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# Don't Throw the Baby Out with the Frack Water: A Reasoned Look at the Benefits and Shortcomings of Hydraulic Fracturing

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## I. INTRODUCTION

The debate over hydraulic fracking is similar to many other political debates in the United States today. There are two very entrenched sides fighting the decision whether to explore this new energy source or pull back because of environmental and health concerns. The fight has spilled over into the public sphere and inevitably the discussion of complex issues gets boiled down to tired, rehearsed talking points that serve as echo chambers for those for or against. This article is an attempt to look at the facts involved, avoiding scare tactics and embellishment, and present a reasoned argument for how the benefits of fracking outweigh its shortcomings.

A key aspect to understanding the effects, both positive and negative, about fracking is knowledge of the process and goals of hydraulic fracking. After readers are clear on what goes on during the fracking process, it will be easier to understand the benefits fracking can bring. Once reasoning for both sides has been explored, this article will attempt to respond to some of the most common arguments against the expansion of fracking. Lastly, fracking is obviously still in its infantile stages but the future of fracking is important to all people because of how impactful energy resources are on everyday life. Predictions for the future of the industry make up a big part of the fracking discussion going forward.

## II. THE PROCESS AND GOALS OF HYDRAULIC FRACKING

### A. *Fossil Fuels*

The end result of the fracking process is the production of energy. Energy, in the form of oil and natural gas, is used to power many of the conveniences that modern society has come to rely on. If society's demand

outweighs the energy supply, power may become too expensive and leave some people and industries literally and figuratively out in the cold. Energy comes in the form of fossil fuels such as oil, coal, natural gas, from nuclear sources and from renewable energy sources such as windmills and solar panels.

Fossil fuels get their name because they are created by time and pressure compressing organic matter such as the remains of plants and animals into large rock formations. Fossil fuels are relevant to the fracking discussion because oil and natural gas are the two primary forms of energy produced by fracking and together they make up 47% (25% and 22% respectively) of energy use in the United States.[1] Coal rounds out the fossil fuels and makes up another 22% of the country's energy usage.[2]

The hierarchy of cleanest burning fossil fuels begins with natural gas. When burned, natural gas produces significantly less of the green house gas carbon dioxide when compared with oil and coal.[3] In 2001 natural gas from fracking made up 1% of the energy use in the United States.[4] In 2010 natural gas accounted for 20% and experts predict it could grow to 46% of energy use by 2035.[5]

After natural gas in the cleanest burning fossil fuels hierarchy comes oil. Oil, generally in the form of petroleum, produces more green houses gases when burned for energy than natural gas but still far less then coal.[6] Oil is the world's most popular fuel and is also used as a lubricant and to produce products such as fertilizers and plastics.[7]

Coal is the lowest fossil fuel on the hierarchy because it produces, relative to natural gas and oil, the most green house gasses when burned for energy. Although coal is plentiful and cheap it is dangerous and destructive

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[1] ALEX PRUD'HOMME, HYDROFRACKING: WHAT EVERYONE NEEDS TO KNOW 10 (2014).
[2] *Id*.
[3] *Id*. at 16.
[4] *Id*. at 20.
[5] *Id*.
[6] *Id*. at 10, 16.
[7] *Id*. at 14-15.

to mine.[8] Coalmines are becoming more expensive to build because of expensive EPA regulations on the building and operating of the plants.

In summation, because fossil fuels make up such a large percentage of the United States' as well as the world's energy needs, strategies/regulations/projects that find ways to fill the fossil fuel demand with cleaner burning natural gas as opposed to a more pollutant source like coal would be meeting energy needs with the cleanest method feasible.

i. *History of Fracking*

Fracking is a term that actually describes a sequence of processes. First is the drilling of a vertical well into a bed of shale. This could also include finding a vertical well that was previously drilled but has since been pumped dry by traditional mining techniques. The next step is to drill a horizontal well that acts as a branch off the original vertical well. Once the horizontal well is drilled a combination of water, chemicals, and proppants, a mixture known as "fracking fluid", is pumped into the well at a high rate of speed. The incoming fracking fluid creates or expands cracks and fractures in the shale and the proppants, such as plastic pellets or sand, allow for the release of hydrocarbons from the rock either in the form of oil or gas. The last step of the fracking process is the remediation of the waste fluid.

A man named George Mitchell first tested the process described above in Texas. His interest in fracking arose when Congress passed the Windfall Profits Tax Act, as a reaction to a high embargo on oil, which created a production tax for unconventional gas. Oil taken from shale beds qualified as unconventional and Mitchell's "slick water" fracking process, which was designed to prevent wells from clogging, increased well production form 70 barrels a day to 700 and made him a wealthy man. The main benefit of Mitchell's new technique is the ability to enhance the production of wells. Not only will every well moving forward be producing at historically efficient rates the fracking technology also allows energy producers to produce energy from sources previously thought to be depleted.

[8] *Id*. at 10-12. Coalmines can cave-in and techniques like strip mining and mountain top mining have dire effects on the environment. *Id.*

Since the early days of fracking advances have been made to improve upon the basic process. Most significantly in terms of improving production and limiting damage is the development of 3D seismic imaging technology, which has improved the ability to find "sweet spots" or clusters of dense gas pockets, and directional drilling which has reduced the distance that a vertical needs to be drilled.

### ii. *Process*

Basic knowledge about how the process of hydrofracking works is essential for a complete understanding of the arguments for and against the process. Knowing how well sites are scouted, how actual wells are drilled and how energy is extracted can dispel rumors as well as illuminate possible issues involved in the fracking process.

Assuming the proper research has been conducted to demonstrate that a productive well can be drilled in a certain location, the physical onsite process of hydrofracking a well begins with building the drill deck that holds and supports the drilling equipment.[9] Then a drill bit is lowered and a vertical well is drilled normally somewhere between 5000 and 9000 feet deep depending on geography at any specific spot.[10] The drill bit is rotated horizontally and continues drilling for a mile or more to create an arm off of the original vertical well.[11] Often these drilling steps are skipped because it is a common practice in the industry to take "traditionally" drilled wells that have already been in use and apply the fracking process to increase their production as opposed to drilling a fresh well.

Regardless whether the well is a traditional well or a fresh well drilled exclusively for fracking, the next step involves the actual fracturing of the rock to release gas or oil from tight spaces not accessible by normal drilling methods. Explosives are strategically placed and detonated to create breaks in the rocks. Fracking fluid is pumped into the well. The pressure of the fluid

[9] *Id*. at 31. Roughnecks rely on tall metal drill rigs that rise up to four stories tall, which lower diamond-tipped drill bits and sections of steel pipe into the borehole. *Id.*
[10] *Id*. Depth is very situational depending on where hotspots are located as well as considering at what depth horizontal wells need to be drilled. *Id.*
[11] *Id*.

and the proppants in the fluid hold open the newly created cracks in the rock.[12] Gas is trapped in air bubbles in the rock and when the rock is cracked open the gas is released.[13] In the next phase, called "flowback" in the industry, the water pressure is relieved and much of the fluid returns to the surface.[14] Finally, the well is cleaned out and prepared for gas production, which can take a few days to begin.[15] Once the fracking fluid has been used, companies employ different methods to dispose or store the large amount of leftover fluid. Methods include putting it in pools to evaporate, burying it deep under ground, storing it in large man-made containers to ship to processing plants, recycle it for use in other wells or use it on fields and roads in the name of "de-icing".[16] The process of creating fractures with high-pressure fluid may be repeated up to 25 times in an attempt to release as much gas as possible.[17]

### iii. *Fracking Fluids*

The liquid mixture used to create pressure to fracture the rock and hold open the fractures is known as fracking fluid. Fracking fluid is made up mostly of water but also includes hydrochloric acid to clean the wells and reduce friction, proppants to hold open cracks and release trapped gas, and other chemicals in the form of lubes, gels and foams depending on the specifics of the site.[18] The exact ingredients differ depending on the drilling company and the geology of the drilling site. Unfortunately because of laws protecting trade secretes companies are not required to provide a comprehensive list of all ingredients used.[19]

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[12] *Id*.
[13] *Id*. at 32.
[14] *Id*.
[15] *Id*.
[16] *Id*.
[17] *Id*. at 38-39.
[18] *Id*. at 32.
[19] *Id*. at 37.

## III. POSITIVE EFFECTS OF FRACKING

Supporters of expanding fracking operations point to three major "pro-fracking" points in their defense of the industry. First, they argue for the positive effect that fracking can have on a struggling economy. Second, proponents emphasize that although fracking presents some environmental concerns, the positive effects on our natural world far outweigh the problems. Finally, supporters of the practice note that fracking has geo-political benefits that could have a positive impact in the international political arena.

The economic impact of fracking could be revolutionary for many communities around the country who are struggling financially. In the year 2000, shale gas, a common type of energy produced by fracking, accounted for 2% of the nation's energy consumption;[20] in 2012, that figure rose to 37%.[21] This increase in reliance on natural gas has turned land with large shale formations into a valuable commodity. Landowners have benefited from leave rates of up to $6,000 an acre plus 20 percent royalties.[22] The country is in an energy transition period, moving from coal and oil to natural gas. There is a reason this transition is happening: natural gas is cheaper and less dangerous to extract than coal. Its is cleaner burning than coal and oil and the huge reserves of natural gas being found in this country create low prices, putting more money into household incomes. Power stations that have switched from coal to natural gas run cleaner and more efficiently, and they can pass those savings along to consumers. Natural gas processing plants create jobs[23] and bring lower-priced energy to manufacturers like farmers and automakers.[24] For example, in 2009 in Pennsylvania, the Marcellus Shale reserve was just being tapped into, and, as a result, the state added 44,000 new jobs, $389 million in state and local tax revenue and $4 billion added to the state economy.[25] Large amounts of natural gas available to be fracked locally lowers transportation costs by shortening supply chains. The trillions in added tax revenue will increase the national GDP.

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[20] *Id*. at 54, 95.
[21] *Id*. at 54.
[22] *Id*. at 53.
[23] *Id*. at 54.
[24] *Id*. at 56.
[25] *Id*. at 55.

The positive effects that fracking can have on the economic welfare in states where it occurs are not limited to simply jobs and money created directly from the fracking industry. Along with that added economic activity other, peripheral, businesses and communities will be helped economically by fracking. This extension of economic benefits beyond just the people and companies directly involved with fracking is known as the "halo effect." The economic halo that the fracking industry creates includes companies in the petrochemical and steel manufacturing industries, trucking and construction companies, real estate markets, and utility companies. Steel is used in the production of fracking elements like the casings for wells and supplies to build drilling platforms. Energy companies need trucks to move gas from drilling site to processing centers and trucks need roads to drive on built to and from their destinations. Lower priced energy positively affects building's heating costs, so lower gas prices require less tax money to heat schools and government buildings. The same logic can be applied to running fleets of vehicles such as garbage and mail trucks on cheaper, cleaner burning natural gas. The halo can extend even further when high power/low labor industries such as toy-making find that the use of cheaper energy can allow them to bring back production to the United States. Shale-rich communities can become more appealing to foreign investors, bringing in money where it is most needed. The amount of energy that can be extracted from reserves in the United States could change it from the status of "energy importer," dependent on other countries to meet its energy needs, to "energy exporter." This would be an economic edge because energy-needy countries would pay for natural gas as well, as being a negotiating tool used to gain advantages for the United States during international deal-making, as opposed to being held over our heads to extract advantages from the United States.

The environmental concerns over fracking have made news as one of the major drawbacks to the technology, but in reality and when compared with some alternatives, the consequences of adopting the widespread use of fracking could actually help the environment. The fact most material to this conclusion is that power plants fueled by natural gas emit about half the greenhouse gases that coal-fired plants do.[26] President Obama has praised

[26] U.S. EPA, *Clean Energy: Natural Gas*, EPA.GOV (May 22, 2014), http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html.

fracking's "good environmental record" in a 2011 MIT report,[27] and an article for *Scientific American* notes that although the media show some tragic accidents involving fracking, "data shows that the vast majority of natural gas projects are safe and the existing environmental concerns are largely preventable."[28] Supporters also note that only "a few instances of ground water contamination" have arisen in the past decade when almost 20,000 well have been drilled.[29] Proponents have gone to great pains to explain that fracking occurs well below water tables, and that in the vast majority of circumstances, the chemicals used are separated from groundwater by impermeable rock.

Fracking has also been accused of being a waste of water. In 2011, fracking operations used approximately 135 billion gallons of water.[30] While that might sound like a lot of water, it is considerably less than the 32,840 billion gallons used by the agriculture industry in the same year.[31] In fact, fracking used less water that year than all U.S. golf courses combined.[32] Other data shows that fracking uses 60% les water than coal production and 75% less water than nuclear energy production on a yearly basis.[33] Between 2007 and 2012, U.S. greenhouse gas emissions decreased by 450 million tons, the most of any country in the world. In that same time period, the percentage of coal used to power electric generation went from 52% to 38%, and natural gas went from 16% to 30%.[34]

As mentioned earlier, fracking creates a local energy supply, which will vastly reduce the distance that energy has to travel to reach its destination. Trucking natural gas from local wells to local processing plants creates far less pollution and requires far less fuel compared to the pollution created transporting oil from the Middle East to the United States. This pollution savings can be multiplied exponentially when the calculations

[27] PRUD'HOMME, *supra* note 1, at 64.
[28] Scott McNally, *Guest Post: Water Contamination – Fracking is not the Problem*, SCI. AM. (Jan. 25, 2012), http://blogs.scientificamerican.com/plugged-in/2012/01/25/guest-post-water-contamination-fracking-is-not-the-problem/.
[29] PRUD'HOMME, *supra* note 1, at 64.
[30] *Id*.
[31] *Id*.
[32] *Id*.
[33] *Id*. at 64-65.
[34] *Id.* at 66.

consider the savings created from reducing energy transportation to other heavy users around the world. If countries like China and India, which are notorious energy gobblers,[35] would replace some of their imported energy with local natural gas fracked from inside their own borders, transportation costs would be reduced dramatically.

Truck fleets like long haul delivery trucks and garbage trucks are one of the countries largest consumers of diesel fuel.[36] Now with lower natural gas prices many fleets see the economics of converting their vehicles to run on cheaper natural gas.[37] For example Waste Management Inc. had to charge customers and extra $169 million in 2011 to keep trucks fueled.[38] The next year the company ran the numbers and realized that even at an increased cost of $30,000 per truck, compared to diesel models, each truck would save an estimated $27,000 per year in fuel costs.[39] Companies like E.F. Transit, out of Indiana, have locked in low natural gas rates for the next several years and are taking advantage of a 50-cent-per-gallon federal tax credit provided by Congress.[40] Major automaker Chevy has introduced a bi-fueled pick-up truck; the Silverado HD.[41] Other large companies such as UPS, AT&T and Staples are also embracing natural gas fueled fleets.[42] Some hang-ups truckers have with converting to natural gas are the current lack of refueling stations, bulky tanks that hold the compressed gas and hazards that come with handing liquefied gas.[43] But all of these hardships will be softened in time by the ever-improving technology driven by a market that is demanding natural gas.

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[35] *Id.* at 12, 25.
[36] Rebecca Smith, *Will Truckers Ditch Diesel?*, WALL ST. J. (May 23, 2012, 8:16 PM), http://online.wsj.com/news/articles/SB10001424052702304707604577422192910235090
[37] *Id*.
[38] *Id*.
[39] *Id*.
[40] Tom Berg, *Monarch Beverage Co. of Indianapolis is Spending $16.5 Million to Convert its Truck Fleet to Natural Gas*, *CNG: Monarch Beverage Spends $16.5 Million to Convert Fleet*, TRUCKINGINFO (Sept. 2013), http://www.truckinginfo.com/article/print/story/2013/09/cng.aspx.
[41] Smith, *supra* note 36.
[42] *Id*.
[43] *Id*.

Not only are the economics of converting truck fleets to natural gas overwhelming but also it is highly advantageous for companies in this day an age to appear to be "going green." In the last few years the American public has been highly supportive of companies who create a modern, attractive and efficient image in all over their operations, including behind the scenes aspects such as transportation.

### A. *Geo-Political*

#### i. *Less OPEC control*

Importing oil from abroad comes at a huge cost to the United States. Annually America spends about $380 billion on imported petroleum.[44] The majority of this fuel comes from OPEC, an oil cartel located mainly in the Middle East.[45] Member countries control 80% of the world's conventional oil reserves.[46] Political and moral considerations associated with some of the OPEC member countries aside, the economic problem of importing oil from OPEC is that the United States is stuck paying whatever prices they demand. OPEC has monopolistic control of the oil industry and restrains supply in order to keep prices elevated. Similar to DeBeers in the diamond industry, OPEC chooses to sell only a fraction of the amount of oil in their supply. OPEC sells only about 31 million barrels of oil a day which is almost exactly what it sold 40 years ago when the world's oil demand and economy were about half as large as today.[47] The only way to fight this sort of control is to foster legitimate competition in the industry so OPEC is pressured to put more product into the market at a fair market value. A large scale energy source is needed in order to compete with an organization that controls 80% of the world's fuel supply. Fracking seemingly can be that source. A

[44] Marshall Kaplan, *Oil Economics: It's the Oil Price and Cost*, FUEL FREEDOM (Nov. 17, 2014), http://www.fuelfreedom.org/the-real-foreign-oil-problem/oil-economics/.
[45] OPEC stands for Organization of Petroleum Exporting Countries. Original members include Iraq, Kuwait, Iran, Saudi Arabia and Venezuela. Nine other countries have joined since its founding in 1960, although two are no longer members. OPEC Definition, MERRIAM-WEBSTER.COM, http://www.merriam-webster.com/dictionary/opec (last visited Sept. 16, 2014).
[46] T. Boone Pickens & R. James Woolsey, *Natural Gas for Cars (The key to ending OPEC's control over the U.S. transportation industry)*, NATIONAL REVIEW (Aug. 26, 2012), *available at* http://www.freerepublic.com/focus/f-news/2923258/posts.
[47] *Id*.

combination of vast deposits of natural gas located in the United States and low prices for that gas, thanks to the advent of fracking, can possibly supply the leverage need to fight OPEC's energy monopoly. The ratio of oil to natural gas prices is currently between 30-1 all the way up to 50-1.[48] Cheap natural gas is the key to ending our vehicles' oil addiction affordably and promptly and eventually can destroy oil's monopoly and OPEC's cartel.

### ii. *Alternative energy for heavy users*

The United States is not the only country responsible for environmental problems such as global warming due to the burning of fossil fuels. All over the world countries will far less rigorous regulations than the US are also heavy contributors to environmental issues. While differing social, political, geographic and economic conditions do not allow other countries to supplant the US fracking framework directly into their energy matrix, places like China and India, who are currently heavily dependent on coal and exported oil,[49] could benefit from using fracking to diversify their energy supply. So far many of these nations are taking a wait-and-see approach while watching how fracking develops in the United States.[50]

## IV. COUNTER-ARGUMENTS

### A. *Chemicals used can spill and seep into groundwater*

There are concerns about chemicals from fracking wells seeping into groundwater reservoirs and contaminating local water supplies. The potential risk to groundwater comes from two sources: the injected fluid, consisting of water plus chemical additives, and the released natural gas.[51] There are two stages where these chemicals could cause a contamination problem.

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[48] *Id*.
[49] Kenneth Rapoza, *China Closer to Joining Shale Gas Fracking Craze*, FORBES (Apr. 13, 2012, 11:12 am), http://www.forbes.com/sites/kenrapoza/2012/02/13/china-closer-to-joining-shale-gas-fracking-craze.
[50] Alanna Petroff, *The World's Next Fracking Hot Spots*, CNN (Sept. 17, 2013, 10:23 am), http://money.cnn.com/2013/09/17/news/global-fracking-ihs/index.html.
[51] Dave Healy, *Hydraulic Fracturing or 'Fracking': A Short Summary of Current Knowledge and Potential Environmental Impacts,* at 10* (July 2012), *available at* www.epa.ie/pubs/reports/research/sss/UniAberdeen_FrackingReport.pdf.

First chemicals could enter the natural environment "at depth" or miles under the ground where the actual fractures were created. According to a University of Texas study this is an unlikely possibility because of lower natural gas flow rates from a formation fracked at significant depth, but the authors mentioned that fracking is just recently becoming widespread so there has not been a chance for long term evaluation. It also seems unlikely that groundwater would become contaminated due to a leak at depth because the fractures are located thousands of feet below the surface, much further from any ground water aquifer and therefore present less of a risk to contaminate groundwater tables which are located in much shallower regions.[52]

Ground water could also become contaminated because of leakage from a defective well bore close to the surface. This is the more likely culprit of contamination because of the closer proximity to the ground water tables. The current opinion shared by several agencies is that all scientifically documented cases of ground water contamination associated with fracking are related to poor well casings and their cements, or from leakages of fluid at the surface rather than the fracking process itself.[53] If this theory is accepted, that ground water contamination is more likely due to faulty equipment, procedure or practice as opposed to a natural product of the fracking process, then the solution can be found in regulation of the industry. To stop fracking all together because of dangers to groundwater would be an overreaction. Instead the solution should be strict practices and effective testing procedures to ensure the mechanics operate safely.

### B. *Poor disposal/storage of waste water*

Disposal of fracking fluid after the fracking process also presents environmental challenges. Some companies have chosen to store the fracking fluid in a pond or in man-made pools and then allow it to either evaporate, or be transported away at a later date.[54] Evaporation leads to concentration of the chemical additives, increasing the potential for environmental impact if a

[52] *Id*. at 11-12.
[53] *Id*. at 11.
[54] *Id*. at 15.

leak develops and increased transportation takes it's toll on the environment in the form of increased use of roads, trucks and fuel.[55] One US company has developed a method to reuse fracking fluid but the high cost of the process may inhibit wider adaptation of the practice.[56] The best solution to this problem is to develop a fracking fluid that is free from chemical additives and is still as effective as chemical laden fluids.

### C. *Earthquakes*

The process of fracking inherently involves the risk of seismic activity. Essential to fracking is the creation of cracks in solid rock. When the natural resting position of a rock formation is altered by pumping millions of gallons of water and proppants into the rock fractures, the risk of larger fractures opening or rock layers slipping is enhanced. During the fracking process there is little direct control of the nature of the fracture network created, and how the newly created network might then interact with a pre-existing and potentially undetected fracture network.[57] The key to minimizing any potentially dangerous seismic repercussions from fracking is careful research and data gathering on the drilling zone before the project begins. If factors such as the amount of natural stress on the rock formation and the existence of any pre-existing fracture network are known in advance of the drilling and fluid injection risk of earthquakes can be quantified and adjustments in amount of fluid and pressure can be made to avoid disrupting a fault and causing an earthquake.[58]

## IV. CONCLUSION

The risks associated with fracking are all too real for the people in the communities affected. The dangers discussed above that are common near fracking sites cause real damage to the lives of the people living in close proximity. This is not something to be taken lightly or glossed over for the sake of over all economic efficiency as some implicitly, if not explicitly argue. The reality is that there are environmental costs, some quite large, to

[55] *Id*.
[56] *Id*.
[57] *Id*. at 8-9.
[58] *Id*. at 8.

any of the means available for harnessing energy and if society continues to consume at its current rate this is a fact that even the staunchest green thumb must accept. But the possible benefits to society are monumental. Cleaner, lower cost energy, freedom from the heavy burdens of importing oil from abroad and jobs created by an industry located inside our boarders are all too important for the future of the country to just plug our ears and decry all change from the detrimental energy status quo.

I would argue that the problem facing the future of fracking is not the inevitable environmental toll that any type of energy extraction process will take, but the reaction of the major industry players to these tolls. An antidotal example from the popular Comedy Central show "The Daily Show with John Stewart" highlighted gas giant Chevron's pathetic effort to compensate a Pennsylvania community who had lost a worker in a tragic fracking well explosion by offering coupons for a free large pizza and soda. Among many humorous but sadly true quips made by Stewart, the one that stuck out was, "It's the least they could do. Literally, I think it's *the least* they could possibly do." While this may make entertaining television, the stark reality is that the companies that stand to gain the most from fracking technology are giving minimal effort minimize the environmental costs of fracking. The onus is on those with control over the process to use this technology responsibly and when mistakes or accidents happen to respond not with an easy or inexpensive solution but in a way that really works to fix the problems they create. The "free pizza" story just goes to show that giant corporations would rather face negative public press than actually reach into their pockets to compensate and make safer the communities in which they operate. Maybe it's that major energy corporations have been cast as the enemy or bad guy for so long that they have come to embrace the roll of the greedy villain.

The actions of any energy company engaging in fracking must be scrutinized at every level. The problem is not just in the reactions after a problem occurs or a community is hurt. To truly maximize fracking's benefits and minimize its risks the real legwork must be done before any well is drilled or any fluid pumped. As this paper has explained, most of the dangers of fracking are due to human and mechanical error not an inherently dangerous process. Careful research into the site geology as well as carful

testing of equipment are real solutions that can be applied in practice to make this process safe.

Experts estimate that the accessible natural gas reserves could sustain the country's energy needs for the next century. That prognosis makes it sound like there will be no lack of available profits to be made for years to come. So it begs the question, with almost guaranteed and unlimited money to be made long into the future, why not take action now, at the infantile stages, to win public opinion? Why not take extreme measures to protect people, manufacture safe equipment, closely monitor drilling site and win public support for a technology that can benefit everyone if used in a responsible way? An over investment in safety and caution at these early stages would cost nickels compared to the gains in the future and companies would not have to fight the wrath of public opinion if they appeared to be making full efforts to protect those in danger. The age-old struggle between the haves and have-nots will not disappear overnight but possibly fracking, with its numerous mutual benefits to all parties, can be a starting point. It is up to decision makers who run companies and who run this country to recognize this opportunity for change. They must take the first step by putting the safety of people and communities over short-term profits in order to truly make fracking a success story.