Is the new boom in domestic natural gas production an economic bonanza or environmental disaster?

December 12 2012, by Gail Bambrick

A hydraulic fracturing rig at work. Credit: Jon Mullen/Getty Images

(Phys.org)—For some Americans, it is our energy dreams come true. To others, it is an environmental nightmare. Ever since a new drilling technology, called hydraulic fracturing or fracking, made it possible to extract natural gas from shale deposits about a mile underground, a new gold rush has been under way.

While fracking has created jobs and contributed to record-low natural gas prices, it comes with another kind of potential cost: risks to our environment and health that some say are far too high.

The fracking process begins with a bore hole drilled some 6,000 feet below ground, cutting through many geological layers and aquifers, which tend to be no more than a few hundred feet below the surface. The shaft is then lined with steel and cement casing. Monitors above ground signal when drilling should shift horizontally, boring sideways to pierce long running sections of shale bedrock.

Millions of gallons of water mixed with sand and chemicals are then blasted into the bedrock, the pressure creating cracks that release trapped natural gas from the shale. The gas and water mixture then flows back up to the surface, where the gas is separated from the water. While most of the water stays in the well bore, up to 20 percent is either reused for more fracking or injected into disposal wells thousands of feet underground.

The wellpad and related infrastructure take up to eight to nine acres of land, according to the Nature Conservancy. Fracking is currently occurring in Texas and Pennsylvania, the two largest gas-producing states, as well as in North Dakota, Arkansas, California, Colorado and New Mexico. And the oil and gas industry is eager to expand its fracking operations into New York, North Carolina, Maryland and Illinois.

Bruce McKenzie Everett, F70, F72, F80, an adjunct associate professor of international business at the Fletcher School, says fracking provides substantial economic benefits and its problems are relatively small compared to those benefits. He worked at the U.S. Department of Energy from 1974 to 1980 before beginning a 20-year career with ExxonMobil, working in Hong Kong, the Middle East, Africa and Latin America. His research has included gas-to-liquid conversion technology

as well as the economics of oil, gas and coal production and use.

On the other hand, John Rumpler, A88, argues that we are making a mistake in thinking that fracking is worth the damage to the environment. He is a senior attorney at Environment America, which is leading a national effort to restrict, regulate and ultimately end the practice of fracking. He has fought for clean air in Ohio and advocated to protect the Great Lakes and the Chesapeake Bay. This fall he is teaching the Experimental College course Fracked Out: Understanding the New Gas Rush.

Tufts Now: Is fracking safe?

Bruce McKenzie Everett: Nothing in the world is entirely safe, but by the standards of industrial activity in the United States, fracking is very, very safe. Think about the airline industry. Lots of things can go wrong with airplanes, but we work very hard to make sure they don't, and as a result, flying is one of the safest activities we've got. Now, that does not mean that things can't happen. It just means that with proper attention, mistakes can be kept to an extremely low level.

The question about fracking that gets the most attention is contamination of drinking water. Aquifers, the underground rivers that provide our drinking water, are about 100 to 200 feet below the surface. The gas-producing shale rock formations tend to be 5,000 to 6,000 feet below the surface. So you need to make sure that the well you drill to pump the water and chemicals through the shale to fracture it and release the gas is sealed properly, and that's not a hard thing to do.

John Rumpler: Fracking presents a staggering array of threats to our environment and our health. These range from contaminating drinking water and making families living near well sites sick to turning pristine landscapes into industrial wastelands. There are air pollution problems

and earthquakes from the deep-well injections of the wastewater into the gas-producing shale, as well as significant global warming emissions.

When the industry says there has not been a single case of groundwater contamination, they mean there is not a verified instance of the fracking fluid traveling up through a mile of bedrock into the water table. What they cannot dispute is that fluid and chemicals have leached into groundwater at 421 fracking waste pits in New Mexico. What they cannot dispute is that a peer-reviewed study by Duke University linked methane in people's drinking water wells to gas-drilling operations in surrounding areas. What they cannot dispute is a University of Colorado study published earlier this year documenting that people living within a half mile of fracking and other gas-drilling operations have an increased risk of health problems, including cancer from benzene emissions.

Are there sufficient regulations now in place to ensure safety?

Rumpler: Is it conceivable to imagine regulatory fixes for all the various problems caused by fracking? Theoretically, perhaps. But imagine trying to implement the hundreds of different rules and regulations at thousands of oil- and gas-drilling sites across the country, and you realize there is no practical likelihood that fracking will ever be made safe.

And there are consequences that we don't even know how to regulate yet. Geologists are just beginning to think about the long-term implications of drilling down a mile and then drilling horizontally through shale rock for another mile. We don't know what happens to the structural integrity of that bedrock once you withdraw all of the gas and liquid from it. No one has the definitive answer. There's been some recent modeling that indicates a loss of stability that goes all the way up to the water table. The U.S. Geological Survey took a look at some earthquakes that

occurred in the vicinity of Youngstown, Ohio, in proximity to deep-well fracking. They found that the seismic activity was most certainly manmade—and there was no manmade activity in the area except fracking.

So when you look at the whole picture—from contaminated wells to health problems to earthquakes—one quickly comes to see that the best defense against fracking is no fracking at all.

As for the current state of regulations, it is worth noting that fracking is exempt from key provisions of our nation's environmental laws, including the Safe Drinking Water Act, the Clean Air Act, the Clean Water Act, and the Resource Conservation Recovery Act. The reason we have national environmental laws is to prevent states from "racing to the bottom of the barrel" to appease powerful industries.

Everett: There are a lot of regulations currently in place. The question is whether they should be done at the federal or state level. For example, the state government of Pennsylvania understood that the economic activity from fracking could be very, very positive for the state. So they worked with the fracking industry and enacted numerous regulations to try to make sure that two things happened: that they eliminated the dangers to the extent that you can, but that they allowed fracking sites to go forward because the jobs and tax revenue were so positive.

In New York State, they've put a moratorium on fracking, basically saying, "I don't know what to do, so I'll study it and see what happens." I think that's unfortunate, because most of New York is quite economically depressed, and they are denying people economic opportunities.

I have taken a very strong position that it's a bad idea to federalize regulations. If you leave it at the state level, local governments will tend

to strike a balance between the economic benefits and the environmental safety issues. If it is left to the federal government, you'll have the same problem you had with the Keystone oil pipeline: people who are not impacted, who will not enjoy the economic benefits, will be allowed to come in and say they don't like it.

What are the economic benefits of fracking?

Everett: It creates jobs, but that's not the most important way to measure its economic effect. The cost of everything we purchase has an energy component to it, either in its manufacture or its shipping or its packaging. So it is very important to the economy to have energy prices that are relatively low.

Natural gas has become incredibly inexpensive, way beyond what we ever thought possible. We're talking about prices going from $10 or $11 per thousand cubic feet 10 years ago down to $3.77 now, because the supply that has been released by this innovative fracking production technique is just so large. It is a simple consequence of supply and demand. These natural gas prices are the equivalent of oil prices falling to $21 per barrel from their current $86 per-barrel price.

Rumpler: First of all, any discussion of economics needs to deal with costs as well as benefits. This fall, our Costs of Fracking report detailed the dollars drained by dirty drilling—from property damage to health-care costs to roads ruined by heavy machinery. In Pennsylvania's last extractive boom, the state was stuck with a $5 billion bill to clean up pollution from abandoned mines. What happens when the fracking boom is long gone and communities are stuck with the bill?

In contrast, energy efficiency, wind and solar all provide great economic benefits with no hidden costs. But the oversupply of cheap gas is driving wind and solar out of the market. It's long been fashionable to say that

natural gas can be a bridge to clean energy, but in fact it's become a wall to clean energy, because investors don't want to put money into wind and solar when gas is so cheap.

What danger to the environment or the economy is caused by the billions of gallons of fresh water each year that are "consumed" by fracking operations? How might this affect the economic benefits or environmental concerns?

Everett: The water from fracking can be handled in one of several ways: storing, reinjecting and recycling. The real problem we have is that water is not properly priced. As a landowner, you are entitled to draw water from underground aquifers at whatever rate you wish, even if that water is only flowing through your land. We therefore tend to treat water as a free good. Putting a price on it or, alternatively, finding a way to assign property rights would probably fix this problem. As a third alternative, government could regulate it. In any case, it's a solvable problem.

Rumpler: Each fracking well uses millions of gallons of water. And that water mostly winds up either staying down in the well or being injected deep into the earth as wastewater. So unlike other sectors that use much more water by volume, including agriculture and residential, the water used for fracking is mostly consumed, gone to us forever.

Does the current low price of natural gas affect fracking or conventional gas production?

Rumpler: Take a look at Chesapeake Energy, which is one of the biggest fracking operators out there. By the accounts of some analysts, they are massively overextended, with too much land and too many drilling leases. With the price at $2 per million BTU, there was some

risk that Chesapeake could at some point lose enough money to risk bankruptcy—and then what would happen to these communities where fracking has taken place? If not Chesapeake, it will be another driller—probably one of the smaller ones—that goes under, and the communities will be left holding the bag. And gas companies don't tell landowners leasing property that oil and gas operations are violations of most standard mortgage agreements, because that is not a risk that the lender is willing to take. Likewise, homeowners' insurance may not cover damages from fracking. Nationwide insurance announced just this summer that their standard policy does not cover damage from fracking. That tells you something. The risk analysts who did the math figured out this is not a safety winner for them.

Everett: The price of natural gas has now gotten so low that some are saying they can't produce it economically—but this is a good thing for all of us, because it will force them to explore new markets and uses. The United States has an open economy and is a large global trading player. Americans pay the global price for the many things we buy and sell, and energy is one. There are several directions that natural gas production, both fracking and conventional, can take.

One is that people just stop producing it at the current rates, and the price returns to a more stable level and just stays there, likely at the $10-to-$12-dollar level of a decade ago. We could also start exporting. The world price for natural gas is $15 to $16 per thousand cubic feet. By selling it on the global market, that money would come into the U.S. economy. It would require some expensive infrastructure to support it, but the profit margin is so huge, some $12 per thousand cubic feet, that it would be well worth it and a positive impact on our economy.

We could also begin to shut down older coal-fired power plants and replace them with cleaner natural gas plants, and natural gas could find its way into the transportation sector. With engine modifications, it could

be used as fuel for cars, or it could be used to produce the battery power for electric cars.

What if we halted all fracking right now?

Everett: If we stopped right now, or placed a moratorium on new fracking, the price of natural gas would go up to the previous $10 to $11, or worse case, to the global price of $15 to $16. This means electricity prices wouldl go up, heating prices would go up, and we'd lose the economic activity the industry is generating through jobs and lower prices. Basically we would be giving up an opportunity.

Hazards can be controlled through solid regulations that include monitoring and quick responses to problems that arise. Any risks are outweighed by economic benefits. It's not even a close call.

Rumpler: There's a difference between not starting fracking in new areas and halting it everywhere immediately. If we don't open new places to fracking in New York, Pennsylvania and Texas—just stop where we are now—the impact would be minimal. As Bruce notes, there is so much gas being produced right now that some gas companies are aggressively seeking export licenses, because they want to get rid of the excess and earn a profit. We don't need it to fill energy needs.

In North Dakota they are flaring off the gas, just wasting it into the air. If we need this gas to meet our energy needs, then they should make gas flaring a federal crime and should immediately ban any and all exports of natural gas. The industry would fight tooth and nail against this.

Until we know more, the risks to our health and environment far outweigh any possible benefit to our economy or energy future.

Provided by Tufts University

Citation: Is the new boom in domestic natural gas production an economic bonanza or environmental disaster? (2012, December 12) retrieved 26 April 2024 from https://phys.org/news/2012-12-boom-domestic-natural-gas-production.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.