Testimony
Committee on Agriculture and Wildlife
House of Representatives
State of Oklahoma

Water Use and Hydraulic Fracturing: Myths and Facts
Steve Everley
Team Lead
Energy In Depth
September 9, 2014

Thank you for the opportunity to address the Committee on this very important topic.

My name is Steve Everley, and I serve as Team Lead for Energy In Depth, a research and education program of the Independent Petroleum Association of America. IPAA represents the oil and natural gas companies that drill 95 percent of all new wells in the United States, and the average company size is fewer than 20 employees. The Energy In Depth program, which IPAA launched in 2009, focuses on issues related to onshore oil and natural gas production, specifically the development of America's "tight" resources across the country. For simplicity, many of these resources are often referred to as shale oil or shale gas plays, or just shale development, shorthand I will use as well.

WATER USAGE NATIONALLY

As many of you know, to develop shale resources, companies must use a technology called hydraulic fracturing, or "fracking." As the name implies, this process requires the use of water -- along with sand and a comparatively small set of additives -- to unlock oil or natural gas, which is typically found about a mile or more below the surface. Though it has advanced and been significantly improved upon since its initial use, the first commercial application of hydraulic fracturing was in 1949 – right here in Oklahoma.

The use of water during hydraulic fracturing has generated some public concern, with questions about potential pollution of drinking water typically at the forefront. The scientific and regulatory communities, including officials in the Obama administration, have affirmed through research and years of experience that the hydraulic fracturing process itself does not pose a credible risk of contaminating groundwater. President Obama's former U.S. EPA Administrator, Lisa Jackson, summarized this conclusion when she said in 2012: "In no case have we made a definitive determination that the fracking process has caused chemicals to enter groundwater."[1] A study for the U.S. Department of Energy, released just a few years ago, put the likelihood of

[1] "EPA's Lisa Jackson on safe hydraulic fracturing," accessed via YouTube: https://www.youtube.com/watch?v=_tBUTHB_7Cs

such an event at about one in 200 million.[2] That is roughly the same likelihood of an individual winning the Mega Millions jackpot.

To be clear, there are other parts of developing oil and natural gas that may pose a higher risk. Virtually all of these processes -- such as well casing and fluid handling on the surface -- have been part of the textbook of developing oil and natural gas for a century or longer. Moreover, strong regulations exist at both the state and federal level to mitigate these risks.

The topic I would like to address in more detail, however, is the actual usage and consumption of water during shale development. Although concerns tend to focus on contamination of groundwater, others have raised questions about the sheer volume of water used and its impact on the availability of water for other users. This concern is especially pronounced in areas suffering from drought or near-drought conditions, or in areas where water is historically scarce.

At first glance, the amount of water used for hydraulic fracturing can appear quite large. Estimates vary, and geology is not uniform, meaning water usage can differ from one region to another. But a typical horizontal well that is hydraulically fractured will use about four to six million gallons of water. Nationwide, the industry used upwards of 135 billion gallons of water for hydraulic fracturing activities in 2011.[3]

Again, this may seem like a lot of water, and it certainly is a significant number. But as with any technical process, context is key, and oversimplifying these numbers can result in misleading or even incorrect assumptions. If we are discussing water table stress or water availability, the raw numbers tell us less than what we can see from comparative usage data, specifically the percentage of water used in an area for hydraulic fracturing.

In 2009, a study prepared for the U.S. Department of Energy[4] analyzed the amount of water required for hydraulic fracturing against total water demand. The report concluded that, on average, hydraulic fracturing would only account for about 0.8 percent -- eight tenths of one percent -- of any given region's total water demand. The amount of water used for hydraulic fracturing in 2011 constituted about 0.1 percent of all freshwater withdrawals nationwide.

Put differently, the amount of water used for all hydraulic fracturing activities nationwide in 2011 was roughly equivalent to what the City of Houston consumes each year.

WATER USE IN LOCAL CONTEXT

These are national figures, but the data are not much different at the state level.

---

[2] "Modern Shale Gas Development in the United States: A Primer," April 2009: http://energy.gov/sites/prod/files/2013/03/f0/ShaleGasPrimer_Online_4-2009.pdf

[3] "Energy Facts: How Much Water Does Fracking for Shale Gas Consume?" April 2013: http://theenergycollective.com/jessejenkins/205481/friday-energy-facts-how-much-water-does-fracking-shale-gas-consume

[4] "Modern Shale Gas Development in the United States: A Primer," April 2009: http://energy.gov/sites/prod/files/2013/03/f0/ShaleGasPrimer_Online_4-2009.pdf

Two states with robust oil and natural gas activity demonstrate this fact with clarity. In Colorado, all oil and natural gas activity accounts for less than one percent of the state's water usage. Hydraulic fracturing itself accounts for less than one-tenth of one percent.[5] In Texas, the largest oil and natural gas producing state, the numbers are virtually the same. In fact, the City of Austin alone uses about 31 percent more water than what is used for hydraulic fracturing statewide. That's a pretty amazing statistic for a state that will be producing more oil than every OPEC country by the end of this year, save for Saudi Arabia.[6]

In New York, regulators have spent half a decade studying the potential impacts of shale gas development. They determined that, should shale development move forward, the amount of water it would require would increase statewide demand only by about 0.24 percent, or just less than one-quarter of one percent.[7]

In Oklahoma, the numbers are a bit larger, although that is to be expected since oil and natural gas development plays a comparatively larger role in Oklahoma's economy than in other states. Water used by the oil and natural gas industry amounts to a little over two percent of the state's total water demand.[8]

At the local level, water consumption numbers can diverge from national or even statewide averages. This is because in some counties, oil and natural gas development is a large if not the largest contributor to the local economy. However, data from the state of Oklahoma show that even in counties where oil and natural gas development uses more than just a fraction of a percent of total water use, other industries still account for greater consumption.

For example, in 2011, Carter County was the largest oil producing county in Oklahoma. Roughly 80 percent of the water demand in that county comes from sectors other than oil and natural gas development. Although oil and natural gas activities do account for about 20 percent of total water demand, which is higher than national and even statewide averages, this is also the largest oil producing county in the fifth largest oil producing state nationwide. Of the top ten oil and

[5] Colorado Oil and Gas Conservation Commission, "Water Sources and Demand for the Hydraulic Fracturing of Oil and Gas Wells in Colorado from 2010 through 2015" http://cogcc.state.co.us/Library/Oil_and_Gas_Water_Sources_Fact_Sheet.pdf

[6] "Texas expected to outproduce all but one of the OPEC nations this year," *San Antonio Business Journal*, April 2014: http://www.bizjournals.com/sanantonio/blog/eagle-ford-shale-insight/2014/04/texas-expected-to-outproduce-all-but-one-of-the.html

[7] New York Department of Environmental Conservation, "Supplement Generic Environmental Impact Statement on The Oil, Gas and Solution Mining Regulatory Program," September 2011: http://www.dec.ny.gov/data/dmn/rdsgeisfull0911.pdf

[8] Oklahoma Water Resources Board, "Comprehensive Water Plan: 2012 Executive Report" http://www.owrb.ok.gov/supply/ocwp/pdf_ocwp/WaterPlanUpdate/draftreports/OCWP%20Executive%20Rpt%20FINAL.pdf

natural gas producing counties in Oklahoma, oil and natural gas activities exceed 20 percent of total water usage in only three.[9]

CONSUMPTION AND FUTURE GROWTH

Although the data on water use present a far less frightening picture about hydraulic fracturing than what we may read in the newspapers, some critics have asserted that hydraulic fracturing is a consumptive use, since the water used often either remains in the producing formation or is injected into a wastewater disposal well. Thus, some claim comparing water used for hydraulic fracturing against other industries is misleading, as other sectors will return the water to the hydrologic cycle.

But even among consumptive uses, hydraulic fracturing is still relatively small. In fact, consumptive water use for shale gas recovery nationwide amounted to just 0.3 percent of total use in the United States.[10] Agriculture consumes far more water than oil and natural gas development, according to data from the U.S. Department of Agriculture. Irrigation, which can include residential use, is also a larger source of water demand, which is why lawn watering limitations often are among the first restrictions to go into effect during droughts.

One additional concern, however, is that as the industry continues to grow, it will require more water. But state projections in Oklahoma show that the industry will remain a comparatively small user of water, even as the industry expands. In 2020, 2030, and 2040, the oil and natural gas sector is projected to be the second smallest overall user of water in Oklahoma. By 2060, water consumed by the oil and natural gas industry will still account for only a fraction of what is consumed by power generation, irrigation, and municipal use.[11]

To be clear, this does not mean that the industry should ignore its water use, nor does it suggest companies should stop looking for ways to reduce consumption through efficiency and new technology. Thankfully, that's a process already occurring. From 2010 to 2020, the water used by the oil and natural gas industry in Oklahoma is projected to increase by about 75 percent. But between 2010 and this year, oil production in Oklahoma has already nearly doubled, with natural gas production growing rapidly as well. Technology within the oil and natural gas industry is not static, and the processes necessary to reduce water use – overall and per barrel – is something that technical experts are not only studying, but also implementing every day.

BENEFITS OF WATER USED FOR FRACTURING

[9] Oklahoma Water Resources Board, "Comprehensive Water Plan: Water Demand Forecast Report, 2012 Update," December 2011:
http://www.owrb.ok.gov/supply/ocwp/pdf_ocwp/WaterPlanUpdate/WaterDemandForecastReport.pdf
[10] Calculations made by Energy In Depth. To learn more, visit: http://energyindepth.org/national/infographic-the-facts-on-hydraulic-fracturing-and-water-use/
[11] Oklahoma Water Resources Board, "Comprehensive Water Plan: Water Demand Forecast Report, 2012 Update," December 2011:
http://www.owrb.ok.gov/supply/ocwp/pdf_ocwp/WaterPlanUpdate/WaterDemandForecastReport.pdf

These water usage data also only tell us part of the overall story. The benefits we accrue from oil and natural gas development, and thus from the water used during production, are also quite large. The World Economic Forum has estimated that the oil and natural gas industry created nearly ten percent of all jobs in the United States in 2011.[12] The average hourly wage for workers in the oil and natural gas industry is about 64 percent higher than the national average for the private sector.[13]

Of all the companies nationwide paying income taxes, the top two payers -- and three of the top seven -- are oil and natural gas companies.[14] According to IHS-CERA, shale oil and gas development generated $74 billion in state and federal tax revenue in 2012 alone.[15] This tax revenue allows us to hire more teachers, pay police officers and firefighters better wages, and improve a variety of public services that we all demand. It's no coincidence that the top oil and natural gas producing states are often facing smaller budget shortfalls than their neighbors, if not searching for ways to handle their recent surpluses.

The return on water investment -- what is generated per unit of water used -- is also seen in the sheer amount of energy unlocked. The amount of energy produced per one million gallons of water used for shale gas recovery is enough to power more than 8,500 American homes. On an energy equivalent basis, this is over 23 times more energy than what is produced from one million gallons of water used for ethanol production. Compared to nuclear power and solar power, the output from shale gas is 1,700 times and 2,300 times larger per one million gallons used, respectively.[16]

This is one reason why University of Texas researchers determined last year that increased use of natural gas can actually help conserve water resources. The UT study estimated that switching power plants to run on natural gas can save up to fifty times more water than what is used during hydraulic fracturing.[17]

In Oklahoma, as mentioned earlier, the oil and natural gas industry accounts for about two percent of the state's total water usage. But approximately one out of every seven jobs in the state is supported by the oil and natural gas industry. According to a report released earlier this

[12] "Oil, gas industry created 9 percent of new U.S. jobs in 2011: WEF," Reuters, March 2012: http://www.reuters.com/article/2012/03/07/us-energy-jobs-idUSTRE8260RT20120307
[13] "Industries at a Glance: Oil and Gas Extraction," U.S. Bureau of Labor Statistics: http://www.bls.gov/iag/tgs/iag211.htm
[14] "The 25 U.S. Corporations That Pay The Highest Taxes," Forbes, 2013: http://www.forbes.com/pictures/mef45kghl/which-corporations-pay-the-highest-taxes/
[15] "America's New Energy Future: The Unconventional Oil and Gas Revolution and the Economy – Volume 3: A Manufacturing Renaissance," IHS-CERA, September 2013: http://press.ihs.com/press-release/economics/us-unconventional-oil-and-gas-revolution-increase-disposable-income-more-270
[16] Calculation by Energy In Depth. For more information, visit: http://energyindepth.org/national/return-water-investment-shale-leads-jobs-energy/
[17] "Natural Gas Use in Power Generation Saves Water and Reduces Drought Vulnerability," Univ. of Texas, December 2013: http://www.utexas.edu/news/2013/12/19/natural-gas-benefits/

year by the State Chamber of Oklahoma, in 2012 the industry employed more than 57,000 hardworking men and women in Oklahoma, with an average salary of $110,000 per year.[18]

The oil and natural gas industry is also the largest taxpayer in Oklahoma, accounting for over one-fifth of all tax revenue the state generated in 2012, and it is the largest single source of capital spending in the state. In 2012, the industry invested over $11 billion in Oklahoma's economy.

The results of that investment are not just jobs and tax revenue, but also greater energy security. Oklahoma has long been known as a major oil and natural gas producer, so the fact that it has doubled its oil production in just the past four years is an indication of just how significant this latest energy boom truly is.

Nationwide, oil and natural gas production is now at its highest level since the early 1970s, and net petroleum imports are at their lowest level since Ronald Reagan's second term. Shale gas has helped propel the United States past Russia as the largest natural gas producer worldwide.[19]

The United States is also projected to become the world's largest oil producer by the end of this decade, thanks to the enormous resources unlocked by hydraulic fracturing. U.S. production has already helped cushion the United States from supply shocks in Libya and elsewhere that otherwise would have caused gasoline prices to rise. According to AAA, the U.S. shale boom has actually saved consumers about 40 cents per gallon at the pump.[20]

CONCLUSION

Hydraulic fracturing is often described as a water intensive process, and many groups who have long tried to outlaw oil and natural gas development in the United States have used raw numbers to try to scare the public about the impacts of domestic energy production. They have claimed that the oil and natural gas industry will worsen droughts and deny families access to drinking water. The facts, as they say, tell a different story.

Nonetheless, many people do have real questions and concerns about water usage within the oil and natural gas industry. These individuals, many of whom actually support domestic oil and natural gas development, deserve to have their questions answered based on facts and the best scientific research. Hopefully the information and data I have provided here today can help answer some of those questions, and I urge everyone to visit our website -- www.EnergyInDepth.org -- to learn even more about this subject.

---

[18] "Economic Assessment of Oil & Gas Tax Policy in Oklahoma," State Chamber of Oklahoma Research Foundation (prepared by RegionTrack, Inc.), January 2014: http://www.okstatechamber.com/sites/www.okstatechamber.com/files/OklahomaOilGasTaxPolicy_Jan2014_0.pdf

[19] "U.S. expected to be largest producer of petroleum and natural gas hydrocarbons in 2013," U.S. Energy Information Administration, October 2013: http://www.eia.gov/todayinenergy/detail.cfm?id=13251

[20] "AAA: Shale Boom Keeps High Gas Prices From Going Higher," Oilprice.com, accessed via NASDAQ: http://www.nasdaq.com/article/aaa-shale-boom-keeps-high-gas-prices-from-going-higher-cm348193

Thank you, and I look forward to answering any additional questions you may have.