Policy 360 – Ep 61 The Fracking Debate - Transcript

Karen Kemp: Hello and welcome to Policy 360. I'm Karen Kemp, sitting in this time for Kelly Brownell. In recent years, oil and gas production in the United States has increased rapidly, in part because of new technologies. High volume hydraulic fracturing or fracking is one of these new processes. Here's how fracking works. Fluid is pumped deep underground creating cracks in the rocks. These cracks make it easier to extract the oil and gas.

Fracking is hotly debated. Proponents say it's good for the United States, that it has cause an economic boom for many communities and is helping the country become energy independent. Opponents site health and environmental concerns, mainly water pollution. There are a lot of other questions surrounding fracking. Does it cause earthquakes? Is it well regulated? My guest today is Daniel Raimi. Daniel set out to look at the evidence for these and other questions. As a part of his research he traveled to every major US oil and gas producing region, North Dakota, Wyoming, Pennsylvania, Texas, and beyond. He turned his scholarly research and his travels into a book called The Fracking Debate: The Risks, Benefits, and Uncertainties of the Shale Revolution. Welcome to Policy 360 Daniel.

Daniel Raimi: Thank you Karen, it's great to be here.

Karen Kemp: Tell me why did you write this book?

Daniel Raimi: I wrote the book because I thought there was a need to answer some of these questions that people kept asking me at dinner parties. Anytime I met someone new or got together with old friends and was asked about what I was working on I would tell them that I was researching oil and gas issues, that I was interested in climate change. When I said the word fracking people's ears perked up and they had a series of questions that reflect the issues that you raised, as well as a couple more issues. I thought it would be useful for the general public, and maybe even more so, policymakers to have a reference that they could go to that is based on the academic research outlining what we know and what we don't know about these big questions related to the shale revolution.

At the same time, I was doing all of this traveling, as you mentioned, to oil and gas producing regions and I'd collected a bunch of stories that I thought were pretty interesting. I enjoyed writing those stories down and trying to integrate them in with the state of the literature to hopefully explain in an accessible way, and maybe even a fun way, what these big questions are and how we might think about them going forward.

Karen Kemp: Great, so let's start with the basics so everybody has a shared understanding of how fracking works. Tell us about it.

Daniel Raimi: As you mentioned in the introduction, hydraulic fracturing or fracking is a process by which companies mix together large volumes of water, sand, as well as chemicals, and they inject that fluid deep underground into a well that's already been drilled. Sometimes people refer to fracking as a well drilling technique or a drilling technique and that's not quite accurate. It's something that happens after the well has been drilled, and the industry will refer to it as a way of stimulating an oil or gas well.

The idea of stimulating an oil and gas well goes back to the 1850s, to the very beginning of the oil industry in Pennsylvania where people would walk around with wheelbarrows full of nitroglycerin based explosives and sell them to oil well operators so that they could lower the explosive to the bottom of their well, detonate it, and increase the amount of oil that that well produced. That's the very earliest type of well stimulation.

The thing that's really new about fracking in today's iteration is that it's applied at large volume, as you said, and it's applied to these rocks called shale rocks or other type rocks. These rocks hold a lot of oil and gas, but for decades the oil and gas industry has not been able to access that oil and gas in an economical way. They've always known there's oil and gas there but it couldn't be extracted profitably.

This high volume hydraulic fracturing, coupled with other technologies such as horizontal drilling and advanced seismic mapping and other things, that's enabled enormous growth in the United States natural gas and oil production, so that today the US is producing far more natural gas than it ever has, and it's producing near its peak of oil, almost 10 million barrels a day today in late January.

Karen Kemp: You mentioned that you traveled all across the United States looking at different fracking operations. Paint a picture of some of the places that you visited.

Daniel Raimi: I have so many stories that it's going to be difficult for me to pick one. I guess my first reaction is the first trip that I took was to southwestern Pennsylvania, south of Pittsburgh, and then to northeastern Pennsylvania, north of Scranton. I had seen documentary films, I had read news reports that described the impact of the oil and gas industry as being really enormous and really stark. When I traveled to Pennsylvania for the first time I almost expected to see something out of Fritz Lang's Metropolis film or some other dystopian scene. What I found in Pennsylvania was nothing like that.

I actually had a hard time finding oil and gas wells to take pictures of. I had a hard time finding rigs that I could see across the hills in southwestern Pennsylvania. That's not to say that the industry wasn't affecting the community, it certainly was, but it wasn't as dramatic as I had expected.

In other parts of the country though, say in west Texas, or in parts of Wyoming, or western Colorado, the signs of the industry are everywhere and they're impossible to miss. If you're driving anywhere in a two hour radius of Midland, Texas you're going to see drilling rigs, you're going to see pump jacks, and all kinds of equipment that are the telltale signs of the oil and gas industry.

Oil and gas production looks different and feels different in different parts of the country. Oil and gas production in southwestern Pennsylvania has an important impact, but because the region is relatively diverse economically, and because it's relatively densely populated, you don't feel the same presence of the industry as you do when you go to west Texas where it's a very rural region and the oil and gas industry is really the bedrock of the regional economy.

Karen Kemp: Let's talk about flaming water faucets. Where did this image come from?

Daniel Raimi: The image of the flaming faucet was popularized by a 2010 documentary called Gasland. The film was nominated for an Academy Award. It was one of the first things that I watched when I was starting to learn about this topic, and it scared my pants off. It paints hydraulic fracturing, and particular and the oil and gas industry as a whole as a sort of out of control, polluting everywhere it goes danger to the communities where it operates.

We'll talk later about the realities and myths of that portrayal, but what the flaming faucet represents is methane in drinking water. Methane is essentially the same thing as natural gas, and methane can end up in drinking water either naturally or because of mistakes in the oil and gas drilling process. It's actually not fracking itself that leads to methane in drinking water. Remember fracking isn't the same thing as drilling a well. If you drill a well and you have problems with the steel and the cement that are supposed to encase the well, then methane can travel from inside the well outside into drinking water sources.

Whether or not a well is hydraulically fractured, an oil and gas well has the potential to transmit methane into drinking water sources. It doesn't happen very much, but when it does happen it can lead to natural gas in your water. If there's enough natural gas in your water then you can potentially light your water on fire.

The flaming faucet scene in Gasland was actually filmed in Colorado. Many people think that it was filmed in a place called Dimock Township in Pennsylvania. It was actually filmed in Weld County, Colorado, which is north of Denver. I didn't go to that particular house. I didn't try to light any water on fire with I was in Weld County, but I did spend a lot of time there. I've actually been to Weld County three times in the last several years. The specific flaming faucet in Gasland, that is a matter of debate. The Colorado Department of Environment reviewed that case and determined that the methane in that individual home's drinking water was actually not caused by oil and gas drilling. It was actually caused by the way that the water well was drilled. The water well itself was drilled into a pocket of naturally occurring methane.

Just because you see someone light their water on fire it doesn't mean that it was necessarily caused by oil and gas development. The reality is oil and gas development and natural causes can both lead to this problem.

Karen Kemp: A lot of the concerns that environmentalists have about fracking are related to the water table and whether this activity is occurring too close to water tables. Tell us about that situation. Are there regulations that control that? Are there places where it is too close to the water table?

Daniel Raimi: It's a great question, and concerns about water contamination have been the leading concern of many environmental groups. There are three things that I want to touch on to answer your question. The first is related to methane in water. Methane in water happens occasionally when there are problems with oil and gas drilling, but it doesn't happen very often. If you look at the data, in Pennsylvania for example, in Pennsylvania in 2010 the rate of water contamination from each new shale well drilled was something like .7%. For every 100 wells that were drilled you might expect slightly less than one water source to be affected by methane.

Over time, the Pennsylvania Department of Environmental Protection revised its regulations. Companies got better about operating in the area and the rate of water contamination went down every year, so that in 2015 there were 800 new shale wells drilled and hydraulically fractured in Pennsylvania and there were zero new cases of water contamination. Does it happen? Yes. Does it happen very often? No.

The second part of the answer to your question has to do with the depth at which hydraulic fracturing takes place. Typically, oil and gas wells are hydraulically fractured 3,000, 4,000, up to 10,000 feet below the surface. Drinking water sources are commonly found at depths of 500 feet or maybe 1,000 feet in an extreme case. In the large majority of cases hydraulic fracturing really does not take place anywhere near drinking water sources, and the likelihood of chemicals or other contaminates moving from deep below where fracking takes place, up to those water tables is extremely small, near zero. There's really only one case and it was in a place in Wyoming that is also featured in Gasland where there's pretty reasonable evidence that hydraulic fracturing itself affected the water source.

This particular case in Wyoming is unusual because fracking occurred at roughly 1,200 feet as opposed to other wells which are typically fractured at much deeper depths.

Karen Kemp: That 1,200, that was an anomaly, a mistake, or an experiment that went wrong. I'm just curious if you remember?

Daniel Raimi: It wasn't a mistake, it was intentionally fractured at that depth. Fracturing at that depth is unusual but it's not unheard of. There was a paper published in

2015 by a former Duke professor Rob Jackson who's now at Stanford, and that paper lays out the depths at which hydraulic fracturing takes place in different states. What it finds is that the average depth of hydraulic fracturing across the United States is just over 8,000 feet. However, roughly 1% of all wells that are hydraulically fractured are fractured at depths of 1,000 feet or less. Again, it's uncommon that fracturing occurs at these shallow depths, but it does happen in some places. That said, the one case that I mentioned in Wyoming, in a place called Pavillion, Wyoming, that's the only case that I'm aware of and I did extensive research on this for the book. It's the only case that I'm aware of where there's evidence that fracturing itself actually negatively affected the water source.

Karen Kemp: Let's talk about a surprising health benefit that you bring up in the book related to coal. Tell us about that.

Daniel Raimi: Many people have concerns about health risks from shale development, and as we've discussed there are real risks of water contamination. There are other potential risks for people living close by related to potentially air emissions or other sources. One thing that doesn't get talked about very much is the health benefits of increased natural gas production in the United States. That's partly because those benefits are widely dispersed. The risks are concentrated in the areas where drilling takes place and the benefits are dispersed and so they're easier to miss.

Natural gas production has gone way up in the United States. That's pushed natural gas prices way down, and because natural gas is used to generate electricity, that low cost of natural gas has allowed it to take market share away from coal fired power plants. Coal fired power plants emit a number of pollutants, including so called criteria pollutants, mercury, other air pollutants that contribute to tens of thousands of premature deaths each year. Natural gasses displacement of coal fired power has helped reduce those harmful air pollutants. It's hard to precisely quantify the health benefits of that, but we know they're out there. I'm looking forward to someone doing a good study where they try to quantify those health benefits for the United States as a whole.

Karen Kemp: Then there's earthquakes, we've heard about that other possible risk of fracking. Tell us about the town of Anthony in central Kansas. What was the problem there?

Daniel Raimi: Anthony's a small town in Kansas that I visited as part of this work. When I was in Anthony I went to the county courthouse because I was doing research on local government finances. I was in the county courthouse and I was talking to the clerk who was showing me a bunch of financial records. Offhandedly she sort of said, "Oh yes, and the inspector was by the other day and he took a look at our foundation and he's worried." I kind of looked around for the closest exit and gulped deeply. The reason that the foundation was having some problems is that in Kansas, but even more in Oklahoma just south of where I was in

Anthony, there was an enormous increase in the number of earthquakes. These were manmade earthquakes, and the scale of the problem is kind of astounding, at least at first blush. I'll talk about the first blush and then the second blush.

In Oklahoma, in 2015 there were more than 900 earthquakes of magnitude 3.0 or greater. Damage typically occurs only if the magnitude is 5.0 or greater, so most of these earthquakes didn't cause damage but they certainly unsettled people. There have been three earthquakes in Oklahoma that have been above that level of 5.0 and they have caused damage to property. This problem of earthquakes has been caused actually not by fracking itself, but by the disposal of wastewater that's produced from all oil and gas wells. Every oil and gas well, regardless of whether or not it's fracked, produces some water. In some cases wells will produce 20 or 50 barrels of water for every barrel of oil that they produce. The more oil and gas production you have, the more of this wastewater you have to dispose of.

The leading way that companies dispose of this wastewater, in Oklahoma at least, is by pumping it underground into injection wells or disposal wells. These are regulated by the EPA, they've been around for a long time, and they're designed to prevent contaminated water from moving up. They're designed to prevent that contaminated water from reaching drinking aquifers and creating problems with those sources. However, they haven't been designed historically to prevent water from going elsewhere. What happened in Oklahoma is that an enormous volume of water was being injected into one particular rock formation called the Arbuckle, and the Arbuckle basically got water logged. Some of the water moved out of the Arbuckle, moved downward into basement rocks and interacted with naturally occurring faults. That newly introduced water altered the underground pressures in the basement rock and led to this surge in earthquakes.

Finally, I get to the second blush of the question, which is so there's been this dramatic increase in earthquakes, but the actual energy that's been released by these earthquakes, their potential to do damage, is still far, far below the risk in places like California. For example, in 2014 there were far fewer earthquakes in California than there were in Oklahoma, but they've released 200 times as much seismic energy as the Oklahoma quakes did.

This earthquake problem in Oklahoma it's certainly a problem, and there's still more that needs to be done to reduce the quakes, but the likelihood of catastrophic quakes that we think about when we think about maybe Japan or California, that seems quite unlikely.

Karen Kemp: What's being done about waste water then? Are there new techniques being developed to dispose of waste water in less troublesome ways?

Daniel Raimi: There are, there are a couple of different policy approaches that you can take to this problem to reduce the risk. One of those approaches is to simply restrict where the wastewater is injected. I talked about the Arbuckle formation, there

are parts of the Arbuckle formation where it's relatively safe to continue injecting water and there are parts of the Arbuckle formation where the government, the State of Oklahoma has severely restricted the amount of water that could be injected into those zones.

The other technique that companies are using more and more to deal with wastewater is actually recycling the water.

Karen Kemp: You mentioned the role of regulation, particularly in Kansas where there were earthquakes happening, and a lot of people think of fracking as being not sufficiently well regulated. What did you find when you traveled across the country?

Daniel Raimi: The major finding is that there's a lot of variation between states. The federal government is not very involved in regulating fracking. You have to look across states and there are over a dozen states that produce large volumes of oil and gas, and they each have these different regulatory structures. There are a number of papers out there that try to assess the relative benefits of different regulatory approaches, and they have a hard time coming to any clear conclusion about which state does the best job. Some states do a really good job in some ways, and other states do a really good job in other ways. It's difficult to come to a broad conclusion. If you want I could mention a couple examples of regulatory approaches that I think have worked really well, but maybe you have something else in mind.

Karen Kemp: Well I was wondering particularly about the Halliburton, the so-called "Halliburton Loophole" which exempts fracking from federal regulation under the Safe Water Drinking Act. Is that something that you're concerned about?

Daniel Raimi: To be honest, no. The "Halliburton Loophole" is something that gets talked about a lot, and the history of this is actually pretty fascinating and I talk about it in the book. As I mentioned, hydraulic fracturing historically has never been regulated by the federal government. In the 1990s I want to say, I think it was the 90s, there was a lawsuit in Alabama where hydraulic fracturing was taking place and where there were some claims of water contamination. What happened in Alabama is that a local environmental group sued the EPA and tried to force them to regulate hydraulic fracturing under the Safe Drinking Water Act.

The environmental group actually won, and the EPA was required to ask companies to obtain a permit before they hydraulically fractured any wells. It didn't actually prevent companies from fracking but it increased oversight. The thing about that particular lawsuit is that it only applied to Alabama. In Texas, the oil and gas industry has never needed a permit to do fracking, same in North Dakota, same everywhere else in the country. This did not have really a material effect on the state of play for oil and gas regulations.

The “Halliburton Loophole” itself is a result of the 2005 Energy Policy Act, and it's called the Halliburton loophole because it's associated with, then Vice-President Dick Cheney, who was the former president of Halliburton and worked with a variety of others to come up with that Energy Policy Act of 2005. To me, the Halliburton loophole is kind of a red herring. It actually didn't change anything on the ground. It may have forestalled some lawsuits and some regulations that might have happened down the road, but I don't think it's a critical regulatory element. Even if the EPA were regulating hydraulic fracturing there would not be major changes in the risk profile for water, or for air, or for other pathways of concern.

Karen Kemp: You mentioned the term risk profile and it makes me think of Europe where there are some nations that have just said no to fracking across the board. Talk a little bit about that different approach and where does that arise from? Why is it banned in some places whereas here in the US we're moving ahead.

Daniel Raimi: You're right, in several countries in Europe hydraulic fracturing is essentially banned. In New York State, in the United States hydraulic fracturing is essentially banned, as well as in Maryland and Vermont. It doesn't have much of an effect in Maryland and Vermont, but in New York it actually matters because there's substantial amount of shale resources in New York that companies would be eager to access. The grounding for these different approaches I think comes from something called the precautionary principle. The precautionary principle, to put it really simply, is the idea that until you fully understand the risk of any given activity you shouldn't undertake that activity.

That's a coherent way of looking at the world. I think it's understandable. The place where it gets challenging and a little confusing to me is if you apply the precautionary principle to fracking shouldn't you apply it to everything else? When you start trying to apply the precautionary principle to everything in the world of regulation you're going to quickly end up with a lot of bans on a lot of different things because certainty is hard to come by, and proving the absence of risk is extremely difficult, if not impossible in many cases.

I think in New York State and in a couple European countries we're seeing the precautionary principle applied selectively to fracking, and in other states we're seeing more of a cost benefit analysis.

Karen Kemp: Let's move to another hot topic, which of course is climate change. What effect is fracking having in that area?

Daniel Raimi: The effects on climate change are complicated and fascinating. The basic story is that in the last 10 years and probably over the next 10, 15, 20 years hydraulic fracturing, because of the increased production of natural gas that it's enabled, has dramatically reduced US greenhouse gas emissions. Today in the United States total carbon dioxide emissions are roughly around their 1990 levels, and down over 15% from their peak in the first decade of the 2000s.

Karen Kemp: That's attributable to the increase in natural gas production?

Daniel Raimi: Mostly, yes - it's mostly attributable to the displacement of coal by natural gas in the power sector. There are multiple complications to this. Methane, which again is essentially the same thing as natural gas, it's a very powerful greenhouse gas in it's own right, and so if it escapes into the atmosphere then some of those carbon dioxide benefits that I just described can be reduced. There's been a big debate about this, how much methane is escaping from US oil and gas systems, and when you look across the breath of the literature, and I look at over a dozen studies in the book, what you find is that methane emissions are a problem, they can be improved, they should be reduced to continue reducing greenhouse gas emissions, but methane emissions are not high enough to negate the benefit of natural gasses displacement of coal.

When you add all that up in the short-term, natural gas looks like a pretty clear win for the climate. Things, again, take a complicated turn when you start thinking over longer time scales. Over those longer time scales hydraulic fracturing, because it's lowered the cost of natural gas and it's lowered the cost of oil substantially, that encourages people to use more of those fuels. That leads to higher greenhouse gas emissions. Over time, what studies show is that in the absence of greenhouse gas policy, the shale revolution probably doesn't help that much and probably doesn't hurt that much in the long term in the fight against climate change.

Fundamentally, with or without the shale revolution the United States and the world needs robust climate change policy to get a handle on this problem.

Karen Kemp: In writing your book The Fracking Debate, you spent a lot of time immersed in one of the most controversial environmental issues today. What are one or two recommendations you would make, whether they're policy recommendations or otherwise, when it comes to this topic?

Daniel Raimi: There are two that come to mind, two big ones right off the top of my head. One of them we've already talked about, and the one we've already talked about is climate policy. Climate change is an enormous challenge for the United States and for the world as a whole. I think that the shale revolution actually provides an opportunity to implement climate policy at lower cost than we otherwise could, and I hope we're able to take advantage of that opportunity.

The second recommendation, it's less of a policy recommendation and it's more of a political recommendation. A lot of people see this issue, the fracking issue, as really black and white as you're either pro-fracking or you're anti-fracking. I don't think that's particularly helpful. When you travel to these communities and you see the risks and you see the benefits and you talk to people about them, you understand there are real opportunities for improvement in regulation and there are real risks that we should protect against. The only way to come up with those balanced policies that achieve those goals is by understanding that it's not an all or nothing proposition. Regulators, the only

way that they can come to those sensible ends is to start from the perspective that it's not all good and it's not all bad.

Karen Kemp: Thanks very much for joining me today. Daniel Raimi is a senior research associate at Resources for the Future where he focuses on energy and climate issues. He also teaches energy policy at the Gerald Ford School of Public Policy at the University of Michigan. His book is called The Fracking Debate: The Risks, Benefits, and Uncertainties of the Shale Revolution. We'll have a link at our website policy360.org. Thanks for joining us, I'm Karen Kemp.