oil and gas regulatory agencies are best equipped, through statutory authority, expertise, and experience, to ensure that fracing and other operations associated with oil and natural gas development proceed in a manner that protects the environment, including groundwater resources, and public safety.
- AASG recognizes that most oil and gas operators are ethical professionals and asserts that the environmental record of fracing over the past 60 years has been overwhelmingly good. AASG also notes that there are, on occasion, operators who do not follow permits and other regulatory requirements. These operators should be appropriately sanctioned and, where appropriate, barred from conducting oil and gas operations.
- AASG notes the generally large separation between the depth of frac emplacement and the depth of shallow groundwater resources in most shale-gas and -oil plays. In areas where frac targets are comparatively closer to groundwater resources, even greater caution should be exercised and regulatory permitting carefully enforced.
- AASG recognizes the fast pace of recent drilling and fracing activities, including operations in shale-gas plays and tight-sand plays, and suggests that caution be exercised by operators, contractors, and regulators. Deliberation and care should be exercised by all parties in the design, review, approval, and implementation of well-completion plans.
- AASG encourages work to acquire and maintain local baseline information on water-well quality and suggests that casing and cementing operations in frac wells be documented carefully by operators, contractors, and regulators.
- AASG supports the voluntary reporting of frac-fluid composition that is under way via the web-based FracFocus Chemical Disclosure Registry administered jointly by the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission.

American Petroleum Institute, 2008, *Hydraulic Fracturing at a Glance*  
[http://www.api.org/policy/exploration/upload/Hydraulic\\_Fracturing\\_at\\_a\\_Glance.pdf](http://www.api.org/policy/exploration/upload/Hydraulic_Fracturing_at_a_Glance.pdf)

Chesapeake Energy, 2011, *Marcellus Shale Hydraulic Fracturing*  
[http://www.chk.com/Media/Educational-Library/Fact-Sheets/Marcellus/Marcellus\\_Hydraulic\\_Fracturing\\_Fact\\_Sheet.pdf](http://www.chk.com/Media/Educational-Library/Fact-Sheets/Marcellus/Marcellus_Hydraulic_Fracturing_Fact_Sheet.pdf)

Energy in Depth website, <http://www.energyindepth.org>

Interstate Oil and Gas Compact Commission, *Hydraulic Fracturing* pamphlet: <http://www.energyindepth.org/PDF/HF-IOGCC-Tri-Fold.pdf>

Kevin Fisher, *The American Oil and Gas Reporter*, July 2010, *Data Confirm Safety of Well Fracturing*

Range Resources, July 2010, *Hydraulic Fracturing Marcellus Shale*, <http://www.rangeresources.com/Media-Center/Fact-Sheets.aspx>

### For more information contact:

#### Co-Chairs, Energy Committee

Scott W. Tinker  
scott.tinker@beg.utexas.edu  
Texas State Geologist

Nick Tew  
ntew@gsa.state.al.us  
Alabama State Geologist

**On the Web:** [www.stategeologists.org](http://www.stategeologists.org)