1. Context and Problem

A. Overview

Over the last century, worldwide demand for energy has surged, while production remains tied to a limited supply of fossil fuels. We can now satisfy our demand for energy only at significant economic, political, and environmental costs. In the coming decades, energy demand will continue to grow rapidly, especially in the developing world.

At the same time, research will continue to increase the efficiency of renewable sources of energy. Unfortunately, current projections don't see renewable sources of energy completely replacing fossil fuels within the next few decades.

Since the late 1990s, there have been significant improvements in the technology used to extract oil and natural gas. These improvements, and particularly refinements to the process of *hydraulic fracturing* (or "fracking") have dramatically increased technically accessible reserves. Fracking could facilitate the recovery of enough natural gas and oil to both supply current American needs and to export internationally.

Fracking promises to reduce the price of energy, but there has been considerable debate about the environmental impacts of this technology. Cheap natural gas could displace funding for alternative clean energy funds, and could stall development of solar, wind, or tidal energy sources. In addition, the processes surrounding fracking raise a number of new and possibly serious environmental concerns, especially concerning water contamination.

In this exercise, we will use the instrument of *deliberative polling* to explore a number of competing regulatory approaches to fracking, ranging from a complete moratorium to a minimal regulatory response.

This document briefly lays out the costs and benefits of each option. During class, you will discuss the issues and have the opportunity to interrogate experts who can help clarify the facts and tradeoffs.

B. Fracking

Hydraulic fracturing ("fracking") is a process in which pressurized water, sand, and chemicals are pumped into a rock formation called 'shale' in order to crack (fracture) the rock and extract natural gas and shale oil. This process makes it possible to extract energy resources from a wide variety of natural rock formations which were previously inaccessible.

The basic idea behind fracking is old, but it has risen in economic significance in the last few decades and has only recently become a major source for natural gas in the US. Between 2005 and 2012 it has grown from a negligible share of US gas production to over thirty percent. It is estimated that about 500 trillion cubic feet of shale gas can be recovered using current technology, which represents about a quarter of all accessible natural gas in the US and could equate to 20 years of US gas consumption. However, these estimates are highly uncertain and volatile. The notion of "technically recoverable" will expand as technology improves, but not all technically recoverable reserves can be *efficiently* recovered. The degree of safety involved in recovery is a point of debate for many fracking opponents.

Worldwide, there are estimated to be about 6 quadrillion cubic feet of accessible shale gas, which is about a quarter of all accessible natural gas and is about 65 years of worldwide gas consumption. Notable currently accessed U.S. deposits are the Marcellus Shale (primarily in New York and Pennsylvania) and the Monterey Shale (California coastline). Fracking occurs in more than thirty states.

Largescale fracking is to a large extent still an unfamiliar process. The environmental consequences are not yet entirely understood, and a number of negative consequences have been identified. Perhaps the most concerning predictable consequence is the possible contamination of groundwater and drinking water, although the magnitude of these effects is still uncertain. A number of nations and states have placed moratoriums on fracking until these consequences are better understood.

C. Why consider fracking?

There are two primary reasons to consider fracking: the positive environmental effects of substituting natural gas for coal, particularly in the developing world, and the positive economic consequences of cheaper energy, and exportation profits for the United States in particular.

In the near term, it is clear that the developing world will massively scale up its energy infrastructure, and it seems unlikely that renewable energy sources will be able to meet a large fraction of this demand. Thus, this production will be primarily natural gas or coal, and using more natural gas means using less coal. Burning natural gas is considerably cleaner than burning coal, and so this is a favorable tradeoff.

The considerable reserves of shale gas will probably allow the price of electricity from natural gas to be well below the price of electricity from coal, even without a carbon tax. Reducing the price of electricity allows society to increase economically and socially valuable uses of electricity; at the same time, the reduced price reflects less social investment in energy production, freeing up resources for other problems. These issues are particularly acute in the developing world, where the lack of affordable energy curtails development and interferes with quality of life.

2. Overview of possible responses

What role for fracking would be best for society? What outcomes should US citizens, corporations, and governments work towards?

We'll consider five possible public policy options:

1. **Ban fracking altogether**. Stop the expansion of new fracking well creation, and cease the use of current fracking sites.
2. **Impose a moratorium on fracking.** Work to prohibit fracking throughout the US and discourage it around the world by way of a moratorium, until further studies are completed.
3. **High-regulation fracking**. Allow fracking using precisely defined procedures and with significant oversight.
4. **Moderate-regulation fracking.** Allow fracking with mandated environmental monitoring, targets for minimizing environmental impact, and penalties for failing to meet those targets.
5. **Low-regulation fracking.** Allow fracking with minimal regulations to prevent gross negligence.

Each of these options entails certain advantages and disadvantages, which we will shortly discuss. But before considering these options, we will consider the general arguments in favor of and against fracking itself.

3. Arguments in favor of and against increased fracking

The basic argument against fracking is that it is associated with a number of public health and local environmental impacts which are not yet well-understood. The displacement of funds or disincentivizing of pursuing clean (cleaner than natural gas or coal) energy sources is also an argument against fracking. One primary argument in favor of fracking is that natural gas displaces other forms of energy, many of which are known to have significant negative environmental impacts, both locally and globally. By permitting fracking, we can replace coal with natural gas, especially in the developing world, and reduce global warming substantially over the coming decades. On top of this, cheaper energy comes with significant economic benefits.

A. Against fracking

Fracking has a number of negative consequences for the local environment and infrastructure. To briefly summarize: fracking may contaminate drinking water and groundwater, fracking involves running large numbers of trucks and pumps which stress local infrastructure and have health implications, and fracking may have other unanticipated environmental consequences.

In response, natural gas producers claim that the negative consequences of fracking are greatly overstated. Moreover, the costs of fracking must ultimately be weighed against the costs of other energy sources. The environmental consequences of fracking operations tend to affect a small region—it may be possible to tell stories about negative impacts of fracking including family sickness, farm animal death, tap water that can be lit with a flame (due to high levels of natural gas), but quantitatively there has not been much evidence that those harms are significant by comparison to the global environmental effects (or even the local environmental effects) of other energy sources.

Drinking water contamination: The contamination of drinking water is probably the most salient environmental consequence. Gas wells often pass underneath aquifers that supply drinking water to local communities. When those wells are inappropriately or inadequately sealed, methane and other fracking materials can leak out and contaminate water supplies.

Investigations of drinking water near fracking operations suggest that such contamination occurs, though the magnitude and extent of the contamination remains unknown. There have been about 1,000 cases of contamination of drinking water reported to date by courts and local governments, although this number could easily significantly underestimate or overestimate the real prevalence: many reported cases have failed to hold up under closer scrutiny, but it may be possible for levels of contamination with serious health consequences to go unobserved. Some locals in fracking-industrialized cities have been instructed to avoid drinking and/or bathing in their home's running water.

Supporters of fracking argue that contamination is a relatively rare result of improper precautions, and that detractors focus on a small number of unfortunate cases.

In most cases, no measurements exist in areas to compare levels of methane, for example, before fracking began to those after. It becomes hard to distinguish leaks from naturally occurring methane. However, given that drinking water may be contaminated by natural gas extraction, and that the extent of this contamination is not yet well understood, it may make sense to slow or stop fracking until the situation is better understood. Contamination by gas would have significant health consequences, and in at least one case has led to an explosion.

A similar concern is the possibility that fracking fluid itself the mixture of chemicals and water which is pumped into the ground to fracture gas-bearing rock, and of natural minerals which emerge from the rock after it is fractured could leak into drinking water supplies. This concern has never been officially documented. If it occurred it would be associated with severe health risks. 17 million gallons of clean water are added to chemicals and sand to create this fracking fluid, up to 18 times over the course of a given well's lifetime. 10-30% of these fluids return to the surface as 'flowback.'

Surface water contamination: In addition to contaminating drinking water, fracking has the potential to contaminate groundwater and surface water. A huge quantity of fracking fluid is used, and this fluid must be disposed of after fracking (at this point it is called “flowback”). This fluid contains the chemicals used for fracking as well as minerals that were brought up during fracking, and may be highly radioactive primarily from leached radium226 and radium229 (A National Council on Radiation Protection study found 8,433 pCi/L of radium, the EPA’s limit for drinking water is 5 pCi/L), and very salty. Chemicals include carcinogenic benzene, toluene, ethylbenzene, and xylene. Disposing of flowback normally involves transporting the flowback using trucks for some distance before pumping it into a deep well for storage.

During this process, it is possible for flowback to spill and contaminate groundwater. This has already happened on a number of occasions. There have also been events in which fracking operators have failed to control a well and fracking fluids have flowed directly into the surrounding terrain.

These events typically involve thousands to tens of thousands of gallons of fracking fluid. This might represent a dangerous quantity of pollutants, but it is a small amount of water—a few minutes of flow from a small stream, or a few milliseconds from the Mississippi river. The quantities of fluid used in fracking operations are considerable, but to date there has not been a large spill. Wyoming experienced a fracking fluid spill from a drill malfunction in March, 2013, with no adverse effects reported. A spill occurred in Pennsylvania in April, 2011. A February 2013 spill in Colorado was ranked 5^{th} in volume out of 5,177 spills recorded by the Colorado Oil and Gas Conservation Commission database.

The disposal of flowback can also pose a challenge. The most common approach is to inject flowback into deep wells, but the safety of this approach relies on the integrity of those wells, which is often uncertain. If the wells are improperly sealed, flowback may leak and eventually make its way to groundwater. This has not yet been officially observed, but it may be hard to detect if it were to occur. The implications for contaminating groundwater in this way are unknown.

During early fracking operations in Pennsylvania, some flowback was sent to municipal water treatment plants which were not able to properly treat the water. This resulted in still-radioactive fluids being dumped into local streams. Since then Pennsylvania operators have changed their policies to dispose of wastewater responsibly. Supporters of fracking argue that these unfortunate events are relatively rare. Opposition to fracking points to anecdotal evidence that local ponds and farms have experienced widespread death of livestock and fish, supposedly due to fracking-related contamination.

Strain on infrastructure: Fracking operations involve significant use of heavy machinery and trucks which run on diesel fuel. This results in emissions that have a negative effect on local health. The large number of trucks involved in a fracking operation may impose an unusual strain on local infrastructure; this strain could be compensated for by a proportionally small tax levied on gas producers, though this has not been implemented yet. Flares (large, controlled flames burning off methane) are loud and bright, sometimes running 24 hours a day for days at a time. There may be negative implications for housing costs near these flares and fracking wells.

Missing pieces:
Fracking companies can currently use a loophole to get around disclosure regulations. They may justify nondisclosure of the exact makeup of their fracking fluids (chemical components) as simple protection of intellectual property, or 'trade secrets.'

Unanticipated consequences: We have not yet acquired a large body of experience with largescale fracking. This makes it difficult to rule out the possibility of unanticipated environmental consequences; it may be possible to understand some of these consequences by theoretical study, in which case fracking could be delayed until those consequences could be mitigated.

For example, the disposal of waste water from fracking has been associated with a number of very small earthquakes. Earthquakes have been rare, and our current theoretical understanding suggests that larger earthquakes are extremely unlikely, but these events point to the possibility of unanticipated consequences when engaging in largescale, imperfectly understood processes. Untangling causality in these cases may be difficult, and given the potential for such negative consequences, it may make sense to be conservative until the issues are better understood.

Fracking on a global scale is primarily aimed at natural gas production, however in California and the United States especially, shale oil is also a major extraction. This may negate some arguments in support of fracking.

Supporters of fracking argue that fracking is a relatively old procedure and that there are no confirmed and well-evaluated reasons to be concerned about fracking in particular, especially in the face of other sources of energy currently use that are known to carry significant costs.

B. In support of fracking

Perhaps the most pressing global environmental issue is climate change. Over the coming decades, climate change will primarily be driven by energy use in the developing world, where coal is currently the dominant source of electricity. Natural gas appears to be one of the only economically viable substitutes for coal, and so the increased use of natural gas is perhaps the most promising route to significantly reducing emissions in the developing world. Even if natural gas cannot serve as a long-term solution to these challenges, it can potentially slow the pace of climate change by decades while the technology behind renewable energy sources mature to the point where they can meet the developing world's energy needs.

What does natural gas replace? Energy production in the US

Each year the United States uses about a trillion dollars of energy, accounting for about 6% of the gross domestic product. In addition to the sheer economic cost of this energy, it is acquired at considerable environmental cost.

About 20% of this energy is produced by burning coal and about 25% is produced by burning natural gas. 15% is produced by nuclear energy and renewables, while the remaining 40% is from oil, primarily used as fuel for transportation or heavy machinery.

The requirements for electricity generation and liquid fuel are quite different; although fracking may have profound consequences for both, in this exercise we will focus on fracking for natural gas and its use for electricity generation. In this role, coal and natural gas are substitutes, as are renewable sources of energy. Roughly 70% of electricity in the US is produced by burning fossil fuels, with 20% produced by nuclear power, 7% from hydroelectric power, and 3% from other renewable sources like solar and wind.

Critics of natural gas point out that in addition to reducing US reliance on coal, a greater availability of natural gas might impede the development of renewable energy sources. In fact, cheap natural gas in the US has already arguably undercut wind power and caused it not to be economically viable. Although natural gas may have a better environmental impact than coal, it still has significant negative impacts, and any slowdown in the transition to clean energy comes with a cost.

Proponents of natural gas respond that electricity generation is already overwhelmingly coal (which is about 10 times as common as renewable sources of energy other than hydroelectric power), and so the effect on coal consumption is much larger than the effect on use of renewables. Development of renewables is in large part driven by nonmarket incentives, and these factors will not be disturbed by the appearance natural gas. Finally, the effect of natural gas on renewables could be minimized by an appropriate tax on natural gas, although such a tax might be politically infeasible. Such a tax would also generate revenue which could be used for other projects, such as the development of alternative energy sources.

Although we are discussing fracking in the US, one of the most important effects of policy in the US will be to influence how fracking is done abroad. The developing world is rapidly scaling up energy production, and the best hope for clean energy in the developing world is an environmentally responsible approach to fracking. Such an approach is most likely if responsible fracking is first developed and practiced in the US.

Energy production worldwide

US energy consumption, as well as US GHG emissions, are now only about 20% of the total worldwide. OECD nations and non-OECD nations (a crude proxy for the developed vs. developing world) currently consume roughly equal amounts of power. However, over the coming decades, energy consumption in the developing world, and particularly in China and India, is expected to grow rapidly, with China and India projected to more than double their consumption over the next two decades.

Energy production in the developing world is currently substantially less clean than in the developed world. China uses coal for about 64% of its energy, uses half of all coal which is burned worldwide, and is responsible for 25% of worldwide GHG emissions.

The developing world will soon be responsible for most energy production and most environmental impacts of energy production, but in fact this calculation *understates* the global importance of energy production in the developing world. Because energy use in the developing world is scaling up extremely rapidly, much of their energy infrastructure will necessarily be created over the coming decades. The power plants that are built today will continue to operate for many decades; since the great majority of new power plants will be in the developing world, the choices made there will have a dominant impact on the future of global energy production and on the course of global climate change.

In the developing world, the need for fossil fuels is more difficult to deny. Few anticipate that China will have made a transition to predominantly clean energy within the next two decades. Thus, in the developing world it is clearer that natural gas is a substitute for coal rather than renewable power.

The costs of coal

Natural gas competes with other electricity sources, particularly coal, and using more natural gas means using less of alternatives. Natural gas appears to have an improved greenhouse gas profile and appears to burn more cleanly with fewer negative health effects. Meanwhile, extracting coal is little better than fracking for local environments, if at all. It seems likely that replacing coal mining with fracking results is actually an environmental improvement.

Global warming: When burned, both natural gas and coal emit CO_2, which acts as a greenhouse gas (GHG) and contributes to global climate change. Producing a given amount of electricity from natural gas results in about 1/3 as many carbon emissions as getting the same amount from coal. This suggests that burning gas may be *much* less environmentally destructive than burning coal.

A significant concern with natural gas production is that methane, the main constituent of natural gas, is sometimes leaked during production or transport. If too much gas is leaked, then this would erode or eliminate the advantage of natural gas for avoiding global warming. Supporters of natural gas reply that gas producers are motivated to use all of the natural gas they produce, because wasted gas is their own loss.

The EPA estimates that 2.6% of all natural gas produced is emitted to the atmosphere (so-called “fugitive” emissions), while industry claims that only about 1.6% of gas is lost. A very small number of recent studies have reported widely varying estimates of how much gas is lost. Even the most pessimistic studies show that many wells leak very little gas while a few leak a lot. Given that there are incentives to minimize leakage it seems likely that a mature fracking industry will have many fewer leaks.

Recent guesses, though very error-prone, suggest that natural gas has a smaller effect on global warming than coal over the 100-year time horizon, while it may have a closely comparable effect over 20 years. Most analysis focuses on the 100-year time horizon because the impact of global warming over 20 years is considered to be much less significant.

In the long run, it seems likely that fugitive emissions can be cheaply controlled well enough to make natural gas a much lower emitter of GHGs than coal.

Extraction: The extraction of coal often involves significant environmental destruction, including strip mining and mountaintop removal. Mining coal involves significant hazards for miners. The extraction of coal also involves a strain on local infrastructure and local carbon emissions. Comparing these disadvantages to the disadvantages of fracking is difficult, but it is worth keeping in mind that the costs of fracking may seem large primarily due to fracking’s novelty—the alternative sources of energy are beset by a similar host of difficulties, and it is unfair to single out fracking on these grounds.

Other emissions: Burning coal also emits nitrogen oxides, sulfur oxides, and particulate matter. These emissions have a significant negative effect on human health—estimates suggest they lead to the early deaths of 10,00030,000 Americans each year—and have harder to quantify effects on local ecologies.

Sulfur and nitrogen oxide emissions from coal plants are the primary driver of acid rain, although sulfur emissions have been significantly reduced in the US via the installation of desulfurization technologies in coal plants. Sulfur oxides are not emitted by natural gas, and nitrogen oxides are emitted in much lower quantities.

C. Economic effects of fracking

Fracking for natural gas and shale oil has and will continue to significantly increase these available supplies. This will decrease the social cost of energy production, and (without taxation) will decrease the price and therefore increase consumption.

The price of natural gas in the US is now approximately $3 per thousand cubic feet, which makes natural gas cheaper than new coal plants (subject to existing regulations in the US) by about 15%. The US spends about $80 billion per year on electricity from coal plants, so the potential for savings by substituting natural gas for some coal production is extremely large, and dwarfs any existing estimates for the local environmental harms caused by fracking. In the near term, the price of natural gas in the US is projected to remain low enough for electricity from natural gas to be significantly cheaper than coal.

Technically recoverable reserves of shale gas in the US are large enough to supply about 40 years of current gas consumption; worldwide reserves are large enough to supply about 65 years of consumption. Thus, fracking may significantly increase the supply of natural gas for many years to come. The efficiency of fracking will decline as the most productive regions are exploited, and extracting the total technically accessible reserves will probably never be practical. At the same time the efficiency of fracking will increase as technology improves.

The local economic effect of fracking is more ambiguous. Fracking may impose poorly monitored externalities on locals, and decreases the value of local land which isn't used for fracking. See the discussion of local environmental effects above. On the other hand, fracking creates many local jobs—both directly and indirectly involved with fracking—and a proportionally small local tax could cover all of the quantifiable local effects without significantly affecting the attractiveness of fracking.

Nationally, the economy will greatly benefit from a move toward energy independence in which the US is able to provide its own oil and gas resources, which is a powerful political statement. Countries will likely come to depend on the US for these vast natural gas resources, and this can be a point of economic gain and political bargaining power on a national level.

4. Discussion of possible responses

Option 1: Ban fracking in the US and discourage fracking elsewhere; do not expand fracking use and cease use of current well sites

It may be feasible to impose a ban or temporary moratorium on fracking within the US and elsewhere. In the US, Vermont has imposed a ban. Abroad, France and Belgium have imposed bans on fracking.

Such a policy would prevent any of the disadvantages of fracking, yet fail to realize any of the aforementioned gains of fracking.

Option 2: Impose a temporary moratorium on fracking in the US, and discourage fracking elsewhere until more studies are completed and consequences reevaluated

It may be feasible to impose a ban or temporary moratorium on fracking within the US and elsewhere. In the US, Maryland and New York have already imposed moratoriums on fracking.

Such a policy would at a minimum delay the negative consequences of fracking until they have been subject to additional study. Further non-industry sponsored studies would prove useful in determining the safety of fracking as a process, and the consequences of expanding this practice. By the same token, such a policy would fail to realize any of the gains of fracking, as discussed above.

Another impact of a moratorium on fracking would be its likely effect on the practice of fracking in the developing world. Given the economic upside of fracking, it will be difficult to discourage in the developing world, where the need for energy is great. If fracking proceeds in the United States, the technology and practices developed here would likely be employed abroad. If these practices are cleaner than the practices that will otherwise be adopted in the developing world, this could have a significant positive environmental effect.

Option 3: Allow fracking using specifically approved procedures under significant oversight (high regulation)

There are many alternative approaches to fracking, varying protocols for drilling and prospecting of wells, extraction of gas and oil, and so on. These approaches have differing environmental effects, and currently the gas producer will choose an appropriate option based primarily on applicable environmental regulations and their own economic incentives.

Instead, regulators could select a single process that is believed to minimize environmental effects and require that all gas producers use the chosen process. For example, regulators might specify the contents of fracking solution to ensure that no harmful chemicals could potentially reach groundwater; regulators might oversee the construction of wells to ensure that cementing was carried out appropriately and with specified tolerances; regulators might require that gas lines be laid before wells are drilled to minimize the possibility of fugitive emissions during that period; and so on.

These decisions could be made in collaboration between regulators and gas producers. This approach would allow regulators to have the strongest possible understanding of the implications of fracking, and ensure that tradeoffs between efficiency and safety are being made in accordance with the public interest. In particular, such a policy would minimize the risk of disasters or unintended environmental consequences, as opposed to a lower-regulation scenario in which some possible outcomes have not been anticipated or gas producers are willing to take socially irresponsible risks.

The primary drawback of such a proposal is that regulators may have a very hard time making an efficient tradeoff between economic feasibility and environmental consequences. They face two main obstacles: first, they may not have a complete understanding of the conditions under which fracking occurs and the accessible tradeoffs, and second, there are varying conditions at different locations and different times.

For example, gas producers might be able to design fracking fluids that are economically efficient and have minimal toxicity or environmental impacts. Mandating a particular specification for fracking fluids would prohibit such innovations. In fact, such technological innovations are constantly occurring, not only for fracking fluids but for the entire process of fracking. Historically such technological advances are responsible for the current economic promise of fracking. An overly restrictive regulatory regime would limit the possibility of future progress, preventing fracking from becoming either more efficient or more environmentally responsible.

These difficulties may decrease the amount of shale gas which can be feasibly accessed, and impose additional costs on gas producers which ultimately get passed along to consumers. Overall, a high-regulation regime would enjoy many of the benefits of fracking, but to a more limited extent than lower-regulation scenarios. Similarly, it would incur many of the costs of fracking, while limiting their extent.

A final advantage of a high-regulation regime is that US regulators may be able to indirectly affect the course of fracking abroad, by determining in detail what protocols are implemented in the US. Protocols that are tested and refined in the US will become more attractive for use abroad. Also, the behavior and decisions of US regulators may be seen as a model for regulators abroad.

Option 4: Allow fracking with moderate environmental monitoring and restrictions (moderate regulation)

For the most part, the public would like natural gas to be extracted as efficiently as possible as long as the negative environmental consequences are minimized. To the extent that environmental consequences can be monitored, it makes sense to explicitly identify the relevant harms, monitor the environments where fracking occurs, and to define sanctions for producers who violate those regulations.

For example, gas producers could be required to monitor drinking water and groundwater near fracking operations and could be fined if concentrations of gas or other chemicals reached potentially dangerous levels. Gas producers could be required to monitor and report on fugitive methane emissions, and fined if emissions fell outside of acceptable boundaries.

The advantage of this type of proposal is that, given an environmental constraint, gas producers are best informed about how to efficiently meet that constraint. Satisfying many of these environmental constraints—particularly minimizing fugitive emissions—would be sound business practice once the relevant technology and understanding was in place; this suggests that if gas producers were incentivized to developed these techniques to meet restrictions in the US, they would be used abroad even without regulations by foreign governments.

One problem with such a regulatory approach is that there may be environmental damages which are very difficult to monitor or anticipate.

Option 5: Allow fracking with few restrictions (low regulation)

If the negative environmental consequences of fracking are much smaller than the economic importance of the extracted gas, it might be reasonable allow essentially unfettered fracking. In this regime, only the most significant environmental harms would be prohibited, and gas producers would be given the maximum possible leeway to make productive use of the land.

The advantage of such a regime is that the maximum possible quantity of gas can be extracted at the minimum cost, bolstering economic development and most effectively achieving the other advantages indicated above. By the same token, the disadvantages of fracking would be realized to a much greater extent than in any of the other proposals.

Even very simple changes to prevent large environmental consequences may not be taken without any externally imposed incentives. In general, a small deviation from the profit maximizing action often prevents a lot of environmental damage, and so failing to force companies to make such tradeoffs may be socially inefficient.

Video Clips:

https://www.vibby.com/v/7yYGSgE9Z **[Fracking Facade]**

https://www.vibby.com/v/mJTJUe49b **[Gasland]**

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