FRACKING THE FUTURE

How Unconventional Gas Threatens Our Water, Health and Climate

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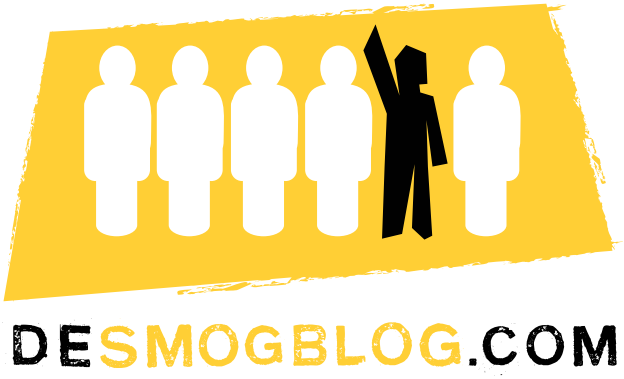

Fracking The Future

How Unconventional Gas Threatens our Water, Health and Climate

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Executive Summary

Unconventional gas drilling is emerging as one of the most controversial energy & environmental issues in the United States and around the world today.

Advancements in extraction technologies, particularly horizontal drilling and high volume hydraulic fracturing (fracking), have enabled drillers to reach previously inaccessible gas in geological formations underlying several areas of the U.S.

Increasing public awareness of the threats posed by America's dependence on foreign oil and dirty coal to public health and the global climate have led many – including some environmental organizations and progressive politicians – to embrace gas as a "bridge fuel" to help America kick its dirty energy addiction.

But recent revelations about the dangers that unconventional gas drilling poses to drinking water supplies, public health and the global climate are raising important questions about how "clean" this gas really is.

Scientists studying the impacts of unconventional gas drilling warn that gas is likely to have a greater influence on water, air and climate than previously understood. Major scientific bodies have cautioned against a national commitment to gas as a bridge fuel, citing the need for further research into the potential consequences of continued reliance on this fossil fuel.

A growing number of land owners, former gas industry executives and elected officials are also challenging the notion that gas is as clean as its proponents argue, and questioning whether unconventional gas drilling can be done without threatening drinking water supplies, air quality and the global climate.

Yet the gas industry continues to benefit from lax oversight and several exemptions from existing public health protections, such as the Safe Drinking Water Act and parts of the Clean Water Act that apply to other fossil fuel extraction industries. Recent attempts by federal agencies and lawmakers to improve oversight of gas operations have been met with strong resistance from the gas industry and its alliance of front groups and defenders in the media.

The gas industry's influence in Washington has grown tremendously thanks, in large part, to the rapid consolidation of the gas industry into the hands of the largest oil companies in the past few years. Not long ago, the industry was made up primarily of what its proponents call "mom and pop" companies—small operators that drilled chiefly for conventional gas.

But with recoverable deposits of that relatively 'easy' conventional gas dwindling in the Lower 48, larger drillers have turned their focus to the more difficult and expensive unconventional gas plays.

Oil giants such as BP, ExxonMobil, Shell and Chevron now dominate the gas industry. The industry's chief front group, Energy In Depth (EID), goes to great lengths to maintain the "mom and pop" image of the industry, claiming it represents small and independent gas producers.

However, its own documents prove that its early funding – and ongoing financial support – comes from many of the largest oil and gas interests.

EID and other gas lobby groups argue that federal oversight and increased scrutiny and accountability measures would harm the industry's development and risk jobs. But big oil companies have made that same "economy-killing" argument for decades – a strategy they learned from tobacco companies and the chemical industry – while amassing record profits and enjoying spectacular growth.

Through intensive lobbying, campaign contributions and other forms of influence, these oil and gas companies have successfully thwarted efforts to hold the gas industry accountable for its impacts on health and the environment.

Now the same companies that brought us the Exxon Valdez spill, the BP blowout in the Gulf of Mexico, Chevron's destruction of the Amazonian rainforest in Ecuador and countless other pollution examples, want the public to blindly trust them - with zero federal oversight - as they pursue drilling for much riskier unconventional gas throughout the country.

The question is, given the oil industry's track record of environmental and health disasters, can the public trust them to get it right with the more challenging unconventional gas?

This report is designed to shed light on the rapidly changing composition of the gas industry and to raise important questions about whether the rush to exploit unconventional gas may be coming at too high a cost to the environment.

While coal and oil certainly pose their own significant challenges to health and climate, it is important to recognize that unconventional gas is also a dirty fossil fuel and does not belong in any credible definition of "clean energy."

Given the extensive uncertainties surrounding the impacts potentially connected to the unconventional gas industry's current drilling practices, it is only prudent at this point to insist on a pause for further evaluation. In fact, as a direct result of the recent Chesapeake gas well blowout in Pennsylvania that spilled drilling chemicals onto nearby properties and waterways, a former gas company executive called for a moratorium on all fracking operations near waterways in Arkansas's Fayetteville shale region, stating that:

"There is no reason on Earth, if they are going to close it down there, they shouldn't close it down here."

It is becoming increasingly clear that the unconventional gas boom is happening too fast, too recklessly and with insufficient concern for the potential cumulative impacts on our most critical resources – clean air, safe drinking water and a stable climate.

DeSmogBlog joins those who are calling for a nationwide moratorium on hydraulic fracturing and other troublesome practices in the unconventional gas industry. Until independent scientists and experts conduct further studies, the public simply cannot trust the fossil fuel industry to continue with this dirty energy boom.

See page 51 for DeSmogBlog's recommendations to policymakers.

The Myth that Gas is "Clean Energy"

The myth of 'clean' natural gas is contaminating the debate about America's energy future.

Given the widespread public rejection of coal—the dirtiest fossil fuel that deserves the reputation it earned itself—the gas industry has worked very hard to portray its product as a "clean" energy "alternative" fuel. Demonstrating the success of its lobbying and advertising campaigns, even the federal government increasingly refers to gas as a "clean"[1] and "alternative"[2] fuel. President Barack Obama has bought into the myth, including natural gas in his 2011 State of the Union definition of "clean energy sources."[3]

Gas, a polluting fossil fuel, is derived from non-renewable sources of organic material formed millions of years ago.[4] It is drilled for and extracted from the earth through invasive procedures, threatening public health and the environment, especially in areas of the country with lots of drilling activity.[5]

The production, transport and burning of natural gas produces significant air pollution. Methane, the main component of natural gas, is a potent greenhouse gas (GHG), more than 20 times as effective at trapping heat in the atmosphere as carbon dioxide (CO_2).[6] Other natural gas emissions include carbon dioxide (CO_2), sulfur dioxide (SO_X), nitrogen oxides (NO_X), carbon monoxide (CO), particulates, volatile organic compounds (VOCs) including benzene, and more pollution.[7]

In fact, in rural and urban areas of the western United States where oil and gas drilling operations are abundant, air quality is significantly impacted, particularly from ground level ozone (smog).[8] The Associated Press recently reported that Wyoming's air quality is worse than Los Angeles' due to gas development.[9] There are increasing signs that drilling operations in the Marcellus shale region in the eastern U.S. present air pollution concerns as well.[10] Smog pollution from drilling can travel up to 200 miles from the gas production area, causing widespread damage to human and environmental health.[11]

1 http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html
2 http://www.afdc.energy.gov/afdc/fuels/natural_gas.html
3 http://www.whitehouse.gov/the-press-office/2011/01/25/remarks-president-state-union-address
4 http://www.eia.doe.gov/kids/energy.cfm?page=natural_gas_home-basics
5 http://content.usatoday.com/communities/greenhouse/post/2011/03/wyomings-smog-exceeds-los-angeles-due-to-gas-drilling/1
6 http://www.epa.gov/methane/
7 http://www.nrel.gov/docs/fy00osti/27715.pdf
8 http://switchboard.nrdc.org/blogs/amall/recent_news_on_the_toxic_air_p.html
9 http://www.msnbc.msn.com/id/41971686/ns/us_news-environment/
10 http://www.wtae.com/r/26821466/detail.html
11 http://www.endocrinedisruption.com/files/NaturalGasManuscriptPDF09_13_10.pdf

Climate Impacts From Unconventional Gas Development

Due to the increasingly urgent threat posed by global climate change, natural gas is often promoted as an ideal interim energy source (or "bridge fuel") in the transition away from coal and oil towards renewable energy. But as the Council of Scientific Society Presidents—which represents 1.4 million scientists from more than 150 scientific disciplines - reported to the Obama administration in May 2010, "some energy bridges that are currently encouraged in the transition from GHG-emitting fossil energy systems have received inadequate scientific analysis before implementation, and these may have greater GHG emissions and environmental costs than often appreciated." The development of unconventional gas from shale deposits, the Council warns, is an "example where policy has preceded adequate scientific study."[1]

There has been little scientific focus on the topic of climate impacts associated with the production of gas from unconventional deposits. However, the few studies that have been conducted offer a sharp contradiction to the popularized notion that gas is a clean source of energy.

Carbon Dioxide

The development of unconventional gas deposits is an energy-intensive undertaking. The enormous amounts of heavy equipment needed to pump water and create adequate drilling pressure required to extract gas from shale produce significant emissions. The construction of well pads, the collection of water and disposal of wastes all entail transportation-related emissions. Much of the production on an unconventional well pad, such as horizontal drilling and hydraulic fracturing, is powered by polluting diesel engines.[2]

The Tyndall Centre for Climate Change Research estimates that CO_2 emissions from gas drilling amount to 15 kg CO_2 per foot drilled from diesel powered engine use alone.[3] Well depths in the Marcellus Shale, which are remarkably deep, can reach up to 8,000 feet vertically and another 11,000 feet horizontally.[4] A total well length measuring 19,000 feet would produce 285,000 kg (285 metric tones) of CO_2 from diesel engines alone. When calculating associated CO_2 emissions, unconventional wells are set apart from conventional wells for two reasons: extended well distance due to horizontal drilling and, more importantly, hydraulic fracturing.

Hydraulic fracturing, the Tyndall Centre reports, is the main source of CO_2 emissions from unconventional gas drilling. Heavy CO_2 emissions are linked back to the engine-powered fracking process, including the blending of fracturing chemicals and sand that are pumped from storage, and the high-pressure compression, injection and recovery of materials into and out of the well.[5]

1 http://www.eeb.cornell.edu/howarth/CCSP%20letter%20on%20energy%20&%20environment.pdf

2 http://www.tyndall.ac.uk/sites/default/files/coop_shale_gas_report_final_200111.pdf

3 http://www.tyndall.ac.uk/sites/default/files/coop_shale_gas_report_final_200111.pdf

4 http://www.worldwatch.org/files/pdf/Hydraulic%20Fracturing%20Paper.pdf

5 http://www.tyndall.ac.uk/sites/default/files/coop_shale_gas_report_final_200111.pdf

After calculating key CO_2 emissions from shale gas extraction, the Tyndall Centre estimates that a single well drilled once for unconventional gas will emit somewhere between 348-438 metric tonnes of CO_2. As high as this figure is, it only reflects a portion of CO_2 emissions and does not account for the entire spectrum of greenhouse gas (GHG) emissions from unconventional gas drilling.

Beyond the issue of CO_2 emissions, there are mounting concerns regarding gas' main component: methane. Fugitive methane is an enormous additional source of GHG emissions from gas drilling.

Methane

According to a recent lifecycle analysis performed by a team of Cornell University scientists led by Professor Robert W. Howarth, unconventional gas—particularly when it is extracted from shale using hydraulic fracturing methods—is likely to present an even greater climate disruption threat than coal and oil, the other dirty fossil fuels. Due to the substantial methane emissions from extraction, processing and transport, unconventional gas may have a greater overall GHG impact than previously understood.

Howarth and his coauthors maintain that when these lifecycles aspects are considered "the large GHG footprint of shale gas undercuts the logic of its use as a bridging fuel over coming decades, if the goal is to reduce global warming."[1]

The most recent analysis conducted by Howarth's team at Cornell, recently published in the peer-reviewed scientific journal Climatic Change Letters, states that on a 20-year time horizon **"the GHG footprint for shale gas is at least 20% greater than and perhaps more than twice as great as that for coal when expressed per quantity of energy available during combustion."**[2]

Professor Howarth calculates that the extraction, processing and transport of natural gas, when considered in tandem with methane leaks, places natural gas ahead of other fossil fuels in terms of total greenhouse gas emissions. "The take home message of the study" says Professor Howarth, is "if you do an integration [study] of 20 years following the development of the gas, that shale gas is worse than conventional gas and is in fact worse than coal and is worse than oil."[3]

The Cornell team has cautioned politicians and industry against a large-scale switch to natural gas, warning that the scramble to develop unconventional gas reserves without considering the full impact of the process could bring dire consequences for the global climate. The predicted increase of gas production in the US has some analysts worried that gas will not substitute for other dirty fuel sources like coal, but will instead be used in addition to other sources, further contributing to growing total fossil fuel consumption.[4] Despite rapidly increasing domestic production rates, some industry leaders admit that the US, due to ever increasing energy demands, will continue to be a net importer of gas.[5] The Cornell study does not provide a definitive answer on the methane issue, but it raises enough concerns to warrant both an immediate moratorium on issuing new fracking permits to gas companies and the urgent need for further study.

1 http://www.eeb.cornell.edu/howarth/Howarth%20et%20al%20%202011.pdf

2 http://www.eeb.cornell.edu/howarth/Howarth%20et%20al%20%202011.pdf

3 http://shaleshockmedia.org/2011/03/31/marcellus-shale-gas-and-global-warming/

4 http://www.tyndall.ac.uk/sites/default/files/coop_shale_gas_report_final_200111.pdf

5 http://www.nytimes.com/gwire/2010/03/11/11greenwire-natural-gas-from-shale-plays-create-new-world-24064.html?pagewanted=2

Industry Attacks On Science

When Dr. Howarth released the first draft of his team's analysis in the spring of 2010, the gas industry was quick to attack it.[1] Although Howarth's team based their early analysis heavily on federal government estimates of methane leakage,[2] maintaining that 1.5 percent of all consumed natural gas escapes as fugitive emissions, Howarth openly admitted his work was a tentative analysis and that further clarification would be needed. Scientific research in this area is difficult due to the general lack of data and monitoring. Emission figures are better known in the coal industry than in the gas industry for a variety of reasons, "one of which is that methane is regulated in the coal mining industry and is not in the natural gas industry," according to Dr. Howarth.[3]

However, it turns out that their early assumptions about methane leakage from shale gas—and EPA's own estimates—were wildly lower than reality, significantly underestimating methane leakage from shale gas extracted using hydraulic fracturing. Apparently, EPA had not previously taken into account the total emissions from the extensive production, processing, venting, and transportation networks used to service natural gas wells.[4] The EPA now cautions that their 1996 authoritative report, Methane Emissions from the Natural Gas Industry, "significantly underestimated" emission sources.[5]

The EPA's revised emission figures substantiated Howarth's claims that fugitive methane emissions are a serious problem and should have serious implications for our interest in gas as a bridge fuel. Previously unexamined emission sources are now understood to contribute tremendous amounts of methane into the atmosphere, at rates thousands of percent higher than previously accounted for.[6]

Dr. Howarth's team revised their own figures to incorporate the EPA's new data and their recent analysis reflects this more startling emissions rate: "Summing all estimated losses, we calculate that during the life cycle of an average shale-gas well, 3.6 to 7.9% of the total production of the well is emitted to the atmosphere as methane. This is at least 30% more and perhaps more than twice as great as the life-cycle methane emissions we estimate for conventional gas."[7]

These higher emissions from unconventional shale gas are significantly greater than conventional gas "due to methane emissions with flow-back fluids and from drill out of wells during well completion."[8] Conventional wells have no flow-back because they are not drilled hydraulically and are completed without a drill out phase. In the flow-back stage alone, where a mixture of methane and fracking fluids return to the surface, unconventional wells lose between 0.6 and 3.2 percent of their lifetime production of gas.[9]

1 http://www.energyindepth.org/2010/04/ithaca-is-gorges-but-cornell's-position-on-hf-is-the-pits/
2 http://www.eia.doe.gov/pub/oil_gas/natural_gas/data_publications/natural_gas_monthly/current/ pdf/table_02.pdf
3 http://shaleshockmedia.org/2011/03/31/marcellus-shale-gas-and-global-warming/
4 For an example of how these leaks are calculated see David Lewis of The Energy Collective http://theenergycollective.com/david-lewis/48209/epa-confirms-high-natural-gas-leakage-rates
5 http://www.epa.gov/climatechange/emissions/downloads10/Subpart-W_TSD.pdf
6 http://www.epa.gov/climatechange/emissions/downloads10/Subpart-W_TSD.pdf. See page 9.
7 http://www.eeb.cornell.edu/howarth/Howarth%20et%20al%20%202011.pdf
8 http://www.eeb.cornell.edu/howarth/Howarth%20et%20al%20%202011.pdf
9 http://www.eeb.cornell.edu/howarth/Howarth%20et%20al%20%202011.pdf

Once the well is ready for production, the drill-out phase entails the removal of plugs, allowing the previously contained gas to flow. An additional 0.33 percent of the lifetime production of gas is lost during this stage.[1]

Dr. Anthony Ingraffea of Cornell University, a hydraulic fracturing expert and contributing author on Howarth's report, determines that the greenhouse gas footprint for both conventional and unconventional gas production has never been properly assessed. But the differences between conventional and unconventional drilling are significant, says Ingraffea, due to the drastic size increases in unconventional wells. Unconventional wells have a greater total length than conventional wells, due to their lateral extensions underground.

This greater total length means that unconventional gas wells require more and heavier drilling equipment, longer drilling time, higher probability of drilling problems, and more venting during drilling. In addition, these longer wells require more and heavier fracking equipment, more stages and volume per stage, more plugs and longer drill-out periods.

Also significant, these large-scale drilling operations produce more flowback waste and produced water, which in turn means higher volumes of waste for longer periods and more venting and flaring of gas.[2]

Much of the escaped methane is released during the well's preparation, before the well has gone into production. During drilling, flowback, and after each stage of fracking, production of the gas is not yet possible and so, says Ingraffea, the fugitive gas is either vented or flared. Drillers often hit pockets of shallow methane which flows directly into the well. This early methane also must be vented or flared.

"I should point out," he adds, "that there are many countries in the world where flaring is illegal."[3]

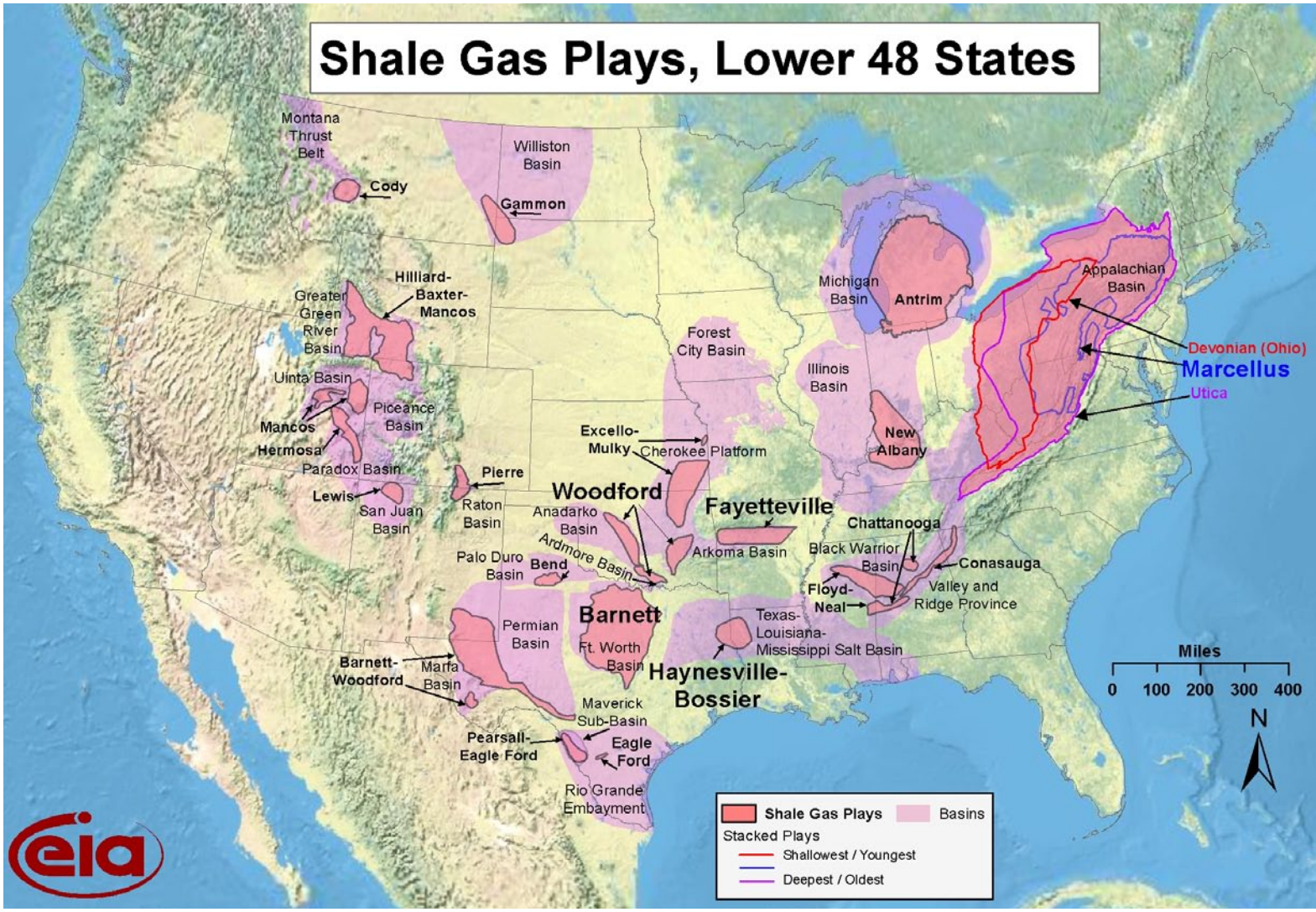
When companies flare they are not only wasting gas through inefficient practices, gas which landowners are not paid for, but they are emitting potent greenhouse gas directly, squandered, into the atmosphere. In order to keep their estimates conservative, the Cornell team averaged that the gas industry splits their waste gas equally between venting and flaring.

Due to limited reporting on methane emissions, the team also excluded shallow gas venting, accidents, incidents, methane migration from around the well and up the well before production. This means that the startling emission rates that the study presents may turn out to be lower than the reality.

1 http://www.eeb.cornell.edu/howarth/Howarth%20et%20al%20%202011.pdf

2 http://shaleshockmedia.org/2011/03/31/marcellus-shale-gas-and-global-warming/

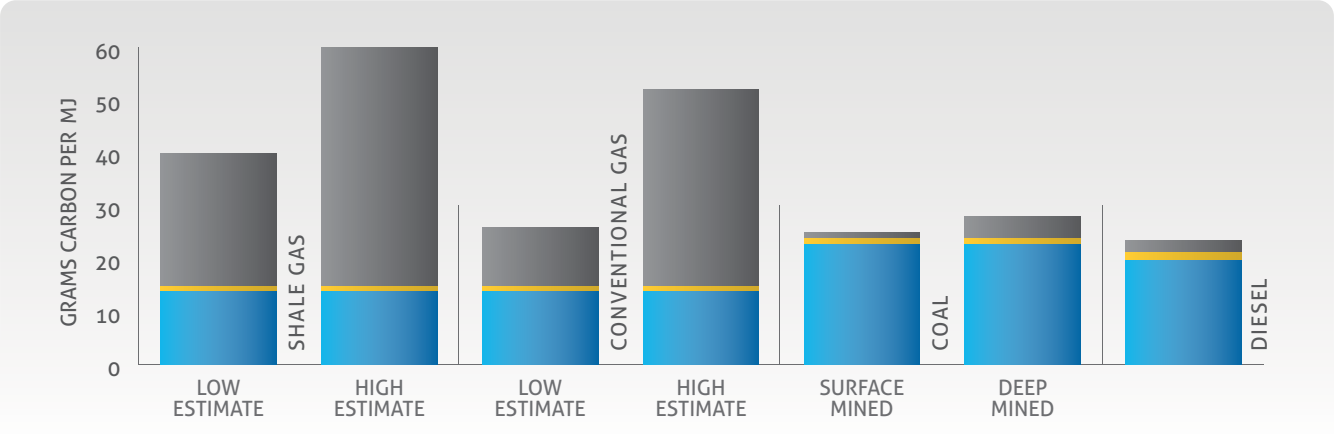
3 http://shaleshockmedia.org/2011/03/31/marcellus-shale-gas-and-global-warming/



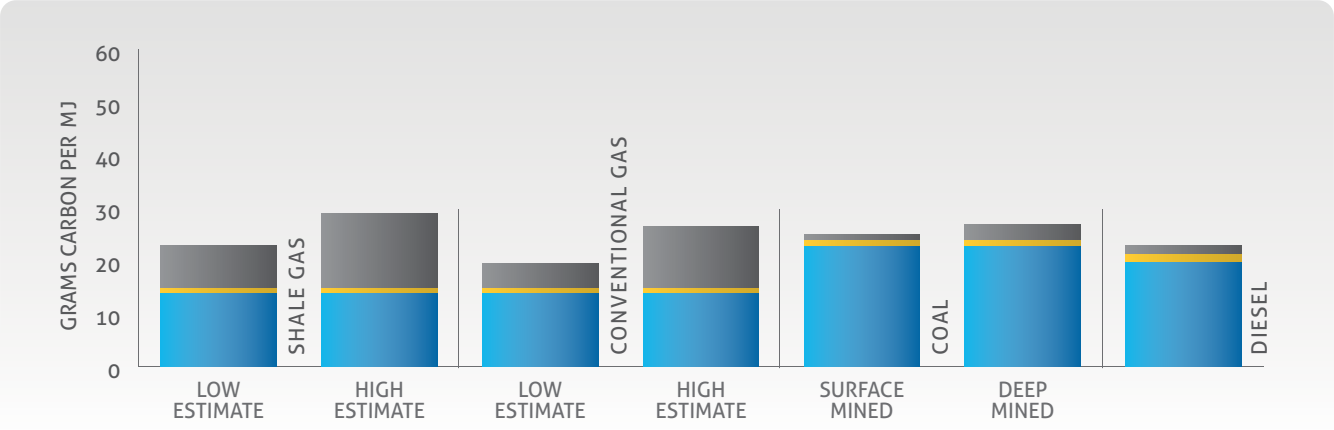
A close look at methane is essential to understanding the global warming potential (GWP) of gas, says Professor Howarth, because methane interacts differently with the atmosphere than carbon dioxide. It is important to note that the Cornell team's findings are based on limited data, and must be replicated by further scientific study.

Figures on fugitive emissions of methane from coal and oil have not been properly assessed, either. All fossil fuel extractive industries should be compelled to collect and release complete data on fugitive emissions. Until that happens, much uncertainty will remain.

A: 20-Year Time Horizon



B: 100-Year Time Horizon



*Comparison of greenhouse gas emissions from shale gas with low and high estimates of fugitive methane emissions, conventional natural gas with low and high estimates of fugitive methane emissions, surface-mined coal, deep-mined coal, and diesel oil. **A** is for a 20-year time horizon, and **B** is for a 100-year time horizon.*

Estimates include direct emissions of CO_2 during combustion (blue bars), indirect emissions of CO_2 necessary to develop and use the energy source (yellow bars), and fugitive emissions of methane, converted to equivalent value of CO_2 as described in the text (gray bars).

http://www.springerlink.com/content/e384226wr4160653/fulltext.pdf

Because the GWP is the "integrated influence of a gas compared to carbon dioxide on global warming over some defined period of time," the time frame influences how one understands a given gas. In the instance of methane, Howarth maintains, the time horizon is crucial, "because methane doesn't hang around in the atmosphere as long as carbon dioxide.

Methane is in the atmosphere for about a decade, carbon dioxide is in the atmosphere for about a century. **So in a short period, right after emission, methane is an incredibly potent greenhouse gas, but over a century it's gone."**[1]

1 http://shaleshockmedia.org/2011/03/31/marcellus-shale-gas-and-global-warming/

Howarth performed two basic calculations in his methane analysis, one according to a 100-year time frame, and a second according to a 20-year time frame. Standard figures place methane at 21 times more potent than CO_2 on a 100-year scale, and 72 fold more potent on a 20-year scale. These figures, says Howarth, have recently been revised to 33 and 105 respectively, new figures that the Intergovernmental Panel on Climate Change advised Howarth to follow.[1]

Methane, new research has shown, beyond having a high warming potential, actually prevents atmospheric cooling because of the indirect effects the gas has on aerosol formation in the atmosphere.[2] Understanding these types of integrated effects on a shorter time horizon is necessary, says Howarth, "because we want to be solving climate change now and we need to worry about those short term aspects."[3] The Cornell team challenges the notion that shale gas can ever be considered "clean." Much worse than coal for the climate over the next two decades, and just as bad as coal over the next century, unconventional gas no longer presents itself as a worthy 'bridge' fuel, Howarth's team concludes.

The EPA's November 2010 decision to more rigorously monitor fugitive methane from the oil and gas industry is due to industry emission rates that compare to 40 million passenger cars annually. [4] Since January 1, 2011, the oil and natural gas industry is now required to report methane leakage from all industry operations. It is possible that these industry reports will contribute to even higher estimates of fugitive methane.

Despite its misleading reputation as 'clean' and 'abundant,' gas is a polluting, non-renewable energy source. In his recent testimony before the Canadian Standing Natural Resources Committee, Dr. Ingraffea stated that:

> "On a large scale, remember that natural gas is a non-renewable fossil fuel. When it is burned it produces carbon dioxide in the atmosphere...Natural gas is a much more potent greenhouse gas than carbon dioxide, so even a relatively small percentage leak on a very large volume of gas results in a very significant impact on greenhouse gas emissions, and therefore potentially on climate change. So there are other effects one should consider on human health, the environment, and climate--not just from water, but also from solids and gases."[5]

But these potential impacts have not been given due consideration and the nation has already, in some ways, committed to a gas-intensive future. "What we're hoping to do with this study," says Ingraffea, "is stimulate the science that should have been done before, in my opinion, corporate business plans superseded national energy strategy."[6]

The critique takes the wind out of the gas industry's sails, ultimately deflating the notion that gas should become the nation's "bridge" fuel on the way to a renewable energy future. In fact, every day that society delays the transition to a truly clean, renewable energy production system represents a setback in the fight against global climate change. All fossil fuels are dirty, threatening to public health and the environment, and bad news for the global climate.

1 http://shaleshockmedia.org/2011/03/31/marcellus-shale-gas-and-global-warming/
2 http://www.sciencemag.org/content/326/5953/716.abstract
3 http://shaleshockmedia.org/2011/03/31/marcellus-shale-gas-and-global-warming/
4 http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/8518e9bdc820460a852577d600591852!OpenDocument
5 Dr. Anthony Ingraffea. Testimony before the Canadian Standing Natural Resources Committee, February 1, 2011. http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=4918403&Language=E&Mode=1&Parl=40&Ses=3
6 http://shaleshockmedia.org/2011/03/31/marcellus-shale-gas-and-global-warming/

The Dangers of Gas Drilling

"You don't want a situation like we have with BP in the Gulf Coast. You don't want an oil company saying 'don't worry.' Instead, you want these effects tested carefully, in well established circumstances."

—Dr. Daniel Botkin, PhD Ecologist and Professor Emeritus, University of California, Santa Barbara

Hydraulic Fracturing 101: The Process and The Risks

The gas industry is steadfast in its claims that hydraulic fracturing and associated drilling practices are safe and pose no threat to human and environmental health. But is it really true? Given the recent deluge of media coverage about gas industry threats, it appears current gas operations are demonstrating a lot of the same type of dangerous practices and cavalier industry culture that led to the BP oil disaster in the Gulf of Mexico. Much like offshore drilling, gas operations occur in a regulatory void, having outpaced federal and state oversight.

Traditional hydraulic fracturing is a process that has been employed by the gas industry since the 1940s, a favorite talking point among fracking defenders.[1] Pioneered by Halliburton, the process involves the injection of water, sand and chemicals into a well to release trapped gas deposits. Hydraulic fracturing has long been used to access conventional oil and gas deposits. However, recent technological developments in drilling have opened up previously inaccessible unconventional gas deposits across North America.

Gas extraction underwent a significant technological transformation in the 1990s, when operators began using a technique developed for oil extraction: horizontal drilling.[2] [3] With the combination of hydraulic fracturing and horizontal drilling into a new technique known as High Volume Slickwater Hydraulic Fracturing, the overall scope of gas extraction has transformed, calling for unprecedented amounts of water, chemical additives and drilling pressure. Hydraulic fracturing experts like Dr. Anthony Ingraffea consider current gas drilling "a relatively new combined technology."[4] Although industry likes to characterize the process as successfully proven for over six decades "what they fail to say is that they've had fewer than 10 years of experience on a large scale using these unconventional methods to develop gas from shale,"[5] Ingraffea says.

Unconventional gas, which does not flow easily, exists in small pockets trapped in tight or less permeable rock formations such as coalbed methane, tight sands or shale. The difficulties of

1 http://www.halliburton.com/public/projects/pubsdata/Hydraulic_Fracturing/fracturing_101.html

2 http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/drilling_sideways_well_technology/pdf/tr0565.pdf

3 http://www.chk.com/about/pages/history.aspx

4 http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=4918403&Language=E&Mode=1&Parl=40&Ses=3

5 http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=4918403&Language=E&Mode=1&Parl=40&Ses=3

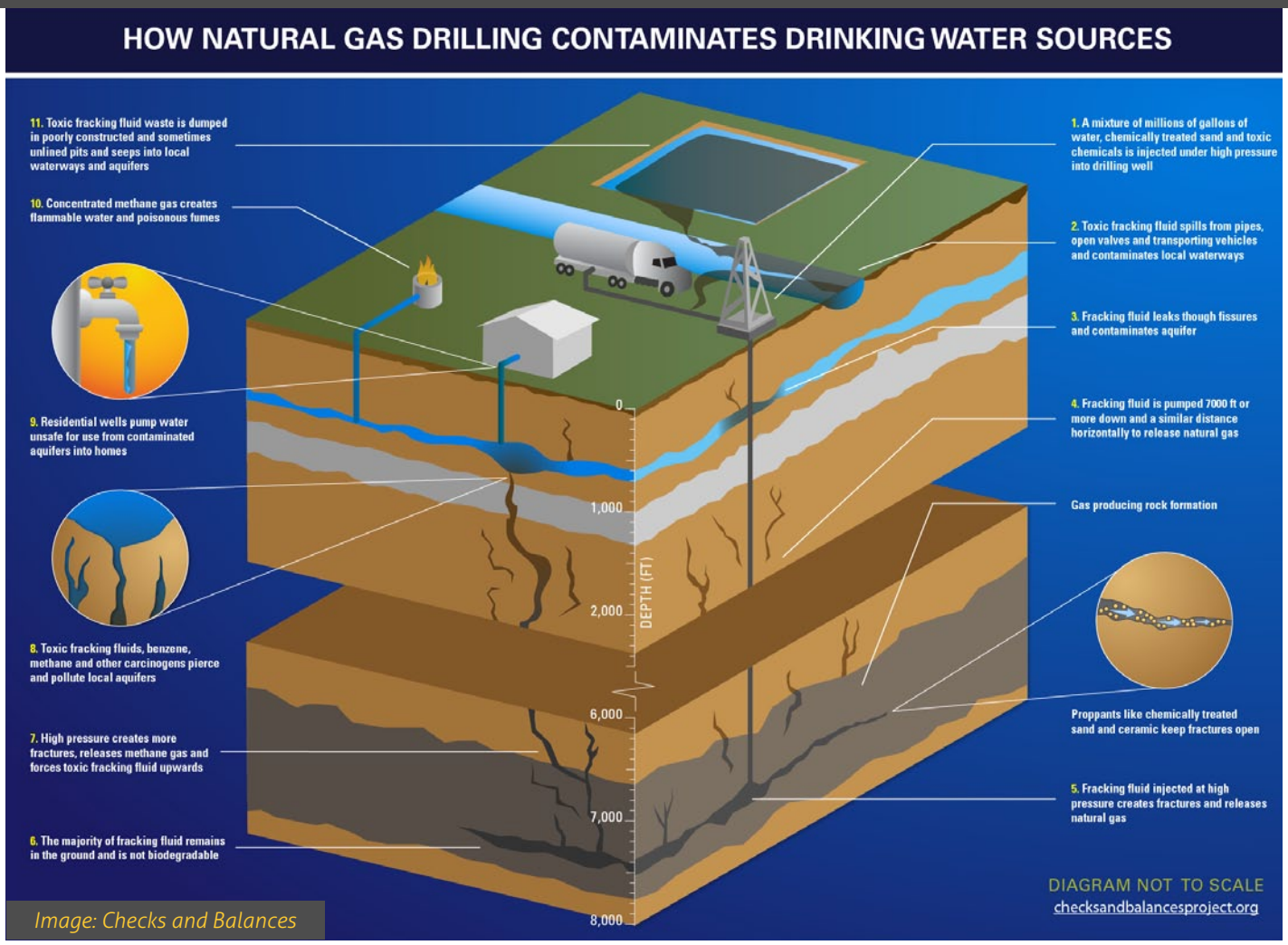


Image: Checks and Balances

accessing large amounts of unconventional gas by drilling lone vertical wells led to the expansion of production procedures. With the introduction of hydraulic fracturing and horizontal drilling, operators can now access a significantly larger area from one single well pad. Current drilling practices, requiring 50 to 100 times[1] the water needed in conventional gas wells and drilling pressures up to 13,500 psi, can access areas around 8,000 feet deep and up to 11,000 feet in horizontal directions.[2]

Chemical additives are used in the primary stages of drilling and in the fluids prepared for the fracking process. Drilling muds or slurries are a mixture of chemicals and fluids used to facilitate boring. Although fracturing fluids are more commonly known to contain chemicals linked to cancer, organ damage, nervous system disorders and birth defects,[3] drilling muds or slurries can contain a number of the same chemical constituents used in fracturing fluids.[4]

1 http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=4918403&Language=E&Mode=1&Parl=40&Ses=3

2 http://www.worldwatch.org/files/pdf/Hydraulic%20Fracturing%20Paper.pdf

3 http://www.endocrinedisruption.com/files/Oct2011HERA10-48forweb3-3-11.pdf

4 Bishop, Ronald E. "Chemical and Biological Risk Assessment for Natural Gas Extraction in New York." January 21, 2011. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf

Once the drill bore has been prepared, a cement casing is poured around the exterior of the well to provide a barrier between the well and the surrounding underground formations. Traveling thousands of feet down, gas wells require numerous cement casings to isolate the various rock layers containing hydrocarbons, briny water and other contaminants.[1] The depth and width of cement casings will vary given the underlying geologic formation and whether the well will pass through an underground aquifer. Fracturing fluids, or 'fracking fluids,' a mixture of millions of gallons (at times as low as 2 million[2] and as high as 7.8 million[3]) of water, sand and chemicals, are injected into the well at extremely high pressure. The pressure blasts the rock apart allowing for the release of the trapped gas which can then flow up the wellbore.

The chemicals in fracking fluid can include friction reducers, surfactants, corrosion inhibitors, biocides, stabilizers and lubricants which perform a number of functions such as preventing buildup in the well bore and allowing for the smooth passage of the gas from the rock. The sand, called a proppant, is used to prop open the fissures which are created in the blast and allow for the free flow of gas.

The recovered gas, intermixed with the fracking fluid, flows to the surface of the well where it is retrieved for processing. An estimated 30% to 70% of the fracking fluid initially remains underground, although more of the contaminated fluid continues to surface for the life of the well, up to 20 or 30 years.[4] [5]

What is initially recovered is separated from the gas in heating tanks, or condensate tanks, which force the gas from the liquid under high temperatures.[6] The gas is then retrieved and transported, usually through a series of trucks and/or pipelines. The left over water, in the forms of produced, condensate and 'flowback' water, is a mixture of fracking chemicals and in some instances toxic substances from the underground rock such as naturally occurring radioactive matter (NORMS), total dissolved solids (TDS), liquid hydrocarbons including benzene, toluene, ethylbenzene, and xylene (BTEX), and heavy metals which can pose a problem if they find their way into waterways or drinking water. While all of the chemicals used throughout the hydraulic fracturing process are not known, it is well documented that some chemicals employed in fracturing and drilling, as well as unearthed substances in flowback water, are known to cause cancer, birth defects and nervous system disorders.[7] [8] [9]

Contamination:

The gas industry commonly claims that "no proven instances of water contamination have occurred due to hydraulic fracturing." This misleading statement uses industry's definition of hydraulic fracturing to refer "only to the process whereby hydrostatic pressure is used to force cracks in deep rock formations," according to Dr. Ronald Bishop of State University of New York, College at Oneonta.

1 http://www.worldwatch.org/files/pdf/Hydraulic%20Fracturing%20Paper.pdf
2 http://fossil.energy.gov/programs/oilgas/publications/naturalgas_general/Shale_Gas_Primer_2009.pdf
3 Pg 5-92 to 5-93 http://www.dec.ny.gov/docs/materials_minerals_pdf/ogdsgeischap5.pdf
4 http://www.endocrinedisruption.com/chemicals.introduction.php;
5 http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=4918403&Language=E&Mode=1&Parl=40&Ses=3
6 Colborn, Theo. Et al. "Natural Gas Operations from a Public Health Perspective." International Journal of Human and Ecological Risk Assessment. http://www.endocrinedisruption.com/files/Oct2011HERA10-48forweb3-3-11.pdf
7 http://www.riverkeeper.org/wp-content/uploads/2010/01/Miller-Final-Report.pdf
8 http://www.endocrinedisruption.org/files/NaturalGasManuscriptPDF09_13_10.pdf
9 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf

Photo: Gasland , http://www.gaslandthemovie.com

However, **"even if you adopt industry's definition of hydraulic fracturing (thus excluding incidents from drilling damage, failed well casings, spills, erosion and sedimentation, or tanker accidents), there is now evidence...that the isolated process of hydraulic fracturing has been responsible for water contamination."**[1]

The Worldwatch Institute reports that although hydraulic fracturing has become the focus of much controversy, "the most significant environmental risks associated with the development of shale gas are...gas migration and groundwater contamination due to faulty well construction, blowouts, and above-ground leaks and spills of waste water and chemicals used during drilling and hydraulic fracturing."[2] Precisely how water contamination occurs due to gas drilling operations can at times be difficult to determine, although the growing number of documented cases[3] point to a variety of contamination sources.

Nearby waterways, domestic wells and underground sources of drinking water (USDW) such as underground aquifers have become contaminated across America due to poor industry practices and incomplete knowledge of underlying rock formations.[4]

An internal document from Pennsylvania's Department of Environmental Protection outlines over 60 instances of water contamination and fugitive methane migration from gas drilling operations, many of which were due to unexpected pockets of underground pressure, the failure to contain well pressure, faulty production casing, or the accidental drilling into other abandoned or producing gas wells.[5]

The improper sealing of the drill bore with cement or faulty, unstable cement jobs are an easy and not uncommon way to contaminate water sources.[6] In this case, fracking fluids can escape the well bore and enter an aquifer which the well sometimes passes through directly.

1 DeSmogBlog Interview with Dr. Ronald Bishop. February 23, 2011.
2 http://www.worldwatch.org/files/pdf/Hydraulic%20Fracturing%20Paper.pdf
3 http://switchboard.nrdc.org/blogs/amall/incidents_where_hydraulic_frac.html
4 http://www.mediafire.com/?5kdec8nfa1h03oo
5 http://www.mediafire.com/?5kdec8nfa1h03oo
6 Pg 8 http://www.worldwatch.org/files/pdf/Hydraulic%20Fracturing%20Paper.pdf

A report by hydrogeologist Geoffrey Thyne entitled "The Garfield County Hydrogeologic Study" outlines how methane migration from natural gas drilling led to the contamination of domestic water wells and West Divide Creek. The enormous amounts of pressure exerted in natural gas drilling operations, up to 13,500 psi, can disrupt the underlying rock, resulting in methane contamination. According to Dr. Anthony Ingraffea, methane contamination can occur from "disturbances of previously blocked migration paths through joint sets or faults, or by puncturing pressurized biogenic gas pockets and allowing migration through as-yet un-cemented annulus, or through a faulty cement job." In large scale hydraulic fracturing operations, underground fracture propagation is difficult to predict according to the BC Oil and Gas Commission.

http://www.damascuscitizens.org/Colorado_COGCC-Hydogeologic-Thyne.pdf

http://www.bcogc.ca/document.aspx?documentID=808&type=.pdf

At times operators are dangerously uncertain as to whether or not they are drilling directly through an underground aquifer.[1] In other instances, the pathways created from the fracking process can lead to the underground migration of chemicals, gasses and radioactive materials between rock layers.[2] How the underground rock will break, known as fracture propagation, during the drilling process is difficult to predict due to previously existing weaknesses and fracture networks in the rock. Natural fractures have the ability to divert the pathway of induced hydraulic fractures, leading to "complex behavior" of fractures in unconventional gas reservoirs.[3] Despite industry claims that the process is "highly engineered and controlled,"[4] in some instances the created fractures travel well beyond anticipated lengths.[5]

Once a well has become inactive it is up to the operator to 'close' the well according to state standards. This sometimes results in the filling of the drill bore with cement. The duty to regulate closed wells is left to state officials. Because of the intense pressure exerted during hydraulic fracturing, underlying rock formations become "thousands of times more permeable" allowing for the continued circulation of gas, briny water and contaminants long after the producing life of the well.[6] The EPA reported in 1992 that an estimated 1.2 million oil and gas wells were abandoned in the U.S. of which 200,000 were leaking.[7]

Using this information, Dr. Ronald Bishop calculates a well failure rate of 16.7%, meaning approximately one in every six abandoned wells will leak into the surrounding area.[8]

1 Mike Soraghan. "Drillers Say They Don't Know if They're Fracking in Drinking Water." Greenwire. Monday July 19, 2010. http://albertasurfacerights.org/articles/?id=573; see also http://democrats.energycommerce.house.gov/index.php?q=news/waxman-markey-and-degette-investigation-finds-continued-use-of-diesel-in-hydraulic-fracturing-f

2 Worldwatch Institute. Assessing the Environmental Risks from Shale Gas Development. http://www.efdsystems.org/Portals/25/Hydraulic%20Fracturing%20Paper%20-%20World%20Watch.pdf

3 Jon Olson. Influence of Natural Fractures on Hydraulic Fracture Propagation. http://www.mendeley.com/research/influence-natural-fractures-hydraulic-fracture-propagation/

4 http://www.mdu.com/Special%20Reports/2010_HydraulicFracturingReport.pdf

5 BC Oil and Gas Commission 2010 Safety Advisory on Fracture Stimulation. http://www.bcogc.ca/document.aspx?documentID=808&type=.pdf

6 http://www.montrealgazette.com/business/Fracking+will+cause+irreversible+harm/4388300/story.html

7 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf

8 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf

A survey of past drilling practices across the states has led Dr. Bishop to conclude that "the probability that a project scope of as few as ten modern gas wells will impact local ground water within a century approaches 100% certainty."[1] Better well-abandonment practices, although more expensive than current practices, are essential to reduce the slow seepage of gas to the ground surface.[2]

Drilling and Fracking Chemicals: Studies, Disclosure and Standards

Chemical additives are used throughout the gas drilling process. Fracturing fluids are known to contain numerous toxic substances although there is still incomplete knowledge regarding all chemicals that may be used in the drilling process. Hydraulic fracturing is also known to force heavy metals and radioactive substances from the underlying rock to the surface in the form of flowback water and drilling muds.

There are hundreds of possible chemicals available for and widely used in fracturing operations, most specifically as additives to drilling muds and fracking fluids. The specific mixture of chemicals in a given fracking fluid will change from well to well as the specifics of geography and other external factors will determine what is required. The chemical additives of fracking fluids are protected as an industry trade secret and as of yet no federal legislation requires their disclosure. The gas industry has complained about attempts to mandate disclosure of drilling chemicals, claiming this would violate their right to protect proprietary information.

The ineffectiveness of 'voluntary disclosure' of fracturing fluids was evidenced by the EPA's 2010 request to 9 companies for chemical disclosure. The information request demonstrated the extent to which companies were avoiding full disclosure. Halliburton failed to comply with the disclosure request and was resultantly subpoenaed by the EPA. Halliburton was reportedly unable to supply the EPA with the requested material on short notice.

Federally mandated disclosure would ensure that companies like Halliburton maintain up to date, well-specific and reliable information regarding the chemicals used in each hydraulic fracturing operation. Without these more stringent reporting and disclosure expectations, there is little to ensure that investigators or emergency responders will have the necessary information needed in the event of accidental contamination, spills, etc.

Yet under the provisions of the Toxics Release Inventory, the EPA is able to protect trade secrets upon formal request.[3] According to this program, the EPA can both protect trade secrets and take measures to protect public health.[4]

Without proper knowledge of the chemicals used throughout the drilling process, medical and emergency personnel cannot adequately respond to accidents and spills. Investigations into water contamination have been hindered and delayed because researchers do not know what to test for.

Some gas companies have engaged in the 'voluntary disclosure' of some fracking fluid chemicals.

But this information offered on operator websites is not exhaustive and often does not contain the necessary information to reveal chemical toxicity, such as Chemical Abstracts Service (CAS)

1 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf
2 DeSmogBlog Interview with Dr. Maurice Dusseault. February 14, 2011.
3 http://www.epa.gov/fedrgstr/EPA-TOX/2009/August/Day-25/t20397.htm
4 http://www.americanprogress.org/issues/2010/04/fracking.html

In 2003 Laura Amos developed a rare adrenal tumor after EnCana began drilling operations near her home in Garfield County, Colorado. Laura knew that drilling had affected her water system after the metal lid exploded off of her well. When Laura began feeling sick, she contacted Dr. Theo Colborn of TEDX to inquire about 2-butoxyethanol (2-BE). Dr. Colborn said that 2-BE had not been tested for human toxicity but had caused adrenal tumors in laboratory rats. Although EnCana initially denied using 2-BE in their drilling additives, the company eventually admitted to its use. The EPA confirmed the contamination and the Colorado Oil and Gas Conservation Commission cited EnCana for the contamination of the Amos' well. EnCana settled privately with the Amos family.

Source: Earthworks Oil and Gas Accountability Project (OGAP) 2009 Press Release: *http://www.earthworksaction.org/PR_EPApavillionDrinkingWater.cfm*

Denver Post: *http://earthworksaction.org/pubs-others/2005_DenverPost_EncanaCited.pdf*

Laura Amos' story: *http://www.earthworksaction.org/cvLauraAmos.cfm*

identification codes.[1] [2] [3] Environmental scientists say that without exhaustive information of fracturing fluids and how they are combined, it is impossible to fully assess their associated risks.[4] To date no federal oversight of chemical disclosure exists.

This federally endorsed silence stifles public participation in the important discussion surrounding the impacts of gas drilling.

Hannah Wiseman, assistant professor of law at the University of Tulsa, writes that statutes such as the Emergency Planning and Community Right-to-Know Act (EPCRA) and the Safe Drinking Water Act (SDWA), from which hydraulic fracturing is exempt, "envisioned that informed citizens would influence industrial activity through open public venues." Without the removal of these trade secret protections, Wiseman continues, "communities experiencing the brunt of the energy boom may have inadequate tools to evaluate and address the potential impacts of this development."[5]

The number of gas operators that have participated in 'voluntary disclosure' have also moved to discourage federal disclosure requirements, describing these oversight measures as costly and unnecessary. Companies such as Halliburton and industry-funded lobby groups such as Energy in Depth provide voluntary information that misleadingly compares fracturing fluids to household cleaning products and cosmetics —even ice cream ingredients.[6] Energy in Depth, an industry funded support group lists 'petroleum distillates' as a component of fracturing fluids, referencing the compound's common use in "make up remover" and "candy."[7]

The Environmental Working Group cautions against this tactic: what companies do not mention is that petroleum distillates include products which are known to cause cancer and in the U.S. the use of these products is "almost completely unregulated."[8]

1 Weston Wilson. "Affirming Gasland." http://1trickpony.cachefly.net/gas/pdf/Affirming_Gasland_Sept_2010.pdf
2 Colborn Report. http://www.endocrinedisruption.com/files/ Oct2011HERA10-48forweb3-3-11.pdf
3 http://democrats.energycommerce.house.gov/index.php?q=news/waxman-markey-and-degette-investigation-finds-continued-use-of-diesel-in-hydraulic-fracturing-f
4 http://www.propublica.org/article/gas-execs-call-for-disclosure-of-chemicals-used-in-hydraulic-fracturing-102
5 http://www.columbialawreview.org/articles/trade-secrets-disclosure-and-dissent-in-a-fracturing-energy-revolution#0%230
6 http://www.halliburton.com/public/pe/contents/Data_Sheets/web/H/H06640.pdf
7 http://www.energyindepth.org/frac-fluid.pdf
8 Environmental Working Group. Drilling Around the Law. http://www.ewg.org/files/EWG-2009drillingaroundthelaw.pdf

Halliburton and Energy in Depth also list guar gum as a fracturing fluid additive, citing its common use in cosmetics and ice cream. What is not mentioned is that the use of guar gum as a thickener is paired with "extremely toxic" cross-linkers and biocides as well as breaker additives to thin the mixture for a return from the well. Guar gum is often mixed with "hydrotreated light petroleum distillates" or deodorized kerosene.[1]

Other biocides that are commonly used include Glutaraldehyde, a respiratory toxin at a part-per-billion (ppb) level that, as a sensitizer, can induce allergies and has known mutagenic affects and 2,2-Dibromo-3-nitrilopropionamide (DBNPA), which is toxic to the respiratory system and skin, is a known sensitizer, and is corrosive to the eyes. Both of these biocides have dramatic effects on ecosystems and especially aquatic organisms when introduced to waterways at very low parts-per-billion concentrations. DBNPA can be lethal to some organisms at a parts-per-trillion level which is far below possible detection limits.[2]

A number of reports have been released on fracking chemicals and associated health risks, most notably by Dr. Theo Colborn of The Endocrine Disruption Exchange (TEDX). Generally, but not always, the chemicals used in fracking operations are reported in MSDS (Material Safety Data Sheets) which are required in most states for the safety of employees working with toxic substances. These sheets are intended to outline the potential health risks when handling these chemicals, however, as Dr. Colborn reports, in many instances the information presented is incomplete, unspecified or simply listed as 'proprietary.'

1 Dr. Ronald Bishop in "Affirming Gasland." http://1trickpony.cachefly.net/gas/pdf/Affirming_Gasland_Sept_2010.pdf

2 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf

By May 2010 Dr. Colborn had identified 944 chemicals associated with drilling and hydraulic fracturing. 407 of these 944 chemicals had less than 1% of the product composition available due to inadequate listed information.[3]

Another 2011 draft report authored by Dr. Ronald Bishop of State University of New York, College at Oneonta states that most of these chemicals have not been tested for "human or environmental toxicity."[4] And although these chemicals can be diluted during the drilling process, some chemicals pose severe risk to human and environmental health "even at concentrations near or below their chemical detection limits."[5] Industry groups maintain that hydraulic fracturing is largely performed using water and sand and that only a fraction, 0.5%, is made up of the chemical additives. Yet, given the enormous amounts of water required, this 'fraction' is not negligible: a conservative estimate arrives at 20 tons of chemicals per 1 million gallons of water.[6]

3 Colborn Report. http://www.endocrinedisruption.com/files/ Oct2011HERA10-48forweb3-3-11.pdf

4 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf

5 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf

6 Barbara Arrindell in "Affirming Gasland." http://1trickpony.cachefly.net/gas/pdf/Affirming_Gasland_Sept_2010.pdf

In a typical well this could amount to 34,000 gallons of chemicals by volume.[1] Recent investigations have revealed that companies also illegally performed hydraulic fracturing using diesel fuel. These companies did so in violation of an agreement with officials to ban the use of diesel in gas drilling altogether.[2]

The use of diesel for hydraulic fracturing is also regulated under the Safe Drinking Water Act.[3] Diesel fuel contains benzene, toluene, ethylbenzene and xylene, a collective of toxic compounds known as BTEX. Benzene is a known carcinogen while exposure to toluene, ethylbenzene and xylene can cause damage to the central nervous system, liver and kidneys. A report by the Environmental Working Group identifies other petroleum distillates, resembling diesel, used in hydraulic fracturing that were found to have 93 times more benzene than diesel but do not fall under any regulation.[4]

The gaps in regulation have allowed for the gross mismanagement of drilling waste, which as *The New York Times* has recently reported, has led to tremendous violations of public health standards[5]. States do not traditionally require an account of how drilling wastes will be handled when granting drilling permits,[6] leading to the widespread failure to adequately treat enormous amounts of highly toxic wastes.

1 http://www.propublica.org/article/new-gas-wells-leave-more-chemicals-in-ground-hydraulic-fracturing
2 http://democrats.energycommerce.house.gov/index.php?q=news/waxman-markey-and-degette-investigation-finds-continued-use-of-diesel-in-hydraulic-fracturing-f
3 http://democrats.energycommerce.house.gov/index.php?q=news/waxman-markey-and-degette-investigation-finds-continued-use-of-diesel-in-hydraulic-fracturing-f
4 http://www.ewg.org/drillingaroundthelaw
5 http://topics.nytimes.com/top/news/us/series/drilling_down/index.html
6 Colborn Report. http://www.endocrinedisruption.com/files/ Oct2011HERA10-48forweb3-3-11.pdf

Gas Drilling: Provoking A Water Crisis

The enormous water requirements for gas drilling, and the unavoidable pollution due to chemical additives and underground contaminants, pose a serious threat to water resources.

In a recent DeSmogBlog interview, Dr. Daniel B. Botkin of the University of California, Santa Barbara —an outspoken critic of unconventional gas and author of "Powering the Future: A Scientist's Guide to Energy Independence"—suggested that issues of water contamination can be blamed on poor practice. [7]

> "In New York and Pennsylvania most of the problems that have happened have been because of accidents. You don't even have to start drilling and they've already handled materials on the ground in a sloppy way."

Alongside concerns about water contamination, Dr. Botkin is also concerned with soil pollution where "the worst problem is with heavy metals and the drilling mud itself." These byproducts of the drilling process have quickly outgrown the means of their disposal. Wastewater poses serious threats to waterways when not stored, transported or treated properly.

7 DeSmogBlog Interview with Dr. Daniel B. Botkin. July 21, 2010

Existing laws designed to hold the gas industry accountable have come under tremendous scrutiny for failing to keep pace with the rapid development in unconventional gas extraction.[1] [2] Making matters worse, the oil and gas industry received numerous favors during the Bush administration in the form of regulatory rollbacks and exemptions, most notably the 'Halliburton Loophole.'[3] [4]

"There is a lot of controversy over what deep drilling for natural gas will do. Beyond the potential for things already going on with human health, there is an unknown with what the effects of this kind of drilling are going to be. Another problem is water, " Dr. Botkin says.

While much of the concern about the impacts of hydraulic fracturing centers on the contamination of drinking water, Dr. Botkin is also concerned about the industry's extensive withdrawals of clean water from already stressed water supplies.

"We are already overusing our water supply and this technology is going to increase the tremendous stress on it."

Average estimates of water usage at a single gas well using multi-stage hydraulic fracturing range from 2 million gallons and at times as high as 7.8 million gallons.[5]

One report from Schlumberger Water Services cites Encana figures at one million gallons per frack for wells that can be fracked up to 20 times.[6] Other sources confirm that in these multi-stage operations a single well can be hydraulically fractured up to 20 times.[7] Post extraction procedures, such as refining and transport, use an additional 400 million gallons of water each day, according to the Union of Concerned Scientists.[8] Dr. Botkin worries that if oversight does not keep up, decision-making will be left to a self-regulating industry. **"You don't want a situation like we have with BP in the Gulf Coast. You don't want an oil company saying 'don't worry.' Instead, you want these effects tested carefully, in well established circumstances."**

The industry wants to maintain that gas is an environmentally friendly, alternative energy source. Despite numerous reports and documented cases,[9] [10] companies[11] and industry groups such as Energy in Depth,[12] the Marcellus Shale Coalition,[13] the Independent Petroleum Association of America,[14] and the American Petroleum Institute,[15] are adamant that no instance of drinking water contamination has ever occurred due to hydraulic fracturing.

1 http://www.earthworksaction.org/halliburton.cfm
2 http://www.ewg.org/drillingaroundthelaw
3 http://www.nytimes.com/2009/11/03/opinion/03tue3.html
4 http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=4918403&Language=E&Mode=1&Parl=40&Ses=3
5 Pg 5-92 to 5-93 http://www.dec.ny.gov/docs/materials_minerals_pdf/ogdsgeischap5.pdf
6 http://www.bctwa.org/FrkBC-Water.html
7 http://www.pump-zone.com/upstream-pumping/frac-pumps/the-evolution-of-hydraulic-fracturing-and-its-effect-on-frac-pump-technology/page-2.html
8 http://www.ucsusa.org/clean_energy/technology_and_impacts/energy_technologies/water-energy-electricity-natural-gas.html
9 http://www.propublica.org/article/water-problems-from-drilling-are-more-frequent-than-officials-said-731
10 New York Riverkeeper. Fractured Communities. http://www.riverkeeper.org/wp-content/uploads/2010/09/Fractured-Communities-FINAL-September-2010.pdf
11 http://www.halliburton.com/AboutUs/default.aspx?pageid=2720&navid=981
12 http://www.energyindepth.org/in-depth/frac-in-depth/regulation-and-safety/
13 http://marcelluscoalition.org/2010/07/msc-to-epa-hydraulic-fracturing-is-"a-safe-essential-part-of-the-responsible-development-of-natural-gas"/
14 http://www.energyindepth.org/PDF/HF_checklist.pdf
15 http://www.api.org/policy/exploration/hydraulicfracturing/index.cfm

The removal of billions of gallons of clean water from watersheds across the nation —rivers, streams, lakes and underground aquifers that provide the water we all need for survival —is reason enough to pause to think about the wisdom of this practice. But tacking onto that the bill for rendering those millions of gallons of water contaminated and radioactive in the process - poses a real sustainability challenge.

Given the industry's secrecy to date[1], lawmakers face an uphill struggle to comprehend the magnitude of the potential problems and consequences stemming from this uncontrolled boom in unconventional shale gas.

According to Dr. Anthony Ingraffea, a hydraulic fracturing expert from Cornell University, the enormous amount of water used in unconventional drilling - 50 to 100 times more water than used for conventional drilling - are, on the other side of drilling, destined to become enormous amounts of toxic drilling wastes. "In regard to the liquid waste stream, the fluids, the flowback fluids and so-called brines and produced waters, which the industry uses interchangeably to describe liquid waste...it is different from what is produced from an oil well or from a conventional well.

It cannot be taken to a public waste water treatment plant and then dumped into a river. It contains something more than salt. It contains heavy metals. It contains some amount of naturally occurring radioactive materials, which are signatures of shale gas. Public waste water treatment plants are not equipped to remove those materials from the waste stream."[2]

Shale regions "exhibit fluctuations in radioactivity," but some areas, like the Marcellus Shale spanning across New York, Pennsylvania and West Virginia, are "significantly radioactive."[3] The naturally occurring radioactive substances in shale are affected by the chemicals used in the drilling process:

> "surfactants and other additives used in drilling muds and hydraulic fracturing fluids can help to leach radioisotopes from their source rocks, leading to greater potential human exposure than would occur if these gas development additives weren't used." [4]

The returned fluid, once resurfaced, poses unique risks, according to Dr. Ingraffea: "I should also emphasize that once the fluid comes back...it contains not only the chemicals that were put in on the way down but the material that was picked up from the shale...In black shales, shales containing gas, the most dangerous of those are the heavy metals—strontium, barium, uranium, and radium—some of which are also naturally occurring radioactive materials."[5]

Wastewater pollutants, which are often intermixed with drill cuttings, can contain some of the most significant toxins known to the drilling process.

1 http://www.nytimes.com/2011/03/02/us/02gas.html?pagewanted=2&ref=drillingdown

2 http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=4918403&Language=E&Mode=1&Parl=40&Ses=3

3 DeSmogBlog Interview with Dr. Ronald Bishop. February 23, 2011.

4 DeSmogBlog Interview with Dr. Ronald Bishop. February 23, 2011.

5 http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=4918403&Language=E&Mode=1&Parl=40&Ses=3

Dr. Bishop discusses barium, lead, arsenic, chromium, benzene and radioactive materials as toxic at parts-per-billion concentrations. Radon, an intensely radioactive material, can be mobilized due to hydraulic fracturing. Radon is an extremely mobile gas which can cause nuclear decay to the lungs and is second only to tobacco smoke in causing lung cancer.[1] Another dangerous compound discovered in shale flowback fluids is 4-nitroquinoline-1-oxide (4-NQO), "one of the most potent carcinogens known, particularly for inducing cancer of the mouth."[2] This toxin is not a chemical additive and does not occur naturally in shale and thus leads Dr. Bishop to question whether chemical interactions caused during the drilling process are responsible for its presence. He adds that no studies have been published on this question to date.[3]

Waste caused by unconventional gas extraction is a serious problem where storage and disposal sites are inadequate to handle such toxic materials. Industry has typically downplayed the risks associated with these wastes, often claiming that much of it remains safely underground.

According to Dr. Anthony Ingraffea, "The industry is fond of saying that most of what they pump down stays down. What they fail to talk about is the timeframe in which they're counting. Typically, the returned fluid, after the fracturing process, is counted as returned fracturing fluid only during about the first week or two of flowback operations. However, all shale gas wells continue to produce fracturing fluid and brine containing heavy metals for the entire life of the well. One has to be very careful. One cannot say that on average, 50% of the fluid comes back.

1 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf
2 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf
3 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf

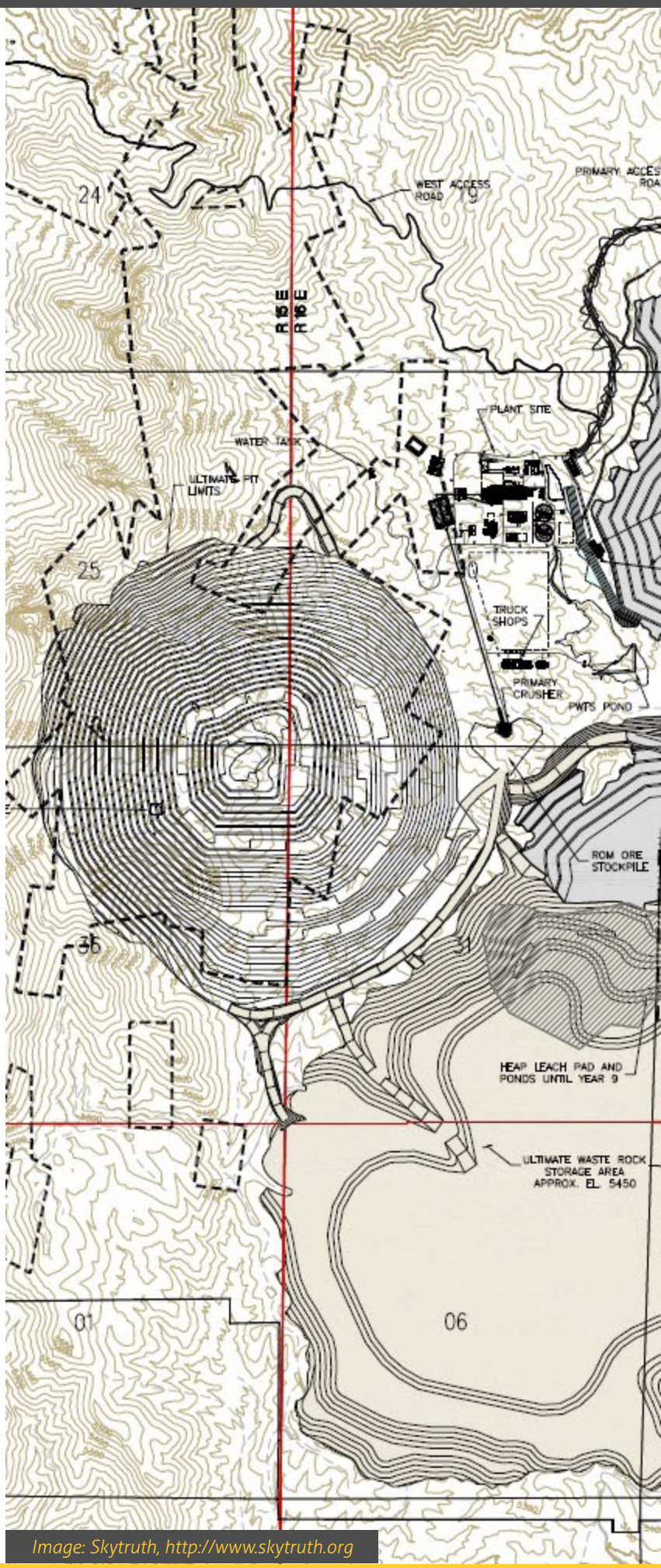


Image: Skytruth, http://www.skytruth.org

One has to say under what timeframe one is making that measurement. Typically almost all of the fracturing fluid comes back during the life of the well."[1]

There have been several reported incidents where wastewater storage failed to contain produced water from gas drilling operations and caused nearby water contamination.[2] [3] Some treatment facilities have taken in drilling wastewater, unable to properly treat it, while regulators have stood idly by.[4] Drilling wastes from certain areas are especially radioactive, threatening the communities near disposal sites.[5] [6] In Pennsylvania, toxic drilling wastewater taken into a sewage treatment plant killed the microbes needed to properly treat the sewage. As a result, improperly treated fecal matter was discharged into the Susquehanna River.[7]

There are also documented instances of wastewater facilities improperly treating produced water from hydraulic fracturing operations.[8] Concerns are growing over the fact that many of the gas producing states do not have the capacity to treat production wastewater.[9] Due to the failure of treatment facilities to cope with the degree of contaminants in drilling wastes, some have recommended that wastewater be treated as "industrial-strength hazardous materials" and kept separate from the treatment facilities that release treated water back into the water supply.[10] As the New York Times has recently reported, given its high levels of salt, radioisotopes and other contaminants, improper treatment of drilling wastes can have dire consequences for drinking water.[11] EPA documents reveal that federal regulators have failed to address this growing threat.[12]

Without placing restrictions on the rapidly growing gas industry, there is little to stem the flow of drilling wastes. Dr. Bishop recognizes the lax regulatory regime as central to this issue: "The sheer volume and peculiar noxious nature of these wastes pose significant challenges, even in the best of operating conditions. Laws in host states tend to make information about additives confidential, so monitoring efforts are hindered —where they are attempted at all. The facilities in place to handle process wastes are NOT adequate, particularly in the northeastern United States where underground injection capacity is extremely limited. This lack of facilities for process wastes may be the greatest obstacle currently faced by energy companies and state regulators."[13]

When not treated, wastewater is generally disposed of through underground injection. This procedure, however, cannot be performed in all states. There are concerns that disposal by means of underground injection will result in "creating yet another potential source of extremely toxic chemical contamination."[14]

1 http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=4918403&Language=E&Mode=1&Parl=40&Ses=3
2 New York Riverkeeper. "Fractured Communities." http://www.riverkeeper.org/wp-content/uploads/2010/09/Fractured-Communities-FINAL-September-2010.pdf
3 http://www.arpanel.org/content/Arkansas%20in%20the%20Balance.pdf
4 http://www.nytimes.com/2011/02/27/us/27gas.html?ref=ianurbina
5 http://www.state.nj.us/drbc/dockets/stone-energy/RadioactiveWasteManagement.pdf
6 Bishop Report. http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf
7 http://www.nytimes.com/interactive/2011/02/27/us/natural-gas-documents-1.html#document/p290/a9912
8 New York Riverkeeper. "Fractured Communities." http://www.riverkeeper.org/wp-content/uploads/2010/09/Fractured-Communities-FINAL-September-2010.pdf
9 http://www.ucsusa.org/clean_energy/technology_and_impacts/energy_technologies/how-natural-gas-works.html
10 http://www.thedailygreen.com/environmental-news/blogs/republican/shale-gas-47012501#ixzz15b5Yz8Rb
11 http://www.nytimes.com/2011/02/27/us/27gas.html?ref=drillingdown
12 http://www.nytimes.com/interactive/2011/02/27/us/natural-gas-documents-1.html#document/p533/a9948
13 DeSmogBlog Interview with Dr. Ronald Bishop. February 23, 2011.
14 Colborn Report. http://www.endocrinedisruption.

Some states require companies to demonstrate that the disposal injection will not escape target zones or contaminate fresh water aquifers.[1]

Some options remain for wastewater to be reused. But according to Dr. Anthony Ingraffea, "[wastewater] recycling in the U.S. is in its infancy. There are two types of recycling. One can hopefully reuse some of the return fluids in subsequent wells. Very few of the companies operating in New York, Pennsylvania, Arkansas, and Texas are doing that right now because it's an enormous additional expense. Recycling also takes the form of transporting the waste fluids away from the well pad to specially designed new technologies that can remove most of the waste from the fluid.

What you're left with is a smaller volume of more highly concentrated waste that can then be transported for safe disposal to underground injection wells, for example —which probably will not work... just like they won't work in Pennsylvania and New York. But they do work in Arkansas and Texas."[2]

Wastewater disposal through underground injection has recently been connected to a scourge of over 800 earthquakes in Guy, Arkansas.[3] Geologists from the American Geological Survey report that a "direct correlation" can be seen between the quakes and wastewater injection disposal sites.[4]

Regions which are "seismically active or intensively fissured pose greater risks for contamination than regions which are geologically stable."[5] An upswing in earthquakes in areas experiencing gas drilling has recently become cause for additional concern. After drilling began in Cleburne, Texas, the town experienced more earthquakes in eight months than in the previous 30 years combined.[6] Towns sitting atop the Barnett Shale field in North-central Texas, areas of western New York, central Oklahoma and West Virginia have all experienced quakes suspected of being connected to gas drilling or wastewater injection.[7]

According to Ronald Martino, a geology professor at Marshall University, it has been known for a half-century that underground fluid injection can lead to induced seismic activity.[8] High-pressure fluid injection has the potential to activate faults, a concern for Jack Century of J.R. Century Petroleum Consultants Ltd., who cautions "when we start perturbing the system by changing fluid pressure, we have the potential for activating faults," adding, "once local seismicity starts, it can't be turned off."[9] Most of the earthquakes experienced in these areas are relatively small, but pose a threat to cement casings, the only measure in place to protect drinking water from gas wells and underground disposal sites.[10]

com/files/ Oct2011HERA10-48forweb3-3-11.pdf

1 Pg 5-120. http://www.dec.ny.gov/docs/materials_minerals_pdf/ogdsgeischap5.pdf

2 http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=4918403&Language=E&Mode=1&Parl=40&Ses=3

3 http://www.huffingtonpost.com/2011/03/06/fracking-arkansas-earthquakes_n_831633.html

4 http://www.aolnews.com/2011/02/17/swarm-of-quakes-rattles-arkansas-residents-and-seismologists/

5 DeSmogBlog Interview with Dr. Ronald Bishop. February 23, 2011.

6 http://blogs.wsj.com/environmentalcapital/2009/06/12/quake-zone-the-natural-gas-industrys-big-fracking-problem/

7 http://www.watershedsentinel.ca/content/does-gas-fracking-cause-earthquakes

8 http://www.newsandsentinel.com/page/content.detail/id/117111/W-Va--studying-link-between-quakes--disposal-wells-.html?isap=1&nav=5071

9 http://www.watershedsentinel.ca/content/does-gas-fracking-cause-earthquakes

10 http://www.watershedsentinel.ca/content/does-gas-fracking-cause-earthquakes

Big Oil's Takeover Of The Gas Industry

Not too long ago, more than 80 percent of U.S. gas supplies were produced by "mom-and-pop businesses"—companies with an average of a dozen employees and a market capitalization of less than $500 million.[1]

But when ExxonMobil announced its successful acquisition of XTO Energy in November 2010, the face of the gas industry changed enormously.

With each passing day, the list of the top gas producers is starting to look a whole lot like the list of Big Oil companies.

Today, the natural gas industry is dominated by companies whose names are well known – Exxon-Mobil, BP, Shell, ConocoPhillips and Chevron are all in the top 10. It turns out that the "clean" gas industry is really just the dirty oil industry in disguise.[2]

1 http://www.npr.org/templates/story/story.php?storyId=113080237

2 http://www.huffingtonpost.com/2010/11/10/big-oil-companies-moving-_n_781832.html

Photo: Ed Schipul, http://www.flickr.com/people/eschipul

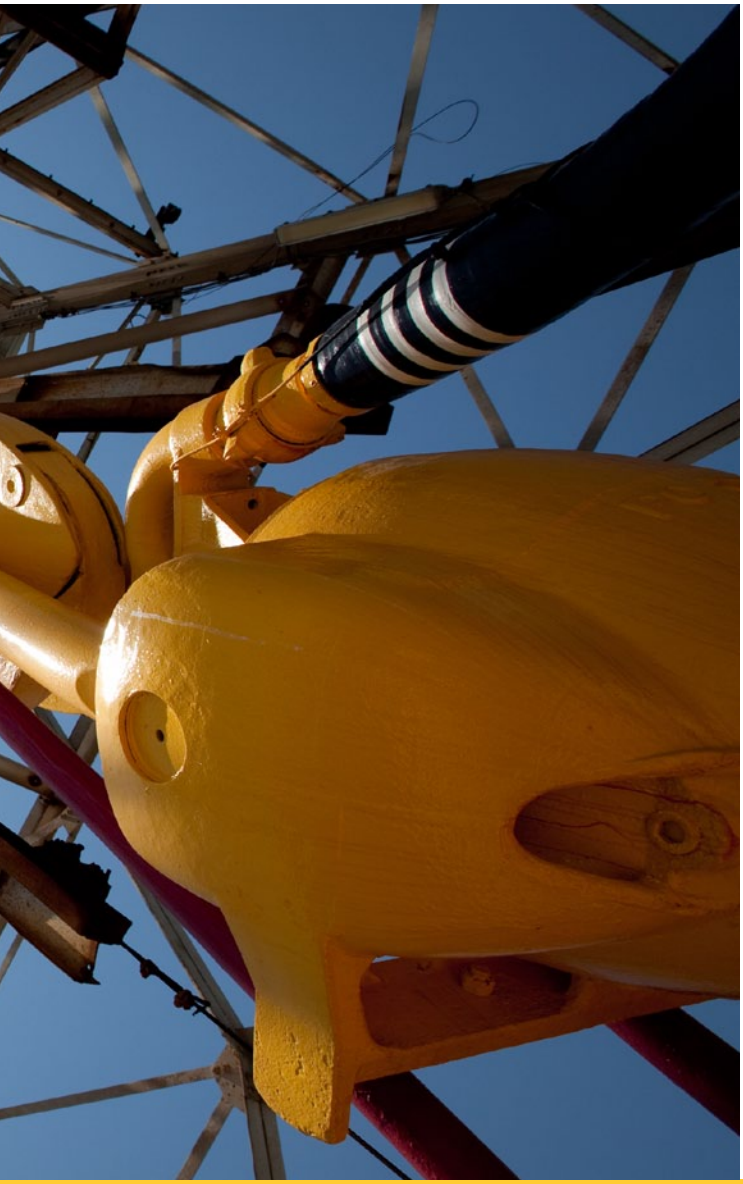
ExxonMobil is now the largest natural gas producing company in the U.S., producing about 16% of the nation's total consumption.[1] ExxonMobil went on a "year-long buying spree" in 2010, snapping up XTO Energy in June 2010 for $31 billion to become the largest U.S. gas producer.

Exxon then acquired Denver-based Ellora Energy Inc. in July 2010 for $695 million, and spent another $575 million in December to purchase Petrohawk Energy Corp's wells and reserves in Arkansas's Fayetteville Shale. With an additional $75 million, Exxon bought up Petrohawk's pipeline assets in the Fayetteville Shale.[2]

But Exxon isn't the only oil major focused on dominating shale gas production. Shell, Europe's largest oil company, is set to produce more gas than oil in 2011, a first in the company's 104-year history.[3]

In one of the biggest oil and gas deals of 2010, Royal Dutch Shell Plc agreed to buy most of East Resources Inc., one of the largest independent gas companies in the Appalachian Basin, for $4.7 billion in cash, increasing Shell's total shale gas acreage in the U.S. to about 3.6 million acres.[4] Some analysts say that acquisition was made strategically after the Gulf of Mexico BP disaster, when Secretary Salazar postponed Shell's permits to drill exploratory oil wells in the Arctic.[5] Shell's purchase of East Resources also occurred just after its joint acquisition with PetroChinaCo of Australian gas producer Arrow Energy.[6]

1 http://online.wsj.com/article/SB10001424052748703548604576037793004899856.html



2 http://online.wsj.com/article/SB10001424052748703548604576037793004899856.html
3 http://online.wsj.com/article/SB10001424052748704409004576146362117313094.html
4 http://www.businessweek.com/news/2010-05-28/shell-taps-shale-with-4-7-billion-east-resources-buy-update2-.html
5 http://www.dailyfinance.com/story/company-news/royal-dutch-shell-buys-east-resources/19495355/
6 http://www.businessweek.com/news/2010-05-28/shell-taps-shale-with-4-7-billion-east-resources-buy-update2-.html

Image: Skytruth, http://www.skytruth.org

Chevron, the second-largest energy company in the U.S., has just completed the purchase of Atlas Energy Inc. for $4.3 billion, which will make it a leading producer of gas from the Marcellus Shale.[1] Hinting at plans for an increase of gas exports, Chevron is also building a $40 billion liquefied gas plant off the coast of Australia.[2]

U.S. gas reserves have caught international attention as well. French oil conglomerate Total SA spent $800 million to form a joint venture with Chesapeake Energy Corp., the country's second-largest gas producer, with Total acquiring 25% of Chesapeake's Barnett Shale assets.[3] BP and Statoil have also entered into separate joint ventures with Chesapeake, purchasing gas assets in two major shale plays, the Fayetteville and the Marcellus.[4]

In January, Chinese oil giant CNOOC offered Chesapeake Energy $1.3 billion for a third of the company's stake in its gas reserves. One month later PetroChinaCo. offered EnCana, another gas giant, $5.4 billion for a share in its gas assets.[5] This decisive shift in the energy sector reveals that the oil majors are well aware of dwindling global oil reserves[6] and the new battle to control the "unconventional" fuel market. For energy companies looking to replenish their reserves, the search for oil is increasingly competitive and fraught with emerging complexities.

1 http://dealbook.nytimes.com/2010/11/09/chevron-to-buy-atlas-energy-for-3-billion/?nl=business&emc=dlbka22
2 http://www.businessinsider.com/big-oil-bets-on-natural-gas-2010-11
3 http://www.bnet.com/blog/clean-energy/chesapeake-8217s-joint-venture-strategy-hooks-another-foreign-energy-company/1041
4 http://www.bnet.com/blog/clean-energy/chesapeake-8217s-joint-venture-strategy-hooks-another-foreign-energy-company/1041
5 http://dailytradealert.com/2011/03/03/exxon-chevron-and-shell-are-betting-51-billion-on-this-commodity-and-its-not-oil/
6 http://online.wsj.com/article/SB10001424052748704409004576146362117313094.html

Exxon's inability to find new oil, the Wall Street Journal reports, is "a conundrum shared by most of the other large Western oil-producing companies, which are finding most accessible oil fields were tapped long ago, while promising new regions are proving technologically and politically challenging."[1]

What remains of the world's oil, about 90%, is nationally owned and so closed to multinational companies like Exxon.[2]

Struggling to find new reserves, Exxon and other oil majors have turned to gas as a proxy. Exxon would have fallen short of their reserve replacement ratio, for the first time in 17 years, had it not been for the vast amounts of newly acquired unconventional gas.[3] Like Exxon, other major oil companies are looking to invest in unconventional gas in order to prolong their highly profitable dominance in the fossil fuels market.[4]

The gas industry trade group Independent Petroleum Association of America (IPAA) downplays the fact that Big Oil is moving in on America's gas reserves, no doubt hoping to stave off public outcry for the repeal of oil and gas industry subsidies and tax breaks lavished on some of the wealthiest companies around. Instead, IPAA continues its attempts to project the 'local' "independent" reputation of the formerly mom-and-pop gas industry, arguing that a tax increase for gas producers would mean "an enormous, job-crushing tax increase on America's small businesses who deliver stable supplies of homegrown, reliable energy to U.S. consumers."[5]

But even back in 2009, before most of the small independent companies were swallowed up by giant multinationals, the top 10 gas producers were responsible for roughly half of all domestic production.[6] With opinion polls showing low public support for oil companies after decades of pollution and global warming denial, perhaps the IPAA fears that Big Oil's new dominance in the unconventional gas industry will bring increased scrutiny and enforcement.

Recent media reports suggest that more consolidation is likely in the unconventional gas industry this year, with analysts characterizing Texas-based Range Resources Corp. as an "attractive takeover target," for instance.[7]

The days of the "independent" mom-and-pop gas industry are gone.

Big Oil has taken over.

1 http://online.wsj.com/article/SB10001424052748704409004576146362117313094.html
2 http://www.businessinsider.com/big-oil-bets-on-natural-gas-2010-11
3 http://dailytradealert.com/2011/03/03/exxon-chevron-and-shell-are-betting-51-billion-on-this-commodity-and-its-not-oil/
4 http://www.businessweek.com/news/2010-10-01/oil-majors-to-dominate-u-s-shale-gas-m-a-wood-mackenzie-says.html
5 http://www.ipaa.org/news/fact_checks/2011/2011-02-11_49.php
6 http://247wallst.com/2010/12/02/seeking-major-profits-in-natural-gas-production-bp-chk-xom-eca-cop-dvn-eog-apc-upl-hk/
7 http://www.cnbc.com/id/42342885/Range_Resources_shares_rise_on_takeover_rumours

Gas Politics Are Polluted

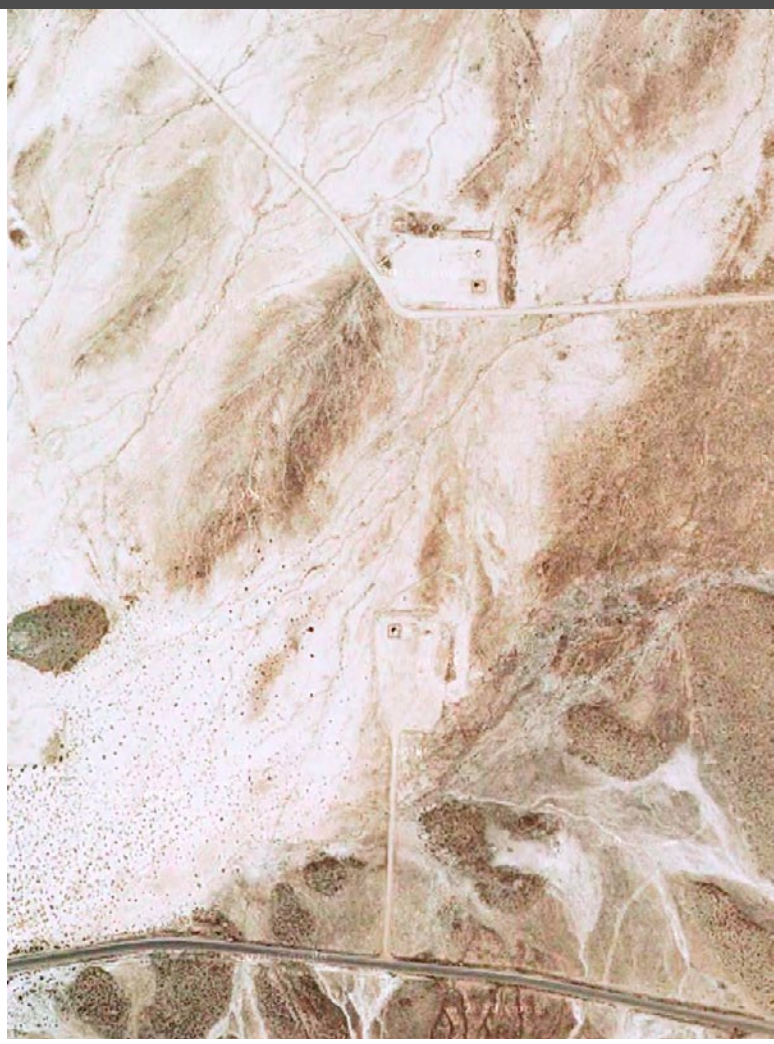
Introduction

Recent concerns about the human and environmental health risks associated with gas drilling have led to a growing interest in the rules governing the gas industry's behavior. Public outcry over instances of water contamination, air pollution and improper handling of dangerous drilling wastes has not yet led to necessary reforms in oversight of this industry. Instead, gas operators remain largely protected—and in some cases exempted—from the same oversight measures designed to hold other polluting industrial sectors in check, protections intended to prevent damage to public health and America's remaining wild lands.

Efforts to hold gas companies accountable for damage to the communities they drill in have been stonewalled by an out-of-date and inept regulatory system. Documents recently revealed by *The New York Times* show that attempts by lawmakers to notch up federal oversight have been stifled, scientists have been silenced and voices of concern from throughout government and industry have been hushed under the enormous pressure exerted by one of the nation's most rapidly growing industries.

As a result, gas drilling has accelerated across America while piecemeal state regulation has failed to keep up. While some states have made progress with drilling requirements and oversight, a nationwide picture demonstrates the immediate need for a deeper look.

Some insight into the history of gas oversight in the U.S. reveals how a well-orchestrated effort to misinform the public and officials has created the perfect recipe for the gas industry to grow much too fast, and to remain essentially unaccountable for many of its practices.



Historical Perspective Prior to the Bush/Cheney Years

Though much criticism of the gas industry has emerged recently, *The New York Times* investigation shows a long debate surrounding the regulation of oil and gas beginning during the Reagan administration in the 1980s. Over pressing concerns to regulate the industry, Congress sought the counsel of the Environmental Protection Agency (EPA). Though the EPA concluded that some of the drillers' waste was toxic and hazardous and advised Congress to tightly control the industry, Congress never heard those recommendations.[1]

1 http://www.nytimes.com/2011/03/04/us/04gas.html?_r=1

Fracking wastewater treatment facility, Ouray, Utah *Image: Google Maps*

This led to the perpetuation of categorical exemptions for the gas industry from the oversight of federal agencies. One exemption held in place after EPA withheld these findings excluded "drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of...natural gas" from the Resource Conservation and Recovery Act (RCRA).[1]

Many recommendations were eliminated from the final reports that were seen by lawmakers in 1987. The findings were altered, it is said, because of pressure from the Office of Legal Counsel in the Reagan White House. As it turns out, this was not an isolated incident of political interference. More than a quarter-century of efforts by lawmakers and public safety agencies to force the federal government to better police the gas industry have been thwarted, as EPA studies have been repeatedly narrowed in scope and important findings removed.

1 http://cogcc.state.co.us/Announcements/CPA_10091.Final.Brief.EP.PLEADING.pdf

Bush, Cheney and the Halliburton Loophole

The George W. Bush Administration received intense criticism from environmentalists for catering to entrenched fossil fuel interests and increasing America's reliance on dirty energy sources, missing a golden opportunity to pursue American leadership in developing clean energy technologies. The Bush/Cheney Administration was well known for its aggressive efforts to increase development of domestic fossil fuel resources, conducting massive land sales and leases for fossil fuel extraction, while simultaneously discouraging enforcement of existing public health, environmental and workplace safety protections.

A 2001 report in the L.A. Times[1] revealed that the Energy Task Force headed by Vice President Cheney courted industry leaders and welcomed input from lobbyists, resulting in the infamous National Energy Policy document.[2] Among the provisions included were taxpayer funds to reimburse oil companies for the costs of complying with the National Environmental Policy Act, suspension of Gulf of Mexico oil royalties, and opening the Arctic to drilling.[3]

The task force document also stated that "enormous advances in technology have made oil and natural gas exploration and production both more efficient and more environmentally sound...Yet the current regulatory structure fails to take sufficient account of these extraordinary advances, excessively restricting the environmentally safe production of energy from many known sources."[4]

Four years later, the resulting Energy Policy Act of 2005[5] - called one of the "most pro-oil, anti-environmental pieces of legislation in history," and noted for its rampant attempts at deregulation[6] - officially exempted hydraulic fracturing from EPA oversight under the Safe Drinking Water Act.

The Energy Policy Act was also responsible for creating "categorical exclusions" from the National Environmental Policy Act, a key rollback that led to expedited oil and gas drilling on federal lands.[7] A 2009 investigation by the Government Accountability Office (GAO) faulted the Bureau of Land Management for engaging in widespread abuse of categorical exclusions during the Bush/Cheney administration.[8]

The rampant deregulation under Bush/Cheney has been blamed for the careless handling of drilling permits that led to the BP oil disaster in the Gulf of Mexico.[9]

The Center for American Progress released a report in 2004 accusing the Bush Administration of "altering scientific information to advance an oil and gas development practice known as 'hydraulic fracturing.'"[10] This report entitled *"Special Interest Takeover: The Bush Administration and the Dismantling of Public Safeguards"* describes how in 2002 the EPA briefed congressional staff about the dangers of hydraulic fracturing, especially concerning benzene contamination in drinking water.

1 http://articles.latimes.com/2001/aug/26/news/mn-38530
2 http://www.wtrg.com/EnergyReport/National-Energy-Policy.pdf
3 http://climateprogress.org/2010/06/04/cheney%E2%80%99s-katrina-bp-oil-disaste/
4 Pgs xiii-xiv http://www.netl.doe.gov/publications/press/2001/nep/overview.pdf
5 http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_bills&docid=f:h6enr.txt.pdf
6 http://climateprogress.org/2010/06/09/cheney's-culture-of-deregulation-and-corruption/
7 http://www.nola.com/news/gulf-oil-spill/index.ssf/2010/05/onshore_oil_drilling_reforms_a.html
8 http://www.gao.gov/new.items/d09872.pdf
9 http://climateprogress.org/2010/06/09/cheney's-culture-of-deregulation-and-corruption/
10 Pg 103 http://www.americanprogress.org/kf/sispecialinterests.pdf

HALLIBURTON

In the aftermath of the BP blowout in the Gulf of Mexico the National Oil Spill Commission placed significant responsibility on Halliburton for employing a cement mixture in the Macondo well that repeatedly failed pressure tests. It is not uncommon for cement to form fissures under pressure and temperature changes. The tragedy in the Gulf of Mexico serves as a reminder that the oil and gas industry clearly need rigorous oversight and enforcement.

Former Vice President Dick Cheney, who previously served as Halliburton's CEO, was instrumental in getting the so-called 'Halliburton Loophole' inserted deep within the pages of the infamous 2005 energy bill. This loophole stripped the EPA of its regulatory oversight of hydraulic fracturing in natural gas development, a technique pioneered by Halliburton.

Halliburton boasts that their "cementing process has become industry standard" for natural gas drilling operations. However, extensive research conducted by the Worldwatch Institute points to the likelihood that faulty cement jobs at hydraulic fracturing sites could lead to instances of water contamination.

However the EPA inexplicably revised their position, saying fracturing would not contaminate drinking water with levels of benzene above federal standards. EPA claimed the change in position was due to information from an 'industry source.' As a result, Cheney's Energy Task Force removed any mention of these concerns from its energy plan.[1]

Numerous investigations into the federal agencies that oversee the nation's natural resources have revealed corruption and unethical behavior, noting the close ties between the oil and gas industry and the agencies charged with holding it accountable. The Bureau of Land Management (BLM), the now defunct Minerals Management Services (MMS) and the Department of the Interior (DOI) have all come under severe criticism, punishment and restructuring following probes into alleged unethical conduct.[2][3][4][5]

The Halliburton Loophole

The Halliburton Loophole[6] is the title given to a small provision inserted within the 2005 Energy Policy Act which exempts hydraulic fracturing, a technology pioneered by Halliburton for the extraction of gas, from the regulatory oversight of the EPA and specifically the Safe Drinking Water Act. Currently the gas industry is the only industry allowed to pump undisclosed chemicals directly into the ground, even when adjacent to underground sources of drinking water.

Halliburton first employed hydraulic fracturing in the 1940s and is today one of the largest suppliers of fracking technologies and chemicals.[7]

Industry-funded support groups such as Energy in Depth deny the exemption granted through the Halliburton Loophole, suggesting that hydraulic fracturing has never been regulated under the Safe Drinking Water Act.

1 Pg 103 http://www.americanprogress.org/kf/sispecialinterests.pdf

2 http://climateprogress.org/2010/06/04/cheney's-katrina-bp-oil-disaste/

3 http://climateprogress.org/2010/06/09/cheney's-culture-of-deregulation-and-corruption/

4 http://www.gao.gov/new.items/d09872.pdf

5 http://thinkprogress.org/interior-scandals-under-bush

6 http://www.nytimes.com/2009/11/03/opinion/03tue3.html

7 http://www.halliburton.com/public/projects/pubsdata/Hydraulic_Fracturing/fracturing_101.html

However, the Underground Injection Control (UIC) program of the Safe Drinking Water Act included hydraulic fracturing under its auspices until the 2005 Energy Policy Act inserted new language to exempt "the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities."[1]

Industrial, legislative and lobbying pressures dating back to the 1980s have successfully enabled numerous other exemptions and favors for oil and gas companies.[2] Federal breaks enjoyed by the gas industry include full or partial exemptions from the Clean Water Act, the Clean Air Act, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund Act), the Resource Conservation and Recovery Act, the Toxic Release Inventory and the National Environmental Policy Act.[3]

Flawed Earlier Studies Underscore Need For Revisiting Fracking Oversight

In 2000, the EPA began a study to determine the risks posed to drinking water by hydraulic fracturing. This controversial study,[4] completed in 2004, concluded that hydraulic fracturing in coalbed methane "poses little or no threat to drinking water."

This study was largely used to justify the "Halliburton Loophole" exemption and is still currently cited by the gas industry to assert the safety of hydraulic fracturing and to deny allegations of water contamination.[5] [6] [7]

The study has since been discredited after widespread criticism from independent experts, as well as internal criticism among EPA scientists who noted the faulty study neglected to test water samples in contaminated areas. Both EPA and independent experts noted the study was compromised due to the involvement of industry groups who were consulted throughout the process, posing a clear conflict of interest.[8] [9]

A 2005 report released by the Oil and Gas Accountability Project documents how the EPA removed essential findings from the study, included insubstantial data and partial findings and failed to address serious concerns relevant to the study's conclusion.[10]

The EPA study was also extremely limited in scope, focusing solely on coalbed methane fracturing and the potential for the underground migration of chemicals through rock layers.[11]

1 http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_hydroreg.cfm
2 http://www.nytimes.com/interactive/2011/03/03/us/20110303-natural-gas-timeline.html?ref=us
3 Colborn Report. http://www.endocrinedisruption.com/files/Oct2011HERA10-48forweb3-3-11.pdf
4 http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_coalbedmethanestudy.cfm
5 http://www.halliburton.com/AboutUs/default.aspx?pageid=2720&navid=981
6 http://iogcc.publishpath.com/hydraulic-fracturing
7 http://www.api.org/policy/exploration/hydraulicfracturing/index.cfm
8 http://www.propublica.org/article/buried-secrets-is-natural-gas-drilling-endangering-us-water-supplies-1113
9 http://www.earthworksaction.org/halliburton.cfm
10 http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf
11 http://www.propublica.org/article/buried-secrets-is-natural-gas-drilling-endangering-us-water-supplies-1113

After the report was released, EPA scientist Weston Wilson cautioned Colorado representatives[1] that "based on available science and literature, EPA's conclusions are unsupportable."[2] [3]

Benjamin Grumbles, then assistant administrator at the EPA, told ProPublica that the study was never meant to be a "bill of health" for hydraulic fracturing. The EPA, says Grumbles, urged Congress to avoid permanent exemptions. "Whether it's hydraulic fracturing or any other type of practice that can have an impact on the environment, one single report shouldn't be the basis for a perpetual, never-ending policy discussion," and, Grumbles goes on, "we certainly did not ask Congress to exempt hydraulic fracturing."[4]

But when Congress decided to force through a catch-all exemption for hydraulic fracturing from the Safe Drinking Water Act, the EPA was directed to keep their opposition silent. As Grumbles recounts, "We opposed the language" of the exemption but "what came across clearly to the EPA was that the [Bush] administration did not want us to take a formal position of opposition to the exemption." As assistant administrator, Grumbles was "disappointed" that Congress chose to ignore his proposal for additional safeguards. The exemption was pushed through without recourse to a "broader recapture position" to address future problems or industry abuse, even though this is standard practice.

1 Letter from Weston Wilson to Senators Allard and Campbell and Representative DeGette http://www.earthworksaction.org/publications.cfm?pubID=372 For a further explanation of the faults with the 2004 EPA study see Weston Wilson's defense comments in the document "Affirming Gasland" http://1trickpony.cachefly.net/gas/pdf/Affirming_Gasland_Sept_2010.pdf

2 http://www.propublica.org/article/congress-tells-epa-to-study-hydraulic-fracturing-hinchey-1110

3 http://latimes.image2.trb.com/lanews/media/acrobat/2004-10/14647025.pdf

4 http://www.propublica.org/article/former-bush-epa-official-says-fracking-exemption-went-too-far

Congress made no plans to revisit "what additional science is needed to justify the continuation of the exemption."

In response to growing concern over instances of water contamination, a bill called The Fracturing Responsibility and Awareness of Chemicals Act (FRAC Act) was introduced in the House and Senate. The FRAC Act would have required gas companies to disclose what chemicals they use in the fracturing process and require the regulation of fracturing activities under the Safe Drinking Water Act. The twin bills were introduced in 2009 but, despite growing support, died in committee.[5] In March 2011, the FRAC Act was reintroduced to Congress and still stands as the only credited, legislative attempt to close the cavernous "Halliburton Loophole."[6] The bill's supporters followed this reintroduction with a second bill, the Bringing Reductions to Energy's Airborne Toxic Health Effects Act (BREATHE Act), which is a response to the gas industry's exemptions from the Clean Air Act.[7]

In late 2009, after President Barak Obama signed the Interior and Environment Appropriations Bill, the EPA was congressionally mandated to launch a new investigation into hydraulic fracturing. This new report will address more extensively the threats posed by hydraulic fracturing to drinking water and human health.[8] The scope of the report was recently expanded by the EPA Science Advisory Board to include additional research into the life-cycle of gas drilling, especially hydraulic fracturing and the potential impacts on drinking water.

5 H.R. 2766 and S. 1215 were introduced in 2009 but died in committee.

6 http://coloradoindependent.com/79273/degette-polis-once-again-introduce-frac-act-to-bring-federal-oversight-to-gas-fracking

7 http://coloradoindependent.com/79800/polis-follows-up-frac-act-with-breathe-act-to-strip-clean-air-exemptions-for-gas-drilling

8 http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/index.cfm

This study will include a focused review of the potential impacts on drinking water, ten in-depth case studies conducted across the U.S., and will include stakeholder participation throughout the research.[1] The proposed research includes an increased scope of study including water acquisition, fracking fluid mixing, hydraulic fracturing, post-fracturing, and flowback and wastewater management. The initial results of the study are due in 2012 and the full report is due in 2014.[2]

Scant State Oversight

Although gas companies and pro-industry groups insist that gas extraction is adequately monitored by the states,[3] much criticism has been levied against state agencies for failing to keep pace with the rapidly growing shale gas industry. The Oil and Gas Accountability Project reports instances where regulators in numerous states failed to adequately respond to citizen complaints of water contamination leading to botched investigations.[4]

State regulators have been accused of pandering to gas drillers, with critics insisting that "the primary mission of these agencies has been to facilitate natural gas extractions and increase revenues for the states."[5] The close relationship between industry and state officials has also come under scrutiny by the EPA, which has criticized state regulators for insufficient response to complaints of water contamination.[6][7] The EPA has also come under fire for its own failure to adequately oversee the booming shale gas industry, although pressures from industry and politicians friendly to the industry have certainly contributed to this failure.[8]

Even the best state-level efforts to monitor the industry are not matched by adequate enforcement. In some states the ratio of gas wells to monitoring agents—for example, there are 12 inspectors to 59,000 wells in West Virginia - demonstrates the need for an increase in oversight and enforcement powers.[9] When regulatory structures do not evolve quickly enough to meet the challenges posed by a rapidly growing industry, states are often unable to adequately address issues, leaving the public at risk. At times states have been without the necessary framework to deny drilling permits to operators with poor records.[10]A number of state officials have cautioned against the rush to drill for gas, admitting to the enormous struggle that keeping up with the industry can be.[11]

Reporting requirements are often not stringent enough to keep a rigorous account of drilling activities in many states. Earthworks reports that many states do not require that companies reveal detailed information on drilling chemicals, the amounts of fluid used in drilling operations and how much of it remains underground, or whether fractures remain within targeted areas.[12] When a recent

1 http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/upload/SAB-Revew-Request-Final-2-8-11.pdf
2 http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/index.cfm
3 http://www.gwpc.org/e-library/documents/general/State%20Oil%20and%20Gas%20Regulations%20Designed%20to%20Protect%20Water%20Resources.pdf
4 http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf
5 http://www.endocrinedisruption.com/files/Oct2011HERA10-48forweb3-3-11.pdf
6 http://yosemite.epa.gov/opa/admpress.nsf/e8f4ff7f7970934e8525735900400c2e/713f73b4bdceb126852577f3002cb6fb!OpenDocument
7 http://www.nytimes.com/2011/03/08/science/earth/08water.html
8 http://www.nytimes.com/2011/03/04/us/04gas.html?ref=drillingdown
9 http://switchboard.nrdc.org/blogs/amall/more_evidence_of_too_few_inspe.html
10 http://switchboard.nrdc.org/blogs/amall/why_we_need_stronger_federal_r.html
11 http://switchboard.nrdc.org/blogs/amall/states_increasingly_worried_ab.html
12 http://www.earthworksaction.org/halliburton.cfm

congressional investigation revealed that numerous companies were illegally injecting diesel fluid in hydraulic fracturing operations, state officials admitted they had no knowledge of the practice.[1]

Recommendations made to state regulators by the State Review of Oil and Gas Environmental Regulation (STRONGER)[2] reveal the glaring voids in existing regulatory structures:

- Baseline testing is not always mandatory prior to drilling activities.
- Cement job logs are not always maintained by operators.
- Potential underground migration pathways which could act as a conduit for fluid migration into groundwater, such as abandoned wells, do not have to be identified before drilling in all states.
- The depth of surface casings when drilling near groundwater do not have to be included in drilling permit applications to ensure groundwater protection.
- Not all states have adequately addressed how information on fracturing chemicals will be made available to medical responders in the event of an emergency.
- Not all operators are required to notify state officials when drilling operations will commence.
- Waste storage and pits do not always undergo inspection or certification.
- Operators are not always required to report hydraulic fracturing fluid volumes or fracture pressures.

1 http://democrats.energycommerce.house.gov/index.php?q=news/waxman-markey-and-degette-investigation-finds-continued-use-of-diesel-in-hydraulic-fracturing-f

2 http://www.strongerinc.org/documents/PA%20HF%20Review%20Print%20Version.pdf

Attempts to increase state oversight of drilling operations have at times been met with hostility. When regulators in Colorado mandated fracture fluid disclosure in April 2010 the industry sued to have the new rule overturned.[3]

Major gas producers have pressured lawmakers to keep oversight of drilling at the state level and not increase federal participation.[4] The Colorado Petroleum Association, for example, has been working overtime to keep the EPA away from oversight of drilling wastes, referencing legal amendments and exemptions dating back to 1980.[5] Federal involvement, the CPA argues, would introduce a "host of practical and legal problems for the oil and gas industry." EPA's response[6] shows the Agency's efforts to enforce interpretative limits on what have become out of control historical exemptions. The CPA arguments also demonstrate a disregard for the EPA's more recent efforts to clarify out-of-date legislation, describing exemptions from thirty years ago as more "authoritative."[7]

Obama, Jackson, Salazar and the Future of Gas Drilling Oversight

There is little evidence to suggest the present administration is equipped to exert the sort of command needed to rein in the gas industry. The Obama administration has vocalized support for gas in the mix of America's clean energy portfolio, promising incentives for an increased use of the fuel.[8]

3 http://www.americanprogress.org/issues/2010/04/fracking.html

4 http://www.reuters.com/article/2010/03/25/energy-climate-fracking-idUSN2523659520100325

5 http://cogcc.state.co.us/Announcements/CPA_10091.Final.Brief.EP.PLEADING.pdf

6 http://cogcc.state.co.us/Announcements/Pit_Liners_EPA%20response.to.CPA_1.pdf

7 http://cogcc.state.co.us/Announcements/CPA_10091.Final.Brief.EP.PLEADING.pdf

8 http://www.eenews.net/public/Greenwire/2011/01/04/3

The administration also supported drilling in the watershed area supplying drinking water to New York City and Philadelphia despite an ongoing comprehensive environmental study and widely supported moratorium.[1]

As growing criticism of the gas industry is shining a spotlight on federal officials, House Republicans are using any excuse to pressure the Obama administration into expediting oil and gas drilling.[2] But despite Congressional pressure there is some indication that the Obama administration is not willing to repeat the mistakes of the past. Obama's hand picked Secretary of the Interior Ken Salazar has shown intent to reform the oil and gas sector, saying that oil and gas companies would no longer be the "kings of the world" to whom public lands were a "candy store."[3] Salazar is critical of the past administration's irresponsible development, evidenced by the dramatic increase in legal battles resulting from rushed leases: 1 percent in 1998 up to 40 percent in 2008.[4]

Although Salazar has been cautious regarding his stance on domestic energy production, acknowledging the ready ire of the industry, he has worked to undo some of the irresponsible patterns of the Bush Administration. He has held back on leases, in some instances revoking leases, and has attempted to increase royalty rates, a plan not passed in Congress. Salazar has also voiced potential plans to mandate disclosure of fracturing fluids through the Department of Interior, most especially for drilling on public lands.[5]

In a testimony to the House Natural Resources Committee, Salazar warned that the continued secrecy surrounding fracturing chemicals could result in backlash from the American public.[6] However there are concerns that this move is orchestrated to placate environmentalists who will surely criticize increased drilling on public lands.[7]

Congress was quick to pressure Secretary Salazar to abandon any increase in federal oversight of gas extraction. The Congressional Natural Gas Caucus, a 32-member bipartisan group, urged Salazar not to introduce any "hastily proposed regulatory burdens" on the industry that will "increase energy costs for consumers, suppress job creation in a promising energy sector, and hinder our nation's ability to become more energy independent."[8] The group also encourages Salazar to respect the "legislative process and yield to the Congressionally-directed study that the Environmental Protection Agency is currently conducting."

Secretary Salazar's hint at increasing regulation has also been criticized by the House Energy and Commerce Committee and the House Natural Resources Committee,[9] suggesting that in the current political environment, it may be hard to oppose industry growth.

Other federal departments may have an equally hard time with attempts to overhaul the current regulatory regime. The EPA has been given little jurisdiction over gas drilling and, as outlined above, some states are actively involved in limiting federal involvement.

1 http://www.nytimes.com/gwire/2010/12/14/14greenwire-obama-admin-wants-study-but-backs-northeast-sh-25319.html
2 http://www.eenews.net/public/Greenwire/2011/01/04/3
3 http://www.reuters.com/article/idUSTRE6054SI20100106
4 http://www.hcn.org/wotr/a-cheer-for-interior-secretary-salazars-new-approach
5 http://thehill.com/blogs/e2-wire/677-e2-wire/131151-interior-mulls-policy-on-disclosure-of-gas-fracking-fluids
6 http://thehill.com/blogs/e2-wire/677-e2-wire/147345-salazar-warns-of-public-backlash-against-gas-fracking
7 http://www.eenews.net/public/Greenwire/2011/01/04/3
8 http://naturalgascaucus.murphy.house.gov/index.cfm?sectionid=46&sectiontree=8,46&itemid=92
9 http://thehill.com/blogs/e2-wire/677-e2-wire/136321-house-members-to-interior-back-off-natural-gas-drilling-rules?page=2

Although Congress has mandated the EPA launch new investigations into the health dangers of hydraulic fracturing and risks posed to drinking water, there has been little to signal Congress' dedication to the federal body's science or recommendations.

As the *New York Times* recent investigative reports have outlined, EPA's involvement with the industry has been actively limited by regulators, lawmakers and industry groups alike.[1] But since these reports have exposed state failure to keep up with the industry, the EPA has been quick to voice its criticism, and launch an investigation of its own. After a top Democrat from the Natural Resources Committee demanded immediate action,[2] the EPA began an inquiry into wastewater disposal practices in Pennsylvania, asking the state to reveal internal documents and issued permits.[3]

Unconventional gas is currently exempt from compliance with the following statutes:

Safe Drinking Water Act (SDWA)

Clean Water Act

Clean Air Act

Comprehensive Environmental Response, Compensation, and Liability Act CERCLA (Superfund Act)

Resource Conservation and Recovery Act (Hazardous Waste Act)

National Environmental Policy Act (NEPA)

Toxic Release Inventory under the Emergency Planning and Community Right-to-Know Act (EPCRA)

http://www.earthworksaction.org/pubs/PetroleumExemptions1c.pdf

1 http://www.nytimes.com/2011/03/04/us/04gas.html?_r=1&ref=drillingdown
2 http://thehill.com/blogs/e2-wire/677-e2-wire/146295-dems-seek-epa-gas-controls-on-heels-of-expose
3 http://www.nytimes.com/2011/03/08/science/earth/08water.html

But even if the EPA begins to ramp up its federal oversight and scrutiny of state practices, there is no guarantee, without stronger legislative directive, that state regulation will adequately improve. The EPA will continue to encounter an uphill struggle with the states that have nothing but the short term economic gains from gas development in view.

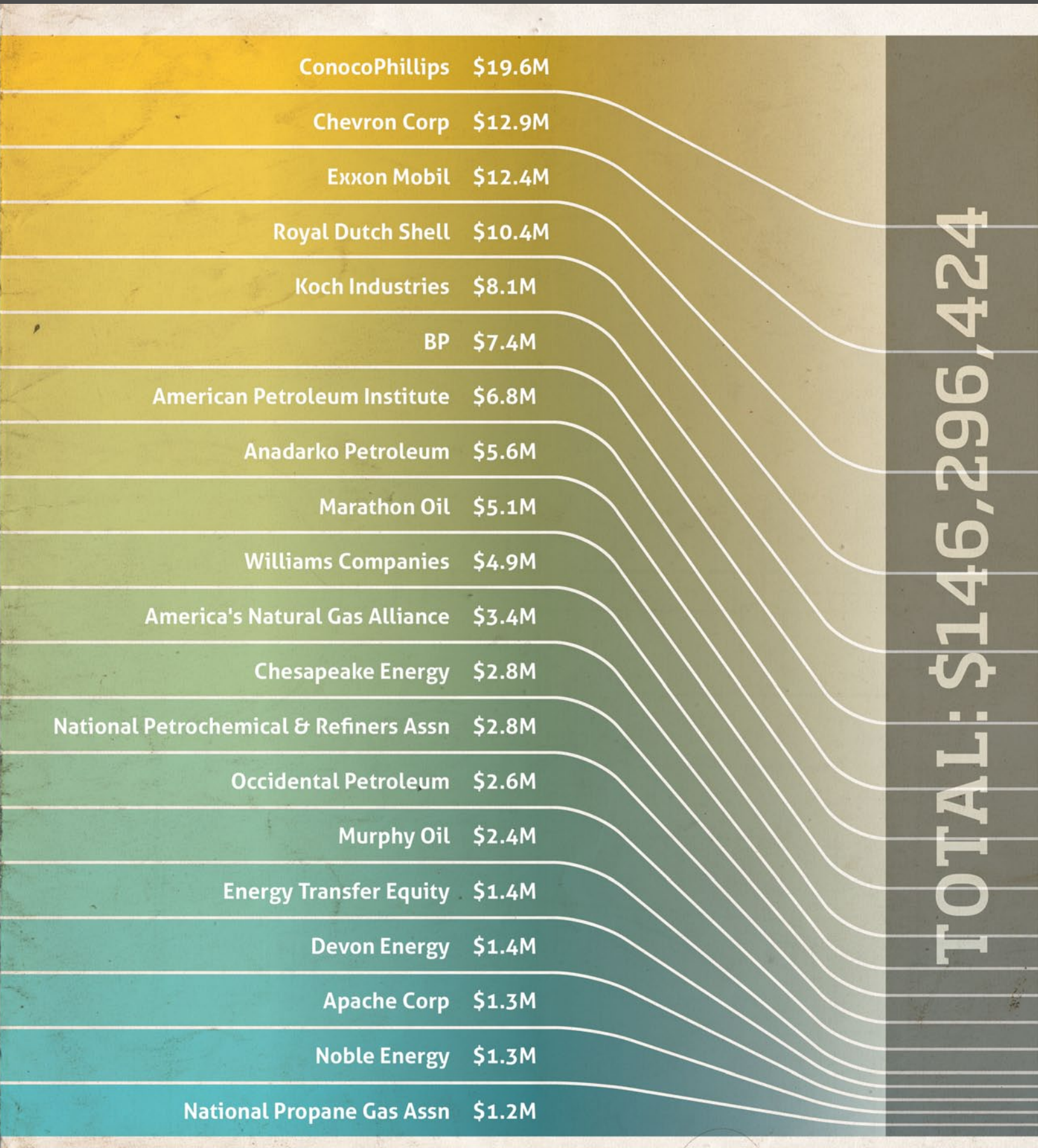
For example, the new governor of Pennsylvania, Tom Corbett, has given unprecedented authority to newly appointed director of the Department of Community and Economic Development, C. Alan Walker. Walker, a former energy executive and CEO of Bradford Energy Company and Bradford Coal, has been granted authority to "expedite any permit or action pending in any agency where the creation of jobs may be impacted."[4]

With this type of state policy on the horizon, weakened federal departments like the EPA will need strong Congressional support to provide effective oversight for the rapid growth of domestic energy production - the kind of help, it appears, they are unlikely to receive in the current Congress.

In late March 2011, President Obama delivered an Energy Security speech at Georgetown University, where he heralded domestic gas production as not only the first solution to energy security, but also an "area of broad bipartisan agreement."[5] However, at a town hall meeting in mid-April, President Obama acknowledged his own concerns about fracking, stating: **"The problem is, is that extracting [gas] from the ground—the technologies aren't as developed as we'd like and so there are some concerns that it might create pollution in our groundwater, for example. So we've got to make sure that if we're going to do it, we do it in a way that doesn't poison people."** [6]

4 http://www.propublica.org/article/corbett-pa-energy-exec-authority-environment
5 http://www.nationaljournal.com/energy/obama-s-energy-security-speech-there-are-no-quick-fixes--20110330
6 http://www.politico.com/news/stories/0411/53423.html

Gas Industry Lobbying Muscle



The gas lobby has been steadily increasing its presence in Washington, with industry sponsored groups such as American's Natural Gas Alliance, the Independent Petroleum Association of America, the American Gas Association, and the Natural Gas Supply Association pushing for natural gas to become a mandated part of America's "Clean Energy Standard."[1][2] With a seven-fold increase in reported lobbyists between 2009 and 2010, the gas network is working hard to secure its reputation against a history of poor practice and the fuel's weakened position as a clean alternative.

But as much as lobbyists have attempted to separate gas from other dirty fossil fuels,[3] [4] the industry has emerged as a heavy polluter, contributing to a dramatic upswing in greenhouse gas emissions, poor air quality, drinking water contamination and toxic wastes. Even company investors have voiced their concerns over the liabilities posed by industry's cavalier practices.[5] And despite widespread concerns over the dangers of natural gas drilling, regulatory agencies have demonstrated a history of placing industry concerns first, over public health and safety.

Industry front groups have released numerous reports attesting to the safety of gas extraction procedures and the supposed rigor of state oversight.[6] Some industry-friendly reports threaten that increased federal oversight of gas production would have catastrophic economic effects,[7] presenting to lawmakers and the public a misleading choice between the economy and environment.[8]

1 http://thehill.com/images/stories/blogs/gasletter.pdf
2 http://thehill.com/business-a-lobbying/84123-natural-gas-lobby-steps-up-to-challenge-coal?page=2#comments
3 http://www.anga.us/learn-the-facts/power-generation/clean--efficient
4 http://www.aga.org/our-issues/issuesummaries/Pages/EnvironmentalBenefitsofNaturalGas.aspx
5 http://www.sustainablebusiness.com/index.cfm/go/news.display/id/21796
6 http://www.propublica.org/article/energy-industry-sways-congress-with-misleading-data-708
7 http://fossil.energy.gov/programs/oilgas/publications/environment_otherpubs/Oil_Gas_Environ_Proposals_Report_Jan_200.pdf
8 http://www.propublica.org/article/energy-industry-sways-congress-with-misleading-data-708

Companies such as BP, Shell Oil and ConocoPhillips have exerted pressure on senators to leave drilling regulation to the states.[1] Lawmakers, in exchange for supporting votes and campaign contributions, are cornered into making concessions on behalf of states reliant on oil and gas revenues.[2]

Gas hungry states are becoming a cornerstone in the lobbying enterprise. Recently the American Petroleum Institute, an industry group, coordinated a trip to Washington with 18 gas workers from six states to push House and Senate officials to prioritize industry growth.[3]

Politicians are now caught between an aggressive multi-million dollar industry campaign to separate gas from dirty energy sources like oil and coal,[4] and experts who caution against a large-scale switch to gas[5] because there is no guarantee that spending millions to commit to the fuel will have any climate or environmental benefits.[6]

In his 2011 State of the Union Address, President Obama sent clear signals that his administration has been swayed by the campaign when he cited gas as a part of the clean energy mix of the future. But the political clout demonstrated by the gas industry, now representing some of the world's largest oil majors, threatens America's true clean energy future by stifling the production of renewable energy.

1 http://www.reuters.com/article/2010/03/25/energy-climate-fracking-idUSN2523659520100325
2 http://www.reuters.com/article/2010/03/25/energy-climate-fracking-idUSN2523659520100325
3 http://www.nytimes.com/gwire/2011/03/08/08greenwire-natural-gas-companies-send-workers-to-hill-to-83229.html
4 http://www.chk.com/naturalgas/Pages/default.aspx
5 http://www.eeb.cornell.edu/howarth/CCSP%20letter%20on%20energy%20&%20environment.pdf
6 http://www.propublica.org/article/natural-gas-and-coal-pollution-gap-in-doubt

The enormous lobbying expenditures made by industry groups to increase political pressure have translated into an inept regulatory structure, public misinformation campaigns, drinking water contamination, an abundance of toxic waste and climate pollution, all in the interest of prolonging the nation's commitment to fossil fuels.

Using data from the Center For Responsive Politics' OpenSecrets.org, DeSmogBlog has compiled information on some of the heaviest hitters in the natural gas lobby.

In the previous two years alone, the oil and gas lobby spent over $320 million pressuring Washington to protect oil and gas industry interests. [1]

2010 Lobbying on Oil and Gas

Total number of clients reported:	188
Total number of lobbyists reported:	779
Total number of revolvers**:	493
2010 Total Expenditures:	$146,296,424

2009 Lobbying on Oil and Gas

Total number of clients reported:	187
Total number of lobbyists reported:	178
Total number of revolvers:	500
2009 Total Expenditures:	$175,189,824

1 *http://www.opensecrets.org/lobby/indusclient.php?lname=E01&year=2010*

*** The term 'revolvers' refers to former federal employees now registered to lobby at the federal level.*

'Energy In Depth'–Industry Front Group Funded By Major Oil and Gas Companies

'Energy In Depth' is the unconventional gas industry's most vocal front group. It was created in 2009 to defend hydraulic fracturing and unconventional gas in the wake of a rising number of investigative media reports calling the industry's risky practices into question.

Energy In Depth (EID) has spent the bulk of its first two years attacking the movie Gasland, as well as the excellent print and online reporting done by ProPublica[1], the Associated Press and, most recently, The New York Times in its "Drilling Down" series[2], all of which revealed significant problems with fracking and other unconventional gas activities.

From its earliest days, Energy In Depth has sought to project an image of itself as the voice for small, independent "mom and pop" gas companies.

EID's chief spokesman, Chris Tucker, told a Pennsylvania radio host in an April 2010 interview:

> "[Energy In Depth] was formed by independent natural gas producers—**not the big boys—but the independent ones, the small 'mom-and-pop' shops** across the country that really were at the forefront of developing this [fracking] technology that's allowing us today to tap this shale."

That is consistent with how Energy In Depth describes itself on its 'Contact Us' page on its website:

> "Energy In Depth is a project of America's small, independent oil and natural gas producers..."

But it isn't true. While EID prefers to project this 'mom and pop shop' image, DeSmogBlog uncovered an industry memo[5] earlier this year revealing the group's actual origins and seed funding. EID's launch was a key component of a multimillion-dollar lobbying and public relations campaign by the largest oil and gas companies designed to defend fracking.

1 http://www.propublica.org/series/buried-secrets-gas-drillings-environmental-threat
2 http://topics.nytimes.com/top/news/us/series/drilling_down/index.html
3 http://media.wilknewsradio.com/a/30268408/chris-tucker-spokesman-for-energy-in-depth-on-marcellus-shale-drilling.htm
4 http://www.energyindepth.org/about/contact-us
5 http://www.desmogblog.com/energy-depth-was-created-major-oil-and-gas-companies-according-industry-memo

The June 2009 memo, entitled "Hydraulic Fracturing Under Attack," was authored by Barry Russell, president of the Independent Petroleum Association of America (IPAA), who specifically listed and thanked the world's largest oil and gas companies for enabling the creation of Energy In Depth, including BP, Halliburton, Chevron, Shell, Halliburton and XTO Energy (now owned by ExxonMobil).

The memo states: *(see blue highlight)*

The Independent Petroleum Association of America

Hydraulic Fracturing Under Attack

June 5, 2009

Dear IPAA Members and Colleagues:

American oil and natural gas producers are under attack on many fronts – from proposed new taxes to possible new environmental regulations. This week, the criticism has focused on one of our most critical practices that provides America with much-needed energy – hydraulic fracturing.

ENERGYINDEPTH

EnergyInDepth.org: ***a state of the art online resource center to combat new environmental regulations, especially with regard to hydraulic fracturing.***

For months, IPAA's government relations and communications teams have been working around-the-clock on a new industry-wide campaign – known as "Energy In Depth" (www.energyindepth.org) – to combat new environmental regulations, especially with regard to hydraulic fracturing. And, we're seeing some outstanding results. IPAA Vice President of Government Relations Lee Fuller and Vice President of Public Affairs Jeff Eshelman are working on the "Energy In Depth" campaign that has garnered the attention of national news outlets, including *The Wall Street Journal*, *The New York Times*, *The Washington Post*, Reuters, the Associated Press, National Public Radio and more. The cooperating regional and state associations have been an integral part of this national campaign and they are working closely with their news media and policymakers using coordinated messages.

The "Energy In Depth" project results from the realization that American production opponents are spending millions of dollars throughout the country. This project is a major initiative to respond to those attacks. It reaches into the new communications tools that are becoming the pathway of choice in national political campaigns. It connects IPAA at the federal level to state associations and member companies across the nation. But, it is costly.

The "Energy In Depth" project would not be possible without the early financial commitments of: El Paso Corporation, XTO Energy, Occidental Petroleum, BP, Anadarko, Marathon, EnCana, Chevron, Talisman, Shell, API, IPAA, Halliburton, Schlumberger and the Ohio Oil and Gas Association. Many of our cooperating associations have also been working hard on this campaign and I'd like to thank them as well. But we can also use more help. Please let me know if you could make a contribution to this effort.

"The "Energy In Depth" project would not be possible without the early financial commitments of: El Paso Corporation, XTO Energy, Occidental Petroleum, BP, Anadarko, Marathon, EnCana, Chevron, Talisman, Shell, API, IPAA, Halli- burton, Schlumberger and the Ohio Oil and Gas Association."

However, none of these major oil and gas companies, nor the industry's largest trade association—the American Petroleum Institute—are acknowledged on the 'About Us' page of Energy In Depth's website.

Instead, EID portrays its origins as far more modest, suggesting that its "website and affiliated educational programs were created by" a coalition of state-based oil and gas associations, whose logos are featured on its 'About Us' page. This is presumably designed to leave the impression that EID was launched by small, "independent petroleum producers" rather than by the largest oil and gas companies on the planet.

Further calling into question the alleged "mom and pop" origins of Energy In Depth, its website was created by Dittus Communications, a Washington DC public relations firm best known for its work for major tobacco and nuclear industry interests.[1] (Dittus is now part of Financial Dynamics, an international communications conglomerate.)

For a group that has accused Gasland director Josh Fox of creating an "alternate history," and claims to be "setting the record straight" about the gas industry's highly controversial practices, EID seems awfully disingenuous about its own origins and whose interests it truly represents.[2]

According to the 2009 memo, Energy In Depth was set up as a "major initiative to respond to...attacks" and to devise and circulate "coordinated messages" using "new communications tools that are becoming the pathway of choice in national political campaigns."[3]

The memo reveals the key role that the Independent Petroleum Association of America played in launching Energy In Depth: *(see yellow highlight)*

"For months, IPAA's government relations and communications teams have been working around-the-clock on a new industry-wide campaign – known as "Energy In Depth" (www.energyindepth.org) – to combat new environmental regulations, especially with regard to hydraulic fracturing."

Two IPAA staffers, Lee Fuller and Jeff Eshelman, spearheaded the launch. Chris Tucker is also listed as staff on the 'Contact Us' page. Tucker did double duty in 2009 handling communications for Energy In Depth and the Institute for Energy Research, using the same phone number for both. (IER has received over $300,000 from ExxonMobil and an undisclosed amount from other oil and coal interests to confuse the public about climate change and to attack clean energy sources. For example, Danish journalists revealed last year that IER had bankrolled a study attacking the prospect of wind energy.[4])

1 http://who.is/whois/energyindepth.org/
2 http://www.energyindepth.org/2010/08/don%E2%80%99t-worry-we%E2%80%99re-with-the-band/
3 http://www.desmogblog.com/sites/beta.desmogblog.com/files/HFUnderFire.pdf
4 http://www.desmogblog.com/institute-energy-research-admits-it-was-behind-anti-wind-study

More recently, Energy In Depth has continued to thank the largest oil and gas companies for providing its ongoing funding.

Below are two of the EID's recent acknowledgements of its supporters. Note the dominance of major oil and gas companies and trade associations and the near total absence of anything that could honestly be called a small "mom and pop" company.

From a November 2010 Energy In Depth "Weekly Update"

THANK YOU 2010 Contributors:

API
Atlas
BJ Services
BP
Chesapeake Energy
ConocoPhillips
Chevron
El Paso
EOG Resources
ExxonMobil
Halliburton
IPAA
Noble Energy
Ohio Oil and Gas Assn.
Range Resources
QEP Resources
Schlumberger
Shell
Talisman Energy
Ultra Petroleum

Whiting

http://energyindepth.org

From a February 2011 Energy In Depth "Weekly Update"

Fundraising Update

We've had some significant early pledges and your EID team would like to thank those companies and trade groups for offering financial support in the coming year. We have an aggressive 2011 agenda/campaign and **need your help**. Please contact Chris or me if you'd like information on EID membership!

Thanks to the following early supporters:

Trade Groups

American Petroleum Institute (API)
Independent Petroleum Association of America (IPAA)
Ohio Oil and Gas Assn.
Pennsylvania Independent Oil and Gas Assn.
Independent Oil and Gas Association of West Virginia
Independent Oil and Gas Association of New York

Companies

Anadarko
BP
Chesapeake Energy
Chevron
ConocoPhillips
Encana
EnerVest
EOG Resources
ExxonMobil
Linn Energy
Range Resources
Shell
Statoil
Swift Energy
Ultra Petroleum
Whiting

Too much too fast?

The number of active natural gas wells in the United States has doubled in the last two decades, and gas drillers say they have fracked around 90 percent of the 493,000 gas wells active today. In Pennsylvania alone, drillers were issued roughly 3,300 gas well permits in 2010, up from only 117 in 2007. Over the past three years, gas fracking in the state produced more than 1.3 billion gallons of wastewater. There are currently 6,400 permitted gas wells in Pennsylvania, and the industry hopes to drill at least 50,000 more unconventional gas wells there in the next 20 years. (Source: The New York Times "Drilling Down" series [1])

1 The New York Times, "Regulation Lax as Gas Wells' Tainted Water Hits Rivers," by Ian Urbina, February 26, 2011 *http://www.nytimes.com/2011/02/27/us/27gas.html*

Photo: Ed Schipul, http://www.flickr.com/people/eschipul

Conclusion

The potentially devastating impacts from unconventional gas development on water and air quality as well as the global climate deserve much more scrutiny.

The potentially devastating impacts from unconventional gas development on water supplies, air quality and the global climate deserve much greater study and scrutiny. The emerging red flags of concern raised by scientists conducting research into unconventional gas threats clearly indicate that a precautionary approach is necessary. Despite the uncertainties, one fact is clear: the U.S. unconventional gas industry is currently exempt from many of the needed transparency, oversight, monitoring, and enforcement statutes designed to protect public health and safety. That must change.

A more accurate accounting of the true costs associated with unconventional gas extraction is critically needed before a national commitment is made to another dirty fossil fuel as an interim "bridge fuel" or longer-term energy option.

As this report outlines, industry lobbying and misinformation campaigns have confused the public and lawmakers and effectively limited much-needed federal oversight of unconventional gas operations. This industry pressure has contaminated the political process and stifled meaningful public participation in the debate about our energy future.

Meanwhile, troubling new findings from independent scientists, academics and concerned citizens shed light on many negative impacts of unconventional gas drilling that were previously unaccounted for. Lawmakers and oversight agencies should take into consideration the warnings from experts highlighted throughout this report—from Dr. Daniel Botkin, Dr. Theo Colborn, Dr. Ronald Bishop, the Cornell team of Dr. Robert Howarth and Dr. Anthony Ingraffea—and others. What these experts caution against is the threat of irreparable harm that the unconventional gas boom poses to water and air quality, human health and a rapidly destabilizing global climate.

If the United States truly endeavors to transition to a clean energy future, its dependence on all fossil fuels must be phased out as rapidly as possible. Opportunities to restructure our energy systems and to create a sustainable energy future present themselves every day. We ignore these opportunities at our own peril, as they are likely to be fewer and further between as scarce fossil fuel supplies grow increasingly difficult and expensive to bring to market.

Right now the dirty oil and gas industry is asking the public to commit to decades more reliance on a dwindling fossil fuel enterprise that, in turn, is virtually guaranteed to pollute our water, air and land, and further provoke a mounting global climate crisis.

Recommendations:

- A national moratorium on hydraulic fracturing for unconventional gas until independent scientific studies are conducted to verify that fracking is not responsible for adverse outcomes on drinking water, public health and the global climate.

- The federal government, not the states, should strictly oversee setting and enforcing standards for unconventional gas drilling. Federal oversight of the unconventional gas industry is critical, since the states have not demonstrated the capacity to hold drillers accountable for contamination of water supplies, growing air pollution problems and the potentially devastating climate change implications of fugitive methane and other emissions. Federal agencies should employ existing federal statutes that don't currently apply to gas drilling, and review the need for any new standards necessary to protect public health and the environment.

- Greater scrutiny is needed on common drilling practices such as cementing procedures, wastewater handling and storage of harmful drilling chemicals.

- Congress and federal agency officials must immediately require mandatory industry reporting of lifecycle emissions of gas drilling operations to ensure relevant and reliable information is accessible to the public, especially independent experts.

- They must also require mandatory disclosure of fracking fluid chemicals, including the exact chemical recipes used in each operation.

A nationwide moratorium on gas fracking is warranted due to:

- Drinking water contamination threats – particularly of private wells near fracking operations, as well as municipal sources drawn from waterways impacted by unconventional gas drilling directly and via inadequate fracking wastewater treatment prior to discharge into these waterways.

- Uncertainties about the extent of methane emissions and leakage from drilling operations, storage tanks and pipelines carrying gas.

- Threats to pristine Western lands such as Colorado's Roan Plateau from unconventional gas drilling.

- Questions about the migration of fracking wastewater injected underground in several areas of the country.

If independent scientists ultimately deem resumption of fracking sufficiently safe, DeSmogBlog recommends that federal oversight agencies and state officials require:

- Mandatory baseline surface and ground water testing be conducted in surrounding areas prior to exploration and development of fracked gas wells.
- Fracking operations should remain suspended until all precautionary safety and capture equipment is deployed at every gas well,
- Disaster and emergency response plans submitted and approved by relevant agencies to deal specifically with fracking-related blowouts and other mishaps.
- Mandatory reporting of methane leakage and other emissions from gas operations.
- Mandatory disclosure of all fracking chemicals used in each operation so that regulators and emergency responders know what is in use at each site at all times.

Beyond these necessary steps to rein in the unconventional gas boom, lawmakers must immediately reconsider their emphasis on promoting unconventional gas for America's future energy needs – which is, essentially, a commitment to further fossil fuel dependence.

Federal investments of taxpayer dollars must look beyond the 'bridge' temptation and instead focus on the rapid scale-up of truly clean, renewable energy sources.

Any federal investment in new unconventional gas infrastructure inherently means diverting dollars that could be better spent transitioning America off fossil fuels permanently.

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