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To: Will Hansen, Legislative Counsel, Office of Senator Robert P. Casey, Jr.

Subject: Draft Statement, Safety of Marcellus Gas Drilling

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Summary Statement

It is this author's opinion that implementing risk management protocols for the oil and gas industry could have a positive impact in reducing the health, safety and environmental issues and should be considered

The U.S. is in the midst of developing one of its major unconventional gas resources. In a report by the Congressional Research Service dated September 9, 2009, unconventional shale accounts for one-third of the U.S. gas resource base, roughly 616 tcf. A major part of this resource is contained within the Marcellus Shale which underlies parts of Pennsylvania, New York, New Jersey, West Virginia, Maryland, and Ohio. Estimates of gas potential from the Marcellus Shale are significant, i.e. output from the Marcellus Shale is projected to fill the gas needs of the U.S. for 15 years. It would be hard not to get excited about the prospects of developing a "home-grown" energy source that is located, produced and distributed completely inside the U.S. It's also heartening to know that good paying jobs are being created and revenues from leases and taxes are refueling the accounts of citizens and governments alike.

So how big is this industry?

John Harper from the Pennsylvania Geological Survey, part of the Department of Conservation and Natural Resources, reports that over 3,700 Marcellus Shale wells have been permitted since the Pennsylvania Department of Environmental Protection (PA DEP) started keeping count in 2008. The Pennsylvania Geological Survey also claims that approximately 450 Marcellus Shale wells have been formally completed, most within the last 2-years. Through June 2010, the industry has drilled a total of 1,681 Marcellus Shale wells. Drill sites dot many hillsides and hilltops in western Pennsylvania. It therefore seems reasonable to characterize the Marcellus gas production industry in this region as large, and growing.

What is all the fuss about drilling into the Marcellus Shale?

Oil and gas drilling have been occurring in Pennsylvania since the famous Drake Well of 1859. But these Marcellus Shale gas wells are very different from more conventional oil and gas wells found throughout the Commonwealth. One of the big differences is the scale and complexity of these operations. Developing a Marcellus Shale drill site, most of which are in sparsely populated areas, is a major undertaking. A high percentage of the drillholes use hydraulic fracturing techniques, known as fracing, to enhance the shale reservoir's ability to release the gas. This type of drilling requires huge pads, most as large as a football field. Periodically, large trucks will fill these pads, side-by-

side, delivering the fracing fluids, under high pressure, into the otherwise tight fractures of the shale. This causes the fractures to extend and open, ever so slightly. Once the fracing fluids are removed from the formation, these enhanced fracture pathways facilitate the movement of gas from the shale and into the production well. These drill pads also need a place to store up to several million gallons of frac water. The safe guards needed to conduct these complex work practices in a responsible fashion have become a source of discussion for more standards and regulations.

How is the industry currently regulated?

The drilling of oil and gas wells in Pennsylvania is regulated by several chapters of the Pennsylvania Code and various state acts. Oil and gas wells are permitted and inspected by the PA DEP's Bureau of Oil and Gas Management. In recent weeks, Secretary Hanger of the PA DEP, has introduced a number of new standards and is in the process of expanding the state's inspection capabilities to ensure regulatory compliance. At this point in time, the PA DEP seems well positioned to take on this responsibility. It is also clear that there doesn't appear to be a compelling need for the federal government to assume this role.

How are we deciding what to do about Marcellus Shale drilling?

Most large land owners have been approached with offers to lease the land for gas drilling. A recent article by Bill O'Driscoll (July 8, 2010) cited the current deliberations the Carnegie Museum of Natural History is having concerning a potential lease agreement on its Powder Mill Reserve in Westmoreland County. In another high profile case, a company has proposed drilling within the city of Pittsburgh. The overriding question - can this resource be developed in a safe and environmentally acceptable fashion? The answers are difficult because risks associated with developing the Marcellus Shale gas reserves have not yet been fully identified.

Why is it important assess risk?

This question can be analyzed by examining our experience with extracting another natural resource – coal. In 1910 when Congress created the U.S. Bureau of Mines, thousands of miners were dying every year in mining accidents. Over the years standards and regulations have been continuously developed and improved upon and new technologies have made their way into the work place. By 1975, when I began my career, 155 miners were fatally injured in mining accidents. Last year the number was 18. The bottom line, both fatal and non-fatal injury rates have continuously dropped as the industry implemented new standards and regulations called for by periodic state and federal mining health and safety legislation. These standards and regulations have been prescriptive in nature and often defined as the best practices necessary to mitigate health and safety injuries. The mining industry is arguably one of the most regulated industries in the U.S. Unfortunately, even in the midst of massive regulations and falling injury rates, this industry still struggles with periodic disasters. Sago, Crandall Canyon and now Upper Big Branch have cast a cloud over the effectiveness of the government's attempt to prescribe every safe action and every best practice. *At some of the worst run mining operations, the operations focus solely on complying with the law.* They are in practice, reacting to safety issues that have the potential to be found by mine inspectors. The necessary efforts to thoroughly understand the hazards in their environment and to develop controls and recovery measures that will mitigate the inherent risks in extracting minerals from the earth are often lacking.

One has to ask the question, why didn't any of the new standards, enacted after the Sago disaster, prevent the massive loss of life at the Upper Big Branch Mine? My fear is that prescriptive regulations lack a clear mandate to encourage operators to become more proactive, to work on leading practices, to go beyond the minimum standards identified in the regulations. As a result, operators who are used to reacting to the threat of citations are ill prepared to develop more proactive approaches. My experience suggests that the best way to eliminate major hazards from the work place is to perform adequate risk assessment / risk management processes.

Should we expect major hazards in Marcellus Shale drilling operations?

Recently several high profile accidents have occurred at drilling sites in the northern Appalachian region. In one West Virginia accident, several workers were seriously injured when high pressure gas was not adequately controlled and an ignition occurred and a fire erupted. The ignition of explosive gas from a high pressure drillhole is an extremely dangerous occurrence that requires specialized training and equipment to safely mitigate. Other major hazards are associated with the special Marcellus Shale work processes discussed earlier. Certainly, major hazards are present.

How should risks be managed?

Risks are best managed when the operator identifies any and all potential hazards associated with a particular work process. Once these hazards are identified, risk are evaluated based on their likelihood of occurrence and consequences. Hazards with the highest risk are identified and can become the operator's primary focus. Management is then challenged to identify an adequate set of barriers and /or prevention controls that can help to significantly reduce risks. All risk management plans must also consider the consequences to the operation if all the prevention controls fail to work and the hazard is released into the environment. It is clear that well thought out emergency response plans are needed.

The risk management process has the advantage of encouraging the operator to consider and plan for the kind of unwanted events that we all hope don't occur at our work sites. It also produces new ideas that help to drive innovation in the work place and forces the operation to document its findings. These reports can be easily reviewed by knowledgeable persons. A good risk management plan also identifies how the barriers and controls put into practice are audited and who is responsible for making sure they are maintained. This is the way many of the best and safest companies already conduct their affairs and it is equally true that the un-safe companies are least likely to embrace these practices. So by encouraging operations to manage their risk to a known standard, we are encouraging proactive behavior (something good companies do already) and discouraging the reactive approaches of the "bad' companies. This would eliminate the need to have government, through standards and regulations, recognize every potential hazard in the workplace and identify every appropriate response to these hazards.

The legacy of mining has the potential to help us develop an alternate strategy for dealing with the risk presented by Marcellus Shale drilling. After all, everyone is struggling with the same issue -- What are the risks and can they be mitigated to acceptable levels?