

POLICY FOCUS

Fracking and Earthquakes

RECIPES FOR RATIONAL GOVERNMENT FROM THE INDEPENDENT WOMEN'S FORUM

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WHAT YOU NEED TO KNOW

The United States has enjoyed record-shattering energy production in the past year. In 2014, U.S. production of crude oil **increased** by over one million barrels a day, a 14 percent growth over the course of the year; by February, it had grown to 9.2 million barrels, according to the **Energy Information Administration**. Last year also saw record natural-gas production, a trend that will only continue, according to federal forecasts.

The U.S. energy boom has been made possible by hydraulic fracturing (“fracking”) and horizontal drilling, two innovations that have allowed oil and gas producers to access reserves of energy that were previously inaccessible, locked into dense underground shale formations. And American consumers have emerged as the biggest winners, enjoying huge savings as the price of energy drops.

Yet as U.S. energy extraction increases, so have concerns about the safety of fracking. In January, the *New York Times* proclaimed that new scientific research had linked “scores of earthquakes” to fracking sites in Ohio. Environmental groups responded with cries for more regulation.

However, research shows that the risk of earthquakes caused by fracking is minimal and sensible regulations and precautions can mitigate the risks associated with wastewater disposal. Given the importance of fracking to the U.S. economy, it’s essential to understand what the science is actually revealing about energy extraction and induced seismicity and to create balanced public policy that allows safe energy extraction to continue.

WHY YOU SHOULD CARE

We all benefit from America's growing energy sector. Here are a few reasons why:

- **Big Consumer Savings on Energy:** In 2013 alone, fracking **saved** consumers an estimated \$248 billion. This year, American households will see as much as **\$2,000 in savings** on their utility bill. Meanwhile, Americans are already **saving** about \$60 a month at gas stations.
- **More American Jobs:** Oil and gas production has directly or indirectly created **9.8 million jobs**. Between 2007 and 2012, while private-sector employment grew by just 1 percent, employment in the energy sector increased by **40 percent**.
- **Strengthened American Manufacturing and Facilitating Cheaper Consumer Goods:** Energy is a major input for manufacturers. Not only does it power the process, oil is also a key ingredient in everything from plastics to medicines to lubricants to synthetic fibers. As energy prices drop, American manufacturing becomes more robust and consumer goods cost less. Last year the energy sector supported an **estimated 1.3 million** manufacturing jobs.
- **U.S. Energy Independence and Foreign Policy:** As the United States produces more oil and gas, it becomes less reliant on foreign energy sources and weakens global dependence on energy-producing countries with bad records on human rights.

MORE INFORMATION

Fracking and Earthquakes: Should You Be Concerned?

U.S. energy producers are increasingly employing extraction techniques known as hydraulic fracturing ("fracking") and horizontal drilling that enable them to access previously inaccessible reserves of energy locked into dense underground shale formations. Yet as U.S. energy extraction increases, so have concerns about the safety of fracking, including about whether this process can cause earthquakes.

In January, the Bulletin of the Seismological Society of America published a much-hyped study that linked 77 small earthquakes to fracking sites in Poland Township, Ohio.

The research itself was groundbreaking: Robert Skoumal, a graduate student at Miami University in Ohio, created his own computer program, using it to link seismic activity and fracking sites over time. Skoumal and his professor, Mike Brudzinski, found that on 77 occasions, seismic events correlated with active fracking operations.

So are these earthquakes? Yes, technically—but many of them were very, very small, detectable only by technology. The average person wouldn't have even noticed many of them. The biggest one was merely a magnitude 3, roughly the equivalent of the impact felt when a gallon of milk falls off a counter, according to Eric Heis, a spokesman for the Ohio Department of Natural Resources. The

U.S. Geological Survey **says** a magnitude 3 quake produces “vibrations similar to the passing of a truck.” None of the earthquakes reached the 4 magnitude threshold (which is 10 times bigger than a magnitude 3 quake and releases 31.6 times the energy), where the earthquake classifies as light and can cause minor damage.

Skoumal and Brudzinski actually got pretty lucky by stumbling on the precise circumstances necessary to observe fracking-induced seismic activity.

In the United States alone, there are more than **1.1 million** active oil and gas wells. Fracking was used in around **90 percent** of these. Worldwide, the number of active, fracked wells is even higher, though it’s tough to give a good global count. Nonetheless, Cliff Frolich, the associate director of Institute for Geophysics at the University of Texas at Austin, says he knows of only “maybe 10 other instances on the planet” where fracking actually caused earthquakes to occur.

So what was so unique about Poland Township, Ohio? “The conditions were ideal,” Skoumal said. The fracking occurred basically right on top of a faultline that was already there and primed for a quake. In the **words** of Skoumal: “Hydraulic fracturing did not ‘create’ a new fault. Rather, it activated an unknown, pre-existing fault that was critically stressed.”

Fracking has to occur *very* close to that sort of fault to trigger an earthquake. In Ohio, seismic activity happened when fracking occurred within half a mile of such a ripe fault. At sites just a little

further away, Skoumal and Brudzinski observed no seismic activity. And even at those sites right on top of the fault, when fracking stopped, so did the quakes.

“These seem to be very specific situations, and it seems to be only when you’re very close to one of these faults that’s sort of ripe. You could have many, many operations where you see no seismicity at all with fracking,” Brudzinski recently told *National Review*. “The fracturing process itself rarely produces earthquakes.”

Wastewater Disposal and Earthquakes

While fracking itself almost never causes earthquakes, there is a much stronger correlation between wastewater injection and seismic activity.

The fracking process itself involves pumping a fluid—mostly made of sand and water—at a high pressure underground. As the fluid is injected, it creates cracks in formations of dense rock, freeing up the oil and gas inside. Afterward, that fluid flows back to the surface.

Energy producers have several options for what to do with this so-called wastewater after the fracking process is completed. Often, energy producers recycle it, using it in future fracking operations. (In Pennsylvania’s Marcellus Shale, for example, recycling **occurs** about 70 percent of the time.)

Energy producers can also “treat” the wastewater, discharging it to the surface, storing it in open-air pits or spraying it on roads to help keep down dust.

Finally, sometimes, energy producers inject the treated wastewater underground, storing it there. That process has been linked to seismic activity in areas where stress has built up; the water gets between the stone-on-stone pressure, relieving it and allowing pent-up seismic activity to occur.

“To help you understand the rock-on-rock [tension]—think of it as a real rough surface, almost like it has teeth. In a regular earthquake, basically, the stresses on both sides of the fault have to be big enough to break the teeth. ... but if you put water in there, the two sets of teeth don’t have to touch and can slip,” Brudzinski told *National Review*.

Frolich, the earthquake expert, tells IWF to think of an air-hockey table: Even at a slight incline, a puck placed on the table won’t slide until the air is turned on, relieving the friction.

“There’s stress in the crust, and there are faults that are not moving because they’re stuck, there’s friction,” he says. “If you pump liquid in there, it reduces the friction on the fault, so it creates little earthquakes.”

While wastewater disposal unleashes earthquakes more often than fracking itself, it’s still a fairly rare occurrence. As *Energy In Depth* notes, a 2014 study published by the American Association for the Advancement of Science observed about 4,500 injection wells in Oklahoma—and found only four of them had probably induced seismic activity.

EID also references a National Research Council report, which says: “Injection for disposal

of wastewater... does pose some risk for induced seismicity, but very few events have been documented over the past decades relative to the large number of disposal wells in operation.

Even when wastewater injection does induce earthquakes, they’re small ones, the EPA reported after considering 30,000 active disposal wells in the U.S. Most didn’t result in seismic events, but among those that did, “very few... produced seismic events with magnitudes greater than M 4.0.”

Sensible Regulations and Precautions Can Mitigate Risks

Especially when it comes to energy regulation, it’s critical that public policy is based on a sound, non-alarmist understanding of science. It’s also important to consider that no industry operates under an unconditional guarantee of safety. Nonetheless, both state regulators and the energy sector have taken the risks, however minimal, seriously and have increased safety precautions.

As the *Wall Street Journal* reported in March 2015, Oklahoma recently began requiring energy companies to either reduce their wastewater injection rate or demonstrate that they aren’t injecting wastewater in high-risk regions. Kansas, too, “lowered maximum injection rates in areas experiencing increased seismic activity,” while Arkansas and Ohio restricted wastewater injection in potentially risky areas. Texas has also invested in more study about wastewater injection and induced seismicity. Furthermore, several states

have already begun measuring and monitoring seismic activity at wastewater disposal sites, ensuring that safe underground injection can continue.

Meanwhile, says Steve Everly, a spokesman for Energy In Depth: “The most important thing that the industry has been doing is sharing subsurface data with state geologists and regulators. ... Companies have also partnered with research institutions—such as the University of Oklahoma, SMU and Stanford University, among others—with whom they have also shared geological information to inform scientific analyses of earthquakes.”

Oklahoma, for example, lacked information on faults and deep geological structures, Everly says, until energy companies shared their data with the state. That information resulted in strengthened well-permitting guidelines in seismically active areas.

Elsewhere, the energy sector has shared information with commissions, working groups and other partnerships. “All that, of course, is designed ultimately to reduce risks associated with induced seismicity,” Everly says. With this in mind, the federal government should continue allowing states to retain regulatory authority. Fracking brings enormous economic benefits and carries a minimal risk of triggering earthquakes. And although post-fracking wastewater disposal does carry some minor seismic risks, states and the energy industry are already leading the way in using sound science to inform their regulations, addressing the needs of their economies, environments, and residents alike.

Alarmism about Fracking and Groundwater

In addition to concerns about fracking and earthquakes, some also worry that energy extraction may contaminate groundwater. Despite a lot of misinformation, numerous studies, including several by states and the federal government, officials have found no evidence that the hydraulic fracturing process contaminates groundwater.

For example, regulatory officials in eight energy-producing states **told** the Government Accountability Office that their research showed fracking had not dirtied groundwater, while the U.S. Department of Energy and Ground Water Protection Council examined 60 years of energy extraction and concluded that “there is nothing to indicate that when coupled with appropriate well construction, the practice of hydraulic fracturing in deep formations endangers groundwater.”

While the fracking process itself doesn’t pose a risk, human error obviously can. Accidents like surface-level spills have been found to contaminate groundwater. Of course, such incidents are not unique to the energy industry. Aware of potential problems, energy-producing states have already established highly effective legal and regulatory measures to prevent mishaps and prosecute irresponsible actors.

WHAT YOU CAN DO

You can help ensure energy policy is based on sound science, not misunderstandings and alarmism!

- **Get Informed:** Learn more about energy and environmental issues. Visit:
 - The Institute for Energy Research
 - The Competitive Enterprise Institute
 - The Property and Environment Research Center
- **Talk to Your Friends:** Help your friends and family understand these important issues. Tell them about what's going on and encourage them to join you in getting involved.

- **Become a Leader in the Community:**
Get a group together each month to talk about a political/policy issue (it will be fun!). Write a letter to the editor. Show up at local government meetings and make your opinions known. Go to rallies. Better yet, organize rallies! A few motivated people can change the world.
- **Remain Engaged:** Too many good citizens see election time as the only time they need to pay attention to politics. We need everyone to pay attention and hold elected officials accountable. Let your Representatives know your opinions. After all, they are supposed to work for you!

ABOUT THE INDEPENDENT WOMEN'S FORUM

The Independent Women's Forum (IWF) is dedicated to building support for free markets, limited government, and individual responsibility.

IWF, a non-partisan, 501(c)(3) research and educational institution, seeks to combat the too-common presumption that women want and benefit from big government, and build awareness of the ways that women are better served by greater economic freedom. By aggressively seeking earned media, providing easy-to-read, timely publications and commentary, and reaching out to the public, we seek to cultivate support for these important principles and encourage women to join us in working to return the country to limited, Constitutional government.

We rely on the support of people like you! Please visit us on our website www.iwf.org to get more information and consider making a donation to IWF.

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