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The Big Fracking Deal: Marcellus Shale - Pennsylvania's Untapped Resource

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THE BIG FRACKING DEAL: MARCELLUS SHALE—
Pennsylvania’s Untapped Resource

I. Introduction

In the mid 1700s, Pennsylvania’s coal mining industry fueled both the Industrial Revolution’s demand for iron and the state economy.1 With the development of Pittsburgh’s steel mills in the 1800s and America’s westward railroad expansion, Pennsylvania quickly became one of the top coal-producing states in the nation.2 In 1918, during the middle of World War I, Pennsylvania coal production peaked at 177 million tons, and by 1920 supplied 80% of the United States’ total demand.3 Although the industry brought great growth and development to the state, mining operations lacked the technology and knowledge to anticipate the lasting environmental impact of coal extraction.4 Without adequate regulations, early practices resulted in the pollution of over 2,400 of Pennsylvania’s 54,000 miles of streams, mostly caused by acid mine drainage from closed operations.5 Since 1967, the Commonwealth


2. See History of Coal Mining, supra note 1 (attributing Pittsburgh coal industry development to iron and steel industry).


5. See id. (explaining long term effects of coal mining industry); see also Coal-Mine-Drainage Projects, supra note 1 (stating acid drainage from abandoned mines is most extensive water pollution problem affecting Pennsylvania’s waterways). Rivers contaminated by mine drainage no longer contain fish. Coal-Mine-Drainage Projects, supra note 1. “Consequently, Pennsylvania loses approximately $677 million annually that could be generated if sport fishing were restored in the affected streams.” Id. The cost of restoring the waterways is estimated to be up to $15 billion. Id.
has spent close to $500 million to mitigate the coal industry's legacy of pollution. Pennsylvania has never imposed a tax on coal extraction, but instead leaves taxpayers to support cleanup efforts.

The discovery of the massive amount of gas within Pennsylvania's Marcellus Shale, estimated to be worth $500 billion, created frenzy among natural gas drilling similar to the Gold Rush. Not only is natural gas promoted as a safe and clean energy alternative to coal, but a large domestic source of natural gas would lessen the nation's dependency on foreign oil imports subject to dramatic market fluctuations. The recent civil war in Libya, a nation accountable for only one percent of United States oil imports, raised the average national price of gasoline to $3.89 per gallon. In addition, the natural gas industry is expected to create over 75,000 new jobs by 2020, provide $600 million in state revenue, as well as $270 million in local tax revenue.

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7. See A Quick History of American Severance Tax, WYOFILE (Feb. 8, 2009), http://wyofile.com/2009/02/a-quick-history-of-american-severance-taxes/ (explaining Pennsylvania has never applied severance tax on coal). One critic noted Pennsylvania lawmakers would rather focus on growing the industry instead of taxing it to death. Id.


Although natural gas boasts many benefits, its extraction has environmental consequences that, if not regulated, may outweigh its contribution to the state of Pennsylvania.\textsuperscript{12} Hydraulic fracturing, the principle method of removing the gas trapped within the Marcellus Shale, creates a wastewater byproduct laced with radioactive agents and chemicals that if reintroduced into the water supply can cause serious health problems when ingested.\textsuperscript{13} To ensure the process of hydraulic fracturing is performed safely and wastewater is treated properly, strict regulations must be established.\textsuperscript{14} States in which hydraulic fracturing is currently utilized, like Pennsylvania, regulate their respective industries because the practice is not governed by federal statute.\textsuperscript{15} The Pennsylvania administration, under the guidance of the Pennsylvania Department of Environmental Protection (DEP) Secretary John Hanger, did its best to increase oversight as the industry rapidly expanded.\textsuperscript{16} The DEP, however, is severely understaffed and more regulations are needed to keep Pennsylvania’s drinking water safe.\textsuperscript{17}

This Comment argues a natural gas severance tax is necessary to fund further oversight and to enable the industry to prosper without expending Pennsylvania’s natural resources and jeopardizing the health of its citizens.\textsuperscript{18} Pennsylvania must ensure history does not repeat itself and the environmental legacy of the “gas rush” is not similar to the history of the coal mining industry—costly cleanup for the lack of early industry regulation.\textsuperscript{19} This Comment first explains the geological makeup of the Marcellus Shale and the extraction process used to harvest the gas trapped within

\textsuperscript{12} For further explanation of environmental consequences, see infra notes 56-123 and accompanying text.
\textsuperscript{13} For a discussion of wastewater disposal, see infra notes 80-105 and accompanying text.
\textsuperscript{14} For further discussion of the current regulatory system, see infra notes 124-173 and accompanying text.
\textsuperscript{15} For further discussion of Pennsylvania state regulations, see infra notes 159-181 and accompanying text.
\textsuperscript{16} See infra notes 159-181 and accompanying text for a discussion of state regulations.
\textsuperscript{17} For a discussion on the need for greater regulation in Pennsylvania, see infra notes 173-181.
\textsuperscript{18} For a discussion of severance tax, see infra notes 188-223 and accompanying text.
It then details the environmental consequences of hydraulic fracturing and its environmental effects on the Commonwealth of Pennsylvania. Next, this Comment examines the current federal and state regulations that seek to minimize the environmental risks and proposes the need for a severance tax to fund further oversight. The Comment concludes with an analysis of the future of hydraulic fracturing regulation and Pennsylvania’s Marcellus Shale industry.

II. THE GAS BELOW THE GROUND—WHAT IS THE MARCELLUS SHALE?

The Marcellus Shale is low density carbonaceous shale located nearly a mile below the surface of much of Ohio, West Virginia, Pennsylvania, New York, and small regions of Maryland, Kentucky, and Tennessee. Experts have known for years that gas deposits were trapped in shale formations, but until recently neither the technology nor the capital investment existed to extract it. The gases trapped in the Marcellus Shale exist in several places: within the pore spaces of the shale, in the vertical fractures that break through the shale, and in the mineral grains and organic material of the shale itself. The gas is difficult and expensive to extract as a result of the great depth at which it is located. In fact, investors

20. For a description of the geological makeup of Marcellus Shale, see infra notes 24-29 and accompanying text.
21. See infra notes 56-105 and accompanying text (explaining environmental effects of natural gas extraction).
22. For an analysis of the current regulatory and system severance tax systems, see infra notes 124-223 and accompanying text.
23. For a discussion of the new EPA investigation and the impact of the 2011 Pennsylvania gubernatorial race on the future of Marcellus Shale regulation, see infra notes 248-281 and accompanying text.
25. See id. (detailing geological makeup of Marcellus Shale).
26. See id. (describing processes by which gas is trapped in Marcellus Shale); see also Adam Orford, Fractured: The Road to the New EPA “Fracking” Study, MAREN LAW (Sept. 17, 2010), available at http://www.martenlaw.com/newsletter/20100917-new-epa-fracking-study (describing process causing gas to be trapped in shale). Millions of years ago, Shale was once embedded in the seabed miles under the water. Orford, supra. Matter at those depths did not decay but over time and pressure, matter decomposed into hydrocarbons. Id. Trapped in shale, gas diffused into the rock and became concentrated in fractures. Id.
did not attempt the laborious extraction process until the record spikes in oil prices. Successful wells, therefore, must promise a natural gas yield large enough to pay for the drilling costs, which can exceed one million dollars.

In 2002, economic pressure from raising fuel prices prompted the natural gas industry to drill Pennsylvania’s first hydraulically-fractured well in Washington County. The well began production three years later and yielded a surprisingly promising flow of gas. It was immediately apparent the gas drilling industry in Pennsylvania would boom. In 2008, geologists estimated the Marcellus Shale might contain 500 trillion cubic feet of gas. Recovering just 10% of the Marcellus Shale would be enough to satisfy the United States’ fuel demand for more than two years, and carries a market value of approximately one trillion dollars. In just three years, Pennsylvania transformed from a low-producing gas state to one of the top-five gas producers in the nation.

28. See id. (explaining why Marcellus Shale has not been developed until now).

29. Id. (explaining importance of high extraction yields to cover cost of drilling); see also Orford, supra note 26 (describing why hydraulic fracturing is principal method of extraction). Recent advances in technology make it more feasible to extract gases from deep shale beds. Orford, supra note 26. “No other technique shows such promise for meeting the U.S. demand from domestic natural gas resources so cheaply.” Id.

30. See What is the Marcellus Shale Formation?, supra note 27 (indicating Washington country well was first PA hydraulic fracturing site).

31. See Orford, supra note 26 (describing economic pressure contributed to natural gas drilling); see also New Research, supra note 24 (describing first Pennsylvania mine to drill Marcellus Shale). Natural gas has become a valuable energy source. Orford, supra note 26. The U.S. consumed about twenty-three trillion cubic feet in 2009. Id. Range Resources-Appalachie, LLC was responsible for the first well, using hydraulic fracturing method that was successful in Texas’s Barnett Shale. New Research, supra note 24.

32. See Lauren Lawley Head, DEP Secretary John Hanger offers parting words, Pittsburgh Business Times (Jan. 14, 2011, 12:00 PM), http://www.bizjournals.com/pittsburgh/blog/energy/2011/01/dep-hanger-offers-parting-words.html (detailing farewell email sent from Former DEP Secretary Hanger to Department staff, recounting Marcellus Shale development). Pennsylvania is predicted to produce approximately ten percent of all natural gas in America. Id.

33. New Research, supra note 24 (indicating promising updates to Marcellus shale gas estimates).

34. Id. (estimating amount of natural gas that may be extracted from Marcellus Shale using hydraulic fracturing).

35. Head, supra note 32 (stating Pennsylvania produced ten percent of all natural gas in America, and Pennsylvania Department of Environmental Protection currently issued permits for more than 5,800 Marcellus Shale gas wells, with more than 2,500 currently drilled).
The natural gas extraction process begins with drilling a well. In early Marcellus Shale wells, drilling companies used the vertical drilling method to drill directly down into the shale. The fractures naturally occurring in the shale are vertical, thus the vertical drilling method creates few fracture-drill intersections and yields a low amount of gas. With recent technological advancements, producers can now drill horizontally. The horizontal drilling method bores a well vertically down into the rock but then extends horizontally at a perpendicular angle. This method allows more intersections with existing fractures, thereby unlocking a larger amount of gas. Regardless of the drilling method, hydraulic fracturing is used to stimulate the well and, thus, maximize the amount of extracted gas.

Hydraulic fracturing, or “fracking,” is currently used in ninety percent of mines across the nation. First pioneered by the Texas corporation Halliburton, the drilling industry has used hydraulic fracturing since the 1940s. Recent technological developments allow hydraulic fracturing to reach the depth needed to extract the majority of gas from the Marcellus Shale. The horizontal or vertical drilling methods construct wells maximizing the intersections

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36. See New Research, supra note 24 (detailing principle methods of natural gas extraction).
38. See id. (explaining vertical drilling techniques). Although the amount of gas yielded is significantly less, the lower capital investment required to initiate the well makes vertical drilling attractive to smaller operations. Id.
39. See New Research, supra note 24 (describing new technology that allows horizontal drilling).
40. See Hydraulic Fracturing Overview, supra note 37, at 1-2 (describing difference between horizontal and vertical drilling).
41. See id. at 1-2 (outlining horizontal fracturing technique).
42. See id. (explaining how well stimulation occurs through hydraulic fracturing process).
44. See id. (describing historical development of hydraulic fracturing technique). The use of fracking technology has increased with exploration of deeper gas fields like Marcellus Shale. Id.
with naturally occurring fractures.\textsuperscript{46} Hydraulic fracturing, however, additionally creates new fractures that enable the pooling and extraction of more gas.\textsuperscript{47} In a typical fracking operation, drillers force large amounts of fracking fluid at high pressure into the well until the shale fractures.\textsuperscript{48} The fracking fluid contains water, sand, and chemical agents.\textsuperscript{49} The sand, or “propant,” keeps fractures open after the pressure is released, and the chemicals act as a lubricant for more efficient extraction.\textsuperscript{50} Steel casings prevent the targeted gas from migrating into local groundwater reserves.\textsuperscript{51}

After the shale is fractured and the gas is captured, at least ten percent of the fracking fluid flows to the surface.\textsuperscript{52} Studies indicate

\textsuperscript{46} New Research, supra note 24 (describing how natural gas occurs within shale).

\textsuperscript{47} Id. (stating horizontal drilling technique penetrates more fractures and allows for increased production).


\textsuperscript{49} See id. (diagramming additives used to produce hydraulic fracturing fluid); see also Mike Soraghan, Halliburton Announces Ecofriendly Fracking Fluid, More Disclosure, N.Y. TIMES, Nov. 15, 2010, available at http://www.nytimes.com/gwire/2010/11/15/greenwire-halliburton-announces-ecofriendly-fracking-fluid-80875.html (examining Halliburton’s changes to make fracking fluid more eco-friendly). Some ingredients listed in new fluid are still hazardous. Id. “While it’s nice to see Halliburton acknowledging that desire, it’s not meaningful or sufficient unless this information is fully disclosed on a site-by-site basis.” Id.

\textsuperscript{50} See Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs, U.S. ENVTL. PROT. AGENCY, EPA 816-R-04-003, at 1-5, (June 2004), available at http://www.gwpc.org/e-library/documents/general/Evaluation%20of%20Impacts%20to%20Underground%20Sources%20of%20Drinking%20Water%20by%20Hydraulic%20Fracturing%20of%20Coalbed%20Methane%20Reservoirs.pdf [hereinafter EPA 2004 Study] (describing process of hydraulic fracturing). “The resulting fracture filled with proppant becomes a conduit through which water can flow to the production well, thus depressurizing the coal matrix, allowing for the desorption of methane and its flow towards the production well.” Id. at 4. The most common form of proppant is fine sand. Id. at 3-4. The geological makeup of the shale controls the fracture from extending too far. Id. at 1-3. The surrounding rock dictates how large the fracture grows, but it will always take the path of the coal seam, where the gases are trapped. Id.

\textsuperscript{51} See Hydraulic Fracturing: Marcellus Shale, RANGE RESOURCES, (July 2010), http://www.rangeresources.com/rangeresources/files/6f/6f38c64-5ac4-4270-95c7-9e991b963771.pdf (explaining process of wellbore isolation through use of steel casing). Steel casing are inserted from the surface deep into the well at varying thicknesses and cemented in place. Id. As the cement sets, the drilling is continued to greater depths until the gas bearing rock is reached. Id. The state set cement casings and specifications are set by the state. Id. Wells can stretch up to almost two miles, using more than three million pounds of steel and cement. Id.

\textsuperscript{52} See Grönadal, Marsh & Roberts, supra note 48 (illustrating through interactive diagram hydraulic fracturing process). Fluids that are left underground can seep out over time. Id.
twenty to forty percent of the fracking fluid remains underground, and gradually leaks into the groundwater. The wastewater that returns to the surface, which now consists of the original chemicals laced with radioactive substances that naturally occur within the shale, then moves to a large retention pond or water treatment facility. In Pennsylvania, the latter is more prevalent, which results in the water eventually being reintroduced into rivers and lakes.

III. ENVIRONMENTAL CONSEQUENCES

"Marcellus gas production is both an environmental threat and opportunity. . . . It cannot be done without any impact on the environment."

In Pennsylvania, the environmental consequences stemming from hydraulic fracturing take many forms. The primary concern is wastewater contamination, which results mostly from the makeup of the fluid used to create the fissures and fractures within the shale. Much of the wastewater produced from hydraulic fracturing contains chemicals, some radioactive, that can be harmful if ingested by humans or animals. Wastewater disposal is a serious

53. See Hydraulic Fracturing 101, EARTHWORKS, http://www.earthworksaction.org/FracingDetails.cfm (last visited Oct. 8, 2011) (discussing environmental impact of fracking). Hydraulic fracturing and dewatering may be a source of underground water contaminations for many years into the future. Id.

54. See Gröndahl, Marsh & Roberts, supra note 48, (illustrating use of wastewater pit for post-fracking water storage).


56. Head, supra note 32 (quoting Former DEP Secretary Hanger’s warning for future Marcellus Shale development).

57. For a discussion of the multiple environmental consequences of hydraulic fracturing in Pennsylvania, see infra notes 58-123 and accompanying text.


issue, especially in Pennsylvania where it is reintroduced back into the waterways.\textsuperscript{60} To create less wastewater, some drillers recycle their fracking water.\textsuperscript{61} This practice, however, may also be environmentally threatening as wastewater becomes more toxic as it is continuously recycled.\textsuperscript{62} Furthermore, most hydraulic fracturing sites are located in areas that contain groundwater for public consumption.\textsuperscript{63} Fracturing operations located close to local communities can lead to a potentially explosive combination due to the migration of gas into underground aquifers.\textsuperscript{64} Finally, the industry puts a strain on local communities that host drilling sites.\textsuperscript{65} This section closely examines each of these issues.\textsuperscript{66}

A. Wastewater Contamination

The Environmental Protection Agency (EPA or Agency) stated there are several opportunities for hydraulic fracturing wastewater contaminates to enter the drinking water supply.\textsuperscript{67} Contaminants can enter through the natural fractures in the rock or through fractures created by the fracturing process.\textsuperscript{68} Additionally, contaminants can enter the drinking water through improperly sealed

agent present in wastewater, enters into the body, it can cause cancer and other health problems. \textit{Id.}

\textsuperscript{60} See generally Pa. Allows Dumping, supra note 55 (detailing concern over treatment of wastewater before disposal into Pennsylvania waterways).


\textsuperscript{62} For a discussion on the effect of wastewater recycling, see infra notes 97-105 detailing effects of recycling.

\textsuperscript{63} See Hydraulic Fracturing 101, supra note 53 (explaining potential for groundwater contamination). Hydraulic fracturing is used in many coalbed methane areas. \textit{Id.} The EPA has stated that ten out of eleven coal bed methane basins are located near drinking water sources. \textit{Id.}

\textsuperscript{64} For further discussion of gas migration, see infra notes 106-117 and accompanying text.

\textsuperscript{65} For a discussion of local impact of the drilling industry, see infra notes 118-123.

\textsuperscript{66} For further discussion of environmental consequences from wastewater contamination, frack water disposal, recycling, gas migration and effects on local communities, see infra notes 56-123 and accompanying text.


\textsuperscript{68} See \textit{id.} (indicating gases may migrate into drinking water through pre-existing fractures within shale).
abandoned wells. Moreover, contaminated water can leak from the production wells or from improperly lined storage and drill pits. Contaminants can also enter the drinking water supply from fracturing fluid spills into surface water. The EPA determined that hydraulic fracturing chemicals are sometimes injected directly into underground sources of water.

During the past three years, at least sixteen wells in Pennsylvania with highly radioactive wastewater reported surface spills. This number may be higher because state gas producers are independently responsible for reporting any surface spills, and regulators do not perform unannounced inspections to check for unreported spills. Excessive rainfall may also cause storage pits, which hold wastewater after it is extracted from wells, to overflow. Additionally, recent studies have demonstrated the environmental threat of abandoned wells. Even after the cessation of drilling,

69. Id. (stating water may also become contaminated by left over fracturing fluids that migrated from wells into drinking supplies after drilling is complete).
70. Id. (stating drinking water may be contaminated during fracturing process if storage pits are not properly lined).
71. See id. (enumerating potential ways contaminates can be introduced into drinking water supplies during hydraulic fracturing).
72. See EPA 2004 Study, supra note 50, at ES-1 (explaining contaminants enter below water drinking supply through normal fracking procedures); see also Hydraulic Fracturing 101, supra note 53 (describing short- and long-term danger from underwater drinking supply contamination); see also Letter from John Bredehoeft to Joan Harrigan-Farrelly, Chief in Natural Resources Defense Council, (May 15, 2003), available at http://www.earthworksaction.org/pubs/Bredehoeft_Testimony_Hydraulic_Fracturing.pdf (exemplifying conflict between coal bed methane development and underground sources of drinking water, as manifested in Powder River Basin of Wyoming and Montana). Coal bed aquifers are at the greatest risk of contamination due to fracking. EPA 2004 Study, supra note 50, at ES-1. "At greatest risk of contamination are the coal bed aquifers currently used as sources of drinking water. . . . [C]ontamination associated with hydrofracing in the [Powder River] basin could threaten the usefulness of these aquifers for future use." Letter from John Bredehoeft to Joan Harrigan-Farrelly, supra.
73. See Urbina, Regulation Lax, supra note 59 (calling for stricter regulations on wastewater disposal).
74. See id. (explaining lack of oversight and limited mandatory reporting obligations placed on Pennsylvania drilling operations). The oil industry has outpaced regulations and some fear if reporting is too stringent the companies might stop reporting. Id.
76. Urbina, Wastewater Recycling, supra note 61 (quoting Anthony Ingraffea, drilling expert and professor of civil and environmental engineering at Cornell). "The waste that flows back slowly and continuously over the 20-30 year life of each gas well could produce 27 tons of salt per year." Id.
wells can leak contaminants into the ground or neighboring wells for twenty to thirty years.\textsuperscript{77} The toxicity concentration of the fluid increases as the age of the well increases.\textsuperscript{78} It is, therefore, imperative to properly seal abandoned wells.\textsuperscript{79}

B. The Disposal Issue—Is Dilution the Solution?

The disposal of fracturing fluids also poses environmental concerns.\textsuperscript{80} Many states require drillers to inject wastewater into shafts thousands of feet deep into the earth.\textsuperscript{81} Due to Pennsylvania’s geologic makeup, injection wells are not as readily available as in other states.\textsuperscript{82} Most wastewater is, therefore, sent to treatment plants and subsequently released into rivers and streams.\textsuperscript{83} Currently, Pennsylvania is the only state that allows waterways to serve as the primary disposal place for fracking water.\textsuperscript{84} Records indicate well operators recycled \textit{320} million gallons of wastewater over an eighteen-month period ending in December 2010.\textsuperscript{85} At least \textit{260} million gallons, however, were treated at plants then discharged directly into rivers.\textsuperscript{86}

Many wastewater treatment facilities are inadequately equipped to handle the large amounts of radioactive contaminants

\begin{itemize}
\item \textsuperscript{77} Id. (quoting Ingraffea).
\item \textsuperscript{78} See id. (explaining wells can produce toxic effects years after hydrofracking actually occurs).
\item \textsuperscript{79} See id. (indicating this is problematic because older well is less likely to be tracking fluids that flow out).
\item \textsuperscript{80} See Pa. Allows Dumping, supra note 55 (describing why Pennsylvania wastewater disposal methods are troubling). Wastewater that is “only partially treated for substances that could be environmentally harmful then dumped into rivers and streams from which communities get their drinking water.” Id.
\item \textsuperscript{81} See id. (indicating most states require deep well injection of wastewater).
\item \textsuperscript{82} See Urbina, Wastewater Recycling, supra note 61 (pointing to Pennsylvania’s geological makeup as reason for departure from traditional methods of wastewater disposal).
\item \textsuperscript{83} Id. (indicating river disposal is method of choice for waste water disposal in Pennsylvania).
\item \textsuperscript{84} See Pa. Allows Dumping, supra note 55 (pointing out while most states use deep-well injection for disposal, Pennsylvania allows waterways to serve as primary disposal place).
\item \textsuperscript{85} Urbina, Wastewater Recycling, supra note 61 (citing state and drilling company records to indicate increase in wastewater recycling). President of Marcellus Shale Coalition commented, “The technical breakthroughs that have allowed us to lead the nation in water recycling are complemented by a carefully orchestrated water-management system, involving a combination of on-site and off-site treatment, depending on specific geography and economics.” Id.
\item \textsuperscript{86} See id. (indicating large amount of wastewater is still discharged into rivers after being treated).
\end{itemize}
and salt found in fracking fluids.\textsuperscript{87} The treatment facility operators in Pennsylvania often do not know the exact components of the waste they receive and are not required to test for radioactivity.\textsuperscript{88} Moreover, the facilities cannot remove enough radioactive material from the fracking fluids to meet the federal drinking water standards prior to discharging the wastewater into the waterways.\textsuperscript{89} Drinking water intake plants are often located downriver from wastewater treatment facilities.\textsuperscript{90} Despite wastewater treatment facilities inability to adequately treat fracking fluids, Pennsylvania regulators aver that contaminants left after treatment are sufficiently diluted in rivers, and therefore allow the discharges into waterways to persist.\textsuperscript{91} Concerned EPA officials, on the other hand, caution that failure to remove toxins could result in contaminated drinking water.\textsuperscript{92}

Researchers still attempt to determine whether the current level of wastewater discharge could cause harm.\textsuperscript{93} Outside of Pittsburgh, municipal authorities reported high levels of trihalomethanes, a byproduct of chlorine disinfectants and fracking wastewater that contains high levels of bromide.\textsuperscript{94} Long-term consumption of trihalomethanes can lead to an increased risk of cancer as well as liver, kidney, and central nervous system problems.\textsuperscript{95} These concerns are exacerbated by the already salty composition of

\textsuperscript{87} See Urbina, Regulation Lax, supra note 59 (describing how many plant operators are not prepared to treat wastewater).
\textsuperscript{88} See id. (indicating intake facilities may not be fully informed of waste they intake).
\textsuperscript{89} See id. (stating most facilities cannot adequately cleanse wastewater).
\textsuperscript{90} See id. (explaining geographic relation of treatment plants and drinking water intake plants makes inadequate cleansing particularly dangerous).
\textsuperscript{91} See id. (explaining regulators theory that toxins present in water after leaving treatment center will not affect drinking water). Most of the toxic material will settle during treatment, forming a sludge that will be shipped to landfills. \textit{Id.}
\textsuperscript{92} See Ian Urbina, Pressure Limits Efforts to Police Drilling for Gas, N.Y. TIMES, Mar. 3, 2011, \textit{available at}, http://www.nytimes.com/2011/03/04/us/04gas.html [hereinafter \textit{Pressure Limits Efforts}] (quoting EPA enforcement lawyer stating "[t]he bottom line is that under the Clean Water Act, dilution is not the solution to pollution."). EPA scientists have stated sewage treatment plants do not, technically speaking, fully treat wastewater under the federal definition of treatment. \textit{Id}. The EPA Region 3 officer, who is responsible for overseeing Pennsylvania, has resisted pleas to stop issuing permits to these treatment plants. \textit{Id.}
\textsuperscript{93} See id. (stating Municipal authorities have been monitoring river waters in areas surrounding Pittsburgh).
\textsuperscript{95} See Urbina, Regulation Lax, supra note 59 (explaining potential health issues arising from long term consumption of water with elevates trihalomethanes).
the water, which resulted from the abandoned coal mines—a reminder of Pennsylvania’s last “gold rush.”

C. Wastewater Recycling

Many natural gas companies began recycling their wastewater in an effort to use less fresh water and eliminate the need to continuously dispose of the fluids during hydraulic fracturing. Despite industry participants describing wastewater recycling as a “win-win,” the process is still environmentally threatening. Recent studies indicate wastewater reused in the fracking process could reach higher radioactive levels than estimated in previous reports. Although there are benefits to recycling fracking fluids, recycling companies admit that “even with reuse of this water, you have to confront the disposal question.”

The chemical sludge derived from the fracking fluid that remains after the recycling process can be reintroduced into the water supply in other ways as well. Drilling companies have begun selling brine, an extremely salty wastewater derivative, to state municipalities, including Pennsylvania, to de-ice roadways. Several companies produced brine from wastewater in Tioga County, Pennsylvania. This wastewater contained a radium level almost 700 times the permissible level in drinking water. After application to the icy roads, the runoff is likely to find its way back into the water supply.

96. See id. (indicating gas drilling wastewater is not only contributor of trihalomethanes to water in area).

97. See Urbina, Wastewater Recycling, supra note 61 (explaining drilling companies have turned to recycling in response to criticism for large amounts of water used in hydraulic fracturing process).

98. Id. (citing Pennsylvania drilling company Range Resources’ website stating “[w]ater recycling is a win-win,” but also acknowledging continued risk of environmental and health dangers).

99. See id. (explaining some recycling processes can yield more concentrated levels of radioactivity in wastewater). Experts state virtually all forms of recycling results in liquid waste, potentially more toxic that its first use. Id.

100. Id. (quoting Brent Halldorson, chief operating officer of wastewater recycling company).

101. See id. (describing salty drilling wastewater, known as brine, is used to de-ice roads).

102. See Urbina, Wastewater Recycling, supra note 61 (indicating more profitable way for companies to discard wastewater as opposed to disposal). West Virginia highway officials announced plan to buy brine for five cents per gallon. Id.

103. Id. (describing origin of brine).

104. Id. (indicating toxic nature of brine used on roads is particularly high in brine originating in Tioga County).

105. See id. (citing West Virginia officials are aware radioactive contaminates may find their way into state waters from use of brine); Marvin Resnikoff, Ekate-
D. Gas Migration—Exploding Wells in Dimock

The most extreme example of water source contamination occurred in Dimock, Pennsylvania. The DEP ordered Cabot Oil and Gas Corporation (Cabot) to plug three of its wells, which were the sources of gas migration attributed to the drilling. The gas contaminated the groundwater and drinking supplies of fourteen homes within the small town. One particular incident stands as a testament to the danger exposed to Dimock residents. Stray gases from a nearby hydraulic fracturing site leaked into the aquifer that provided water to a local homeowner’s well. When the homeowner’s motorized pump turned on, sparks caused an explosion that tossed aside a several thousand pound concrete slab. The incident is not isolated, as several other drinking wells in Dimock have also exploded. One homeowner was instructed “to open a window if he planned to take a bath.” These incidents allegedly stemmed from Cabot’s failure to comply with a DEP order
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to fix defective cement and well casings, which violated the state's Clean Streams Law and Oil and Gas Act.114

The DEP fined Cabot and imposed a one-year suspension on its drilling permit for the Dimock area.115 DEP Secretary John Hanger commented, "Gas migration is a serious issue that can have dire consequences to affected communities and we will not allow Pennsylvania's citizens to be put in harm's way by companies that choose not to follow the law."116 To avoid another situation like Dimock, the DEP has imposed stricter requirements for well casings.117

E. Impact on Local Drilling Communities

Pennsylvania residents are also concerned about the present and future effects of the fracking industry on local infrastructure.118 During a Senate Republican Policy Committee meeting held in January 2011, county commissioners explained both the positive and negative impact of Marcellus Shale drilling.119 The positive impacts included increased local revenue, over one billion in land royalties paid to local land owners, and investment in infrastructure to improve roads to accommodate the higher volume of traffic.120 On the negative side, local communities are experiencing increased crime, housing shortages, and higher truck traffic, resulting in road congestion and traffic accidents.121 Local government associations asserted most counties were unprepared for Marcellus Shale devel-

114. See Lustgarten, supra note 109 (attributing explosion incident to incomp-
liance with state regulations). The November 2009 consent order and agreement indicated Cabot needed to correct violations. Id.

115. See Pennsylvania DEP, supra note 107 (describing Pennsylvania DEP san-
ctions against Cabot).

116. Id. (quoting Secretary Hanger's comments on industry regulations).

117. For further discussion of DEP casing regulations see infra note 170 and accompanying text.


119. See id. (elaborating on positions presented by witnesses at hearing regard-
ring impact on local economy).

120. See id. (stating industry has positive impacts on counties within state). Commissioner McLinko of Bradford County, Pennsylvania points to local tax and county fee revenues as positive of industry. Id. Drilling activity also leads all industries in job creation. Id.

121. See id. (describing downside of drilling industry). Over the past year, Bradford County invested more than $125 million to rebuild roads damaged by increased truck traffic. Id. The Tioga County commission reported the lack of hotel rooms has damaged the tourism industry that the county relies on. Id. Ed
velopment and, therefore, had to play catch-up in regulating the land used for fracking and the environmental impacts. A major question still remains: "[A]re [there] sufficient and appropriate regulatory controls built into our statutes and related regulations to deal with the water, wastewater, runoff and transportation issues [raised by drilling]."

IV. REGULATIONS—A FRACURED HISTORY

Hydraulic fracturing is the primary method of gas extraction in the United States. A coherent regulatory standard to govern the use and environmental consequences of hydraulic fracturing does not exist because it is a recent technological development. Furthermore, federal law widely exempts hydraulic fracturing from many currently operating environmental regulations. Drilling states, therefore, must develop their own oversight procedures. The section below outlines the history of hydraulic fracturing regulations on both a federal level and within the Commonwealth of Pennsylvania.

A. Federal Regulation: A Fractured History of Exemption

In the 1970s and 1980s legislators sought to ensure the future protection of the environment through environmental reform. Legislation, however, was notably lax on the oil and gas industry—presumably in response to political pressures from industry lobby-

Troxell, Director of PA Government Affairs states significant increases in truck traffic in PA boroughs leads to high congestion and more accidents. Id. (citing David Sanko, Executive Director of PA State Association of Township Supervisors, who stated communities had not planned for new industry).

122. Id. (quoting Douglas Hill, Executive Director of County Commissioners Association of PA, expressing concern for local regulatory controls now in place for industry).

123. See Senate Committee Hears Challenges, supra note 118 (quoting Douglas Hill, Executive Director of County Commissioners Association of PA, expressing concern for local regulatory controls now in place for industry).

124. See Miller, supra note 146 (stating majority of mines use fracking technique).

125. For a discussion of federal oversight, see infra notes 129-158 and accompanying text.

126. For a discussion of federal regulations applicable to the oil and gas industry, or lack thereof, see infra notes 127-151 and accompanying text.

127. For a discussion of state regulations, see infra notes 129-181 and accompanying text.

128. See id. (providing overview of federal and state oil and gas regulations).

The 1972 Clean Water Act (CWA), for example, aimed to guarantee zero discharge of pollutants into national waters by 1985. Congress, however, amended the CWA in 1987 to allow the EPA to establish a permit system for stormwater runoff discharges. Oil and gas exploration was largely exempt from the new regulations, which clarified “no Clean Water Act permit was required for storm water runoff at oil and gas exploration, production, processing and treatment operations and transmission facilities . . . provided that the runoff was not contaminated by contact with raw materials.” Furthermore, in 2006, regulators excluded “all field activities or operations, processing, treatment operations, and transmission.”

The Safe Drinking Water Act (SDWA) also exempts the oil industry from regulation. Congress passed the SDWA in 1974 to regulate the injection of waste into underground areas and provide quality drinking water. In 1995, EPA Administrator Carol Browner clarified the hydraulic fracturing process was not within the definition of “underground injection” and, therefore, outside the scope of the SDWA. Conversely, just two years later the Eleventh Circuit ruled hydraulic fracturing did fall within the scope of the SDWA. The ruling came after allegations that an Alabama
fracking operation contaminated underground drinking water.139
Vice President Cheney, a former CEO of the drilling company Halliburton, convened a special task force on energy policy in 2001.140
Despite judicial urging to include hydraulic fracturing in the SDWA, the task force recommended Congress exempt the drilling practice from the SDWA.141

In 2004, while conducting its first study analyzing the effects of fracking on drinking water, the EPA informed Halliburton and other drilling companies "it would certainly strengthen our preliminary position not to continue studying the issue . . . if the service companies were able to remove diesel all together [from hydraulic fracturing], or even more in that direction."142 The drilling companies agreed to remove diesel, then the EPA completed its study.143
The EPA concluded the fracking process posed little or no threat to drinking water and further research was not warranted.144

EPA whistle-blower Weston Wilson later questioned the credentials of the EPA’s study.145 Wilson called the study “scientifically unsound” and urged continued investigations through an unbiased peer review panel.146 Five of the seven members of the study’s review panel appeared to have conflicts of interests, and would bene-

We readily find that the word “injection” means the act of “forc[ing] (a fluid) into a passage, cavity, or tissue.” . . . Sensibly, therefore, “underground injection” means the subsurface emplacement of fluids by forcing them into cavities and passages in the ground through a well. The process of hydraulic fracturing obviously falls within this definition, as it involves the subsurface emplacement of fluids by forcing them into cracks in the ground through a well.139

See id. at 1471 (describing allegations that nearby hydraulic fracturing operation caused diminished quality of well water).

See Urbina, Regulation Lax, supra note 59 (discussing special task force to investigate hydraulic fracturing).

See id. (discussing political pressure related to SDWA exemption).


See EPA 2004 Study, supra note 50, at ES-2 (explaining deal with oil companies to eliminate use of gasoline).

See id. (concluding hydraulic fracturing did not pose significant risk to warrant further study). “The risk posed to USDWs by introduction of [fracking] chemicals is reduced significantly by groundwater production and injected fluid recovery, combined with mitigating effects of dilution and dispersion, adsorption, and potentially biodegradation.” Id.


See id. at 1 (contending scientific basis for EPA study unsound).
fit from a decision not to continue investigations. Wilson asserted an unbiased investigative method would produce untainted conclusions. In 2005, EPA inspectors found sufficient evidence to justify a review of Wilson's complaints. Additionally, the Oil and Gas Industry Accountability Project (Project) initiated a peer review study of the EPA report. The Project issued its own report refuting the EPA's conclusion that fracturing did not pose a threat to drinking water.

Despite the incomplete conclusions of the EPA's study, Congress passed the Energy Policy Act which excluded hydraulic fracturing from regulation under the SDWA. More importantly, the Act allowed drilling operations to maintain the confidentiality of the components of fracking fluids. The missing SDWA regulations are termed the "Halliburton loophole," a reference to Vice President Cheney's alliance with Halliburton Oil as the underlying reason for the absence of regulation.

Many other pieces of legislation relating to the oil and gas industry reveal preferential treatment. The 1976 Resource Conservation and Recovery Act, for example, sets standards for handling hazardous waste, but it is not applicable to specific oil and gas

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147. See id. (suggesting panel was not able to give unbiased analysis).
148. See id. at 13-14 (calling into question peer review board used in study). Five of the seven members of the panel appeared to have a conflict of interest, and would benefit from a decision to discontinue investigations. Id.
149. Inadequate Regulation, supra note 130 (describing reaction to Wilson's allegations).
151. See id. at 57 (stating insufficient evidence existed for EPA to conclude hydraulic fracturing is not threat to drinking water).
152. See Safe Drinking Water Act § 300h(d) (defining underground injection). The act provides:

The term 'underground injection'—(A) means the subsurface emplacement of fluids by well injection; and (B) excludes—(i) the underground injection of natural gas for purposes of storage; and (ii) 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.

Id.
153. See id. (allowing confidentiality of drilling corporations fluid makeup).
154. See Inadequate Regulation, supra note 130 (describing SDWA exemption as "Halliburton loophole").
155. See Lax Rules, supra note 129 (creating timeline of major federal environmental laws exempting or excluding natural gas industry).
wastes.\textsuperscript{156} The 1980 Superfund Act holds industries liable for the release and cleanup of hazardous material, but it is inapplicable to oil and gas.\textsuperscript{157} Without federal oversight, regulations are inconsistent as states thus individually determine the standards for hydraulic fracturing.\textsuperscript{158}

B. State Regulation—Pennsylvania’s Drilling Industry Oversight

The sudden discovery of subterranean natural gas reserves forced many states, including Pennsylvania, to make ad hoc regulations.\textsuperscript{159} For example, New York’s inability to implement oversight methods on pace with the rapid growth of the gas industry prompted officials to issue a moratorium on hydraulic fracturing.

\begin{itemize}
\item \textsuperscript{157} See Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund Act), 42 U.S.C. § 9601(14) (defining hazardous substances for purpose of CERCLA). The act provides:
\begin{itemize}
    \item The term does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance [in the first sentence] of this paragraph, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).
\end{itemize}
\item \textsuperscript{159} See Pa. Allows Dumping, supra note 55 (explaining gas boom caught regulators off-guard).
\end{itemize}
THE BIG FRACKING DEAL

until June 2011.  

With a vote of forty-eight to nine, the New York Senate passed the moratorium after it determined further research was needed to ensure the existence of adequate guidelines for permit issuance. The New York State Senate Democratic Conference Leader, John Sampson, explained, "We do not need to look any further than the devastation in the Gulf of Mexico to realize that there is no financial benefit worth risking the safety of New York’s water supply."  

Echoing the New York legislative measure, environmental groups in Ohio and Maryland also called for moratoriums on hydraulic fracturing until the drilling industry demonstrated use of safe and environmentally friendly practices. Pennsylvania, on the other hand, embraced the drilling industry. Other Marcellus Shale states are watching to see how Pennsylvania’s regulatory experiment plays out.

Shortly after the 2005 drilling of Pennsylvania’s first successful gas well, parts of western and central Pennsylvania experienced “boomtown” conditions as drilling companies leased hundreds of acres of land from local property owners to begin operations. Pennsylvania was soon labeled as the “nation’s drilling epicen-

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161. See id. (explaining reasons for moratorium).

162. Id. (quoting Senate Democratic Conference Leader John Sampson).


165. See id. (explaining other Marcellus Shale states’ reluctance to proceed with fracking at this moment).

Although initially caught off guard, under the oversight of Secretary Hanger Pennsylvania responded to the growth of the hydraulic fracturing industry by updating the Oil and Gas Act and other environmental laws. For instance, in August of 2010, Pennsylvania promulgated a new regulation to protect drinking water from total dissolved solids (TDS), and thereby increased the likelihood its waters meet SDWA criteria.

In response to the dangers associated with gas migration and public outcry from towns like Dimock, in January of 2011 Pennsylvania enacted new rules governing the design and construction of gas wells. Pennsylvania also implemented more stringent regulations to seal off mines after the completion of drilling. Addi-
tionally, since 2008, the Pennsylvania DEP more than doubled its drilling oversight staff with additional revenue raised by increasing the drill permit application fee.\textsuperscript{172}

Even with these recent changes, Pennsylvania regulators remain severely understaffed.\textsuperscript{173} In November of 2010, thirty-one inspectors were responsible for more than 125,000 oil and gas wells.\textsuperscript{174} Regulatory initiatives also fall short.\textsuperscript{175} Although the Pennsylvania state legislature recently instituted tighter controls for new wells, the new regulations grandfathered in any pre-existing operations and thus allow those operations to continue environmentally dangerous practices.\textsuperscript{176}

Industry lobbyists, such as the Marcellus Shale Coalition, an industry group representing drilling in Pennsylvania, strongly oppose the regulation and oversight of wastewater disposal.\textsuperscript{177} To ensure the adequate treatment of wastewater, the administration of former Governor Ed Rendell proposed a manifest system under which the tracking information for each load of wastewater leaving a drilling site must be recorded.\textsuperscript{178} The legislature instead implemented a system that only requires well operators to report to state officials on a monthly or yearly basis, which provides no verification of how waste is actually disposed.\textsuperscript{179} In addition to the lack of information on the disposal of wastewater, data on the radioactivity of water used by drinking-water intake facilities is similarly lacking due to the current state and federal laws requiring radioactivity tests only

\begin{small}
\begin{enumerate}
\item[172.] See Head, supra note 32 (quoting Secretary John Hanger describing accomplishments in regulations).
\item[173.] See Urbina, Regulation Lax, supra note 59 (explaining despite staffing improvements, substantial oversight is still needed).
\item[174.] See id. (indicating low inspector to well ratio).
\item[175.] See id. (describing lack of tough regulations on industry).
\item[176.] See Pa. Allows Dumping, supra note 55 (indicating while new treatment plants are subject to tighter regulations, existing plants have been allowed to continue practices with little changes).
\item[177.] See Letter from Ray Walker and Rich Weber, Co-Chairs, Marcellus Shale Committee, to John Hanger, Acting Secretary Pennsylvania Department of Environmental Protect, (Jan. 27, 2009) at 209 available at http://www.nytimes.com/interactive/2011/03/01/us/natural-gas-documents-2.html#document/p88/a10124 (indicating strong industry opposition to drilling wastewater tracking system); see also Urbina, Wastewater Recycling, supra note 61 (describing industry opposition to increased oversight of wastewater disposition). Industry officials argued "there is no other industry in Pennsylvania that is required to have a manifest system for residual waste." Id.
\item[178.] See Urbina, Wastewater Recycling, supra note 61 (describing proposed manifest system requirements).
\item[179.] See id. (indicating current system is not as demanding on industry as proposed requirements).
\end{enumerate}
\end{small}
once every six to nine years. Proposals by various Pennsylvania administrators to require treatment facilities to monitor for radiation have thus far been unsuccessful.

C. Funding Regulations—Gas Severance Tax

Pennsylvania’s response to fracking was a hot topic in the 2010 gubernatorial race. Both candidates, Democrat Dan Onorato and Republican Tom Corbett, agreed it was imperative to continue regulating the natural gas industry. The candidates, however, disagreed on the scale of regulation and the necessary funding for such regulation. This section first details the severance tax laws adopted by other major gas-producing states. It then focuses on how the issue shaped this year’s gubernatorial race. Lastly, it examines the plans of Pennsylvania’s Governor-elect Tom Corbett.

1. The Fracking Tax—What Pennsylvania Can Learn From Texas, Arkansas, and West Virginia

The tax plans of other gas-producing states offer a starting point to analyze the effectiveness and drawbacks of a “frack tax.” Texas, Arkansas, and West Virginia successfully illustrate effective

180. Urbina, Regulation Lax, supra note 59 (describing study indicating limited radioactivity testing in Pennsylvania). Out of 65 intake plants downstream from drilling plants, not one had been tested since 2008. Id. Some public sewage treatment plants accepted wastewater at radioactivity levels as high as 2,122 times drinking water standard. Id.

181. Id. (stating Pennsylvania is considering implementing regulations for treatment plants to regulate radioactivity in wastewater).


184. For a discussion of both candidates’ position on severance tax, see infra note 224-230 and accompanying text.

185. For a discussion of the severance tax structures of Arkansas, Texas and West Virginia, see infra notes 188-199 and accompanying text.


187. For further discussion on the impact of the severance tax on the PA election, see infra notes 224-230 and accompanying text.

188. For an analysis of comparative severance tax systems, see infra notes 189-199 and accompanying text.
severance tax policies, which provide either “front-end” or “back-end” tax breaks for certain types of wells. While Pennsylvania drilling companies do not outright oppose the taxes paid in every other gas-producing state, the drilling companies lobby for all possible tax exemptions in Pennsylvania.

To help recover development costs, front-end tax exemptions, like those in Arkansas, exempt gas companies from a severance tax during the first few years of well production. Similarly, Texas allows operators of specifically designated “high-cost” wells to pay a reduced tax rate until gas companies recuperate half of their development costs. Both Texas and Arkansas also offer tax reductions, or back-end exemptions, for wells that are “low-producing.” Arkansas and Texas both provide tax exemptions, but neither state applies both front-end and back-end tax breaks, nor exempts oil and gas companies from paying property taxes in addition to the severance tax.

West Virginia taxes natural gas extraction at a rate of five percent of the gross value of production. A back-end exemption is currently in place for West Virginia wells producing less than 5,000 cubic feet of gas per day. Additionally, the state gives exempt-

189. For definitions of front end and back end exemptions, see infra notes 190-193 and accompanying text.
192. See Unintended Consequences, supra note 190, at 2 (describing Texas reduced tax rate for high cost wells). Tax is calculated using a sliding scale based on actual versus state-wide well development costs. Id.
193. See id. at 2-3 (detailing both states provide reduced tax rate for low-producing wells). Texas reduced rate when natural gas prices dropped under $3.50 per MCF. Id. at 2.
194. See id. at 1 (illustrating novelty in exemptions argued by Pennsylvania drilling industry).
196. See id. (explaining exemptions for lower-producing wells).
tions for long-term, low-producing wells.\textsuperscript{197} This exemption provides an incentive for the wells that would otherwise cease to operate due to the burdens of a tax to continue to produce and contribute to the economy.\textsuperscript{198} West Virginia distributes the tax revenue to local drilling municipalities and the state General Fund.\textsuperscript{199}

2. Applying a Severance Tax in Pennsylvania

Despite delaying the imposition of a severance tax due to high gas prices, former Pennsylvania Governor Ed Rendell strongly supported the severance tax on drilling.\textsuperscript{200} Governor Rendell sought to impose the highest severance tax in the nation—a $\.39 tax per thousand cubic feet of gas extracted.\textsuperscript{201} The Pennsylvania House of Representatives passed the proposed tax, but the Senate rejected the proposal.\textsuperscript{202} Senate leaders called the tax “completely unacceptable” and proposed a plan comparable to those existing in other major gas-producing states.\textsuperscript{203} Currently, Pennsylvania thus remains the only state among the top fifteen gas-producing states in the nation to not impose a tax on drilling.\textsuperscript{204}

In anticipation of a severance tax, the natural gas industry in Pennsylvania is presently lobbying for both front-end and back-end exemptions.\textsuperscript{205} These exemptions would give the gas industry time to regain their capital investments.\textsuperscript{206} Additionally, the natural gas industry maintains a severance tax with exemptions does not un-

\begin{itemize}
\item \textsuperscript{197} Id. (indicating exemptions used to lessen tax on lower-producing wells).
\item \textsuperscript{198} See \textit{id.} (giving policy reason for extended exemption on low-producing wells). The state allows exemptions for wells that, for a maximum of ten years, have not produced “marketable quantities of gas for 5 consecutive years prior to being placed back into production and thereafter producing marketable quantities.” Id.
\item \textsuperscript{199} See \textit{id.} at 34 (stating severance fund allocation).
\item \textsuperscript{200} See \textit{Booming Industry, supra note 167, at 1} (explaining Rendell Administration initial delay in implementing severance tax plan); see also Robert Swift, \textit{Rendell Calls Gas Severance Tax Dead This Year, The Daily Review} (Oct. 22, 2010), http://thedailyreview.com/news/rendell-calls-gas-severance-tax-dead-this-year-1.1052464 (announcing failure of Pennsylvania legislature to pass severance tax in 2010).
\item \textsuperscript{201} See \textit{Eric Boehm, Pennsylvania Still Only State Without Natural Gas Severance Tax, Statehouse News Online} (Oct. 21, 2010), http://statehousenewsonline.com/2010/10/21/pennsylvania-still-only-state-without-natural-gas-severance-tax/ (stating high price of Pennsylvania tax). At current gas price, this tax would be approximately 10%. \textit{Id.} Senate Republicans pushed for a lower tax of 1.5% for the first three years, and rising 5% later. \textit{Id.}
\item \textsuperscript{202} See \textit{id.} (indicating Republican opposition).
\item \textsuperscript{203} See \textit{id.} (proscribing plans more like Arkansas and Texas).
\item \textsuperscript{204} See \textit{id.} (describing fate of proposed severance tax).
\item \textsuperscript{205} See \textit{Unintended Consequences, supra note 190, at 1} (stating drilling industry’s urge for exemptions from proposed severance tax).
\item \textsuperscript{206} See \textit{id.} at 2 (stating reason for implementing exemptions).
\end{itemize}
duly burden the lower-producing wells. Opponents argue, however, the exemptions are both unnecessary and ineffective. They assert front-end tax breaks, like those implemented in Arkansas and West Virginia, create a mismatch between the most profitable period in well production and the time when demands are most burdensome on the environment and host communities. Opponents allege that a tax exemption during the initial years of well production would allegedly fail to capture 42% of the natural gas produced over the life of a Marcellus Shale well. Furthermore, opponents estimate back-end exemptions eliminate the taxation of 22% percent of well production. Accordingly, they argue back-end exemptions provide too great of a subsidy when oil production is lucrative. Typical Marcellus Shale wells reach low production status after twelve years, but may continue to produce gas for twenty-five more years. This low production status greatly decreases the tax basis even though the well may produce marketable gas. If both exemptions are implemented, only one-third of the natural gas produced by a well could be taxed.

Despite the evidence suggesting a severance tax would provide substantial revenue to Pennsylvania, state legislators fear “too tough” of taxes would stifle the industry. On the contrary, the

207. See id. at 4-5 (asserting lower producing wells should be exempt from taxation to keep them “economically viable” when gas prices rise).

208. See id. at 5-6 (explaining upfront exemptions and low-producing wells would significantly lower effectiveness of tax); see also Michael Wood, How to Structure a Severance Tax That is Fair to Pennsylvania, PA. BUDGET AND POLICY CTR. 3 (Aug. 30, 2010) [hereinafter How to Structure a Severance Tax] http://www.pennbpc.org/how-structure-severance-tax-fair-pennsylvanians (stating capital recovery tax breaks and low-producing well exemptions are unnecessary).

209. See Unintended Consequences, supra note 190, at 3 (detailing large environmental cost imposed on local communities during beginning stages of drilling). Chemical spills, heavy truck traffic and worker injuries occur more frequently during beginning of drilling process. Id.

210. See id. at 3 (stating front-end exemption would eliminate very large tax base, based on Author’s estimates from Bartlett Shale production data).

211. See id. at 5 (estimating result of low-producing well exemption).

212. See id. (noting problems with providing back-end exemption).

213. Id. (describing production cycle of Marcellus Shale well).

214. See Unintended Consequences, supra note 190, at 5 (elaborating on tax loss of back-end exemptions).

215. See How to Structure a Severance Tax, supra note 208, at 3 (arguing against industry’s requested tax exemptions).

Pennsylvania gas industry already enjoys preferential tax treatment. Oil and gas wells are exempt from property taxes and the Pennsylvania tax code allows drillers to deduct the costs of locating gas, drilling, research and development, tools, and royalty payments to landowners. The tax code essentially lowers a drilling companies’ taxable revenue.

Severance tax proponents, however, argue other gas-producing states that impose a severance tax have not deterred the industry participants as drilling companies have accepted the tax as a cost of doing business. This is even more applicable for Pennsylvania as it is located in the pinnacle of the national gas market. With easy accessibility to New York, Boston, and Washington D.C., drilling companies are eager to have a stake in this lucrative territory.

Still, opponents minimize the positive impacts a severance tax would have for the state, claiming the revenue generated from the industry will be substantial without adding an additional tax.

Opponents argue the West Virginia severance tax drove investors to Pennsylvania, and a Pennsylvania tax will drive them to New York. Dodds, supra. A severance tax was never imposed on coal because doing so would undermine the industry. Id.


219. See id. (describing impact of multiple exemptions).

220. See Booming Industry, supra note 167, at 1-2 (arguing need for severance tax); see also Fair Compensation, supra note 217, at 1 (detailing costs for natural gas industry that are passed onto Commonwealth and local municipalities). Drilling decisions are based on the location of the reserves and the price of gas, not severance tax rate. Booming Industry, supra note 167, at 2.

221. See Fair Compensation, supra note 217, at 2 (describing Pennsylvania’s price advantage over competing states). With half of the price of natural gas attributable to transportation and distribution costs, the Marcellus Shale’s proximity to the northeast market is crucial for gas companies. Id.

222. See Booming Industry, supra note 167, at 2 (elaborating on importance of Marcellus Shale proximity to large northeast market of approximately fifty-five million people).

223. See Roarty, supra note 183 (explaining Pennsylvania Governor-elect Tom Corbett’s stance on severance tax); see also Boehm, supra note 201 (citing Penn State University study estimates). The natural gas industry is expected to produce 174,000 jobs and local tax revenues exceeding $1.4 billion per year. Id.
3. Fracturing the Pennsylvania Gubernatorial Election—The Dividing Issue of Severance Tax

Unable to resolve the severance tax issue before his term’s end, Governor Rendell admitted defeat and declared the tax “dead.”224 Echoing Rendell, Johnna Pro, spokesperson for the House Appropriations Committee (D-Philadelphia), commented: “Ultimately, the people who will pay in the long run will be the people who get a property tax bill . . . There will be no money to mitigate environmental impact, and there will be no money to provide for local communities to repair their roads.”225 Despite Rendell’s declaration, the tax issue was alive in the 2010 gubernatorial race, which featured a crucial debate on severance tax.226

Both Republican Tom Corbett and Democrat Dan Onorato received campaign funding from the gas industry, yet Corbett stood firmly against the tax.227 Corbett explained the “infant industry” needed the opportunity to develop and recover the massive initial capital expenditures.228 Dan Onorato countered that the revenue generated by the industry could be used to strengthen environmental infrastructure programs, and accused Corbett of “just representing the gas drillers.”229 Although Corbett won the gubernatorial race, there is growing concern that he will be unable to regulate

224. See Swift, supra note 200 (announcing failure of Pennsylvania legislature to pass severance tax in 2010).

225. Boehm, supra note 201 (quoting Johnna Pro, spokesperson for House of Appropriations Committee, describing impact of failure to pass severance tax).

226. See Roarty, supra note 183 (describing dividing effect of severance tax on campaigns of both candidates). Supporting the tax could give Onorato an edge in the southeast where there is a stronger environmental vote. Id. Opposing the tax could give Corbett leverage as a more fiscally conservative candidate. Id.


228. See id. (asserting Corbett’s reluctance to tax Pennsylvania’s developing gas industry); Bill O’Boyle, Marcellus Shale Top Issue for Onorato, Corbett in Gubernatorial Race, THE TIMES LEADER, Oct. 28, 2010, available at http://www.timesleader.com/news/Marcellus_Shale_top_issue_for_Onorato_Corbett_in_gubernatorial_race_10-24-2010.html (stating drilling company gave campaign contributions to both candidates); see also Roarty, supra note 183 (asserting Corbett’s non tax stance). Quoting Dan Onorato, “the tax hasn’t hurt their business . . . the drillers can’t go elsewhere – the gas in here in Pennsylvania. My opponent wants the taxpayer to pay for it.” O’Ttoole, supra note 227. Quoting Kevin Harley, Corbett spokesperson, “Corbett believes that by growing the industry, we could produce as much as 600,000 jobs, which will increase the tax base, which will increase the revenue to the state.” Roarty, supra note 183.

229. Roarty, supra note 183 (quoting Dan Onorato’s opinion of Corbett’s campaign platform).
drilling without exploiting Pennsylvania’s environment and local communities.230

D. Going Forward Under a Tax Free Leadership

On January 11, 2011, Governor Corbett’s inauguration was attended by protestors of Marcellus Shale drilling, specifically in protest of the substantial campaign funds Corbett received from gas companies and his opposition to the severance tax.231 Regardless of one’s stance on his platform, Governor Corbett’s approach to regulating Marcellus Shale drilling will shape the Pennsylvania economy for many years to come.232 In a June 2010 press release, Governor Corbett stressed that responsible regulations and legislation are crucial to both protecting the environment and economically capitalizing on the Marcellus Shale.233 His proposed plan calls for determining industry best practices, implementing training programs, and improving emergency preparedness.234 He also plans to create the Energy Executive, a new position dedicated to coordinating the overall state energy policy, and his new DEP Secretary, Michael Krancer of the Pennsylvania Environmental Hearing Board, will bring a wealth of experience to the new administration.235

Many Pennsylvania residents, however, remain skeptical of Governor Corbett’s ability to fund his energy policy without a sever-


231. See id. (illustrating importance of Marcellus Shale policy in this year’s election).


233. See id. (describing Corbett’s plan to “harness Pennsylvania’s energy potential in an environmentally sound manner in an effort to reduce our dependence on foreign oil and make energy affordable”).

234. See id. (elaborating on Marcellus Shale regulations).

ance tax, and further suspect his "pro-drilling" reputation will yield softer regulations on the industry.\textsuperscript{236} Among the programs that may be harmed by insufficient funding and proposed budget cuts is Growing Greener, a program first instituted in 1999 and reinstated in 2002.\textsuperscript{237} Growing Greener distributes funds through state agencies to address critical environmental concerns, such as abandoned mine cleanup efforts, abandoned oil and gas well plugging, and protection of open space within communities.\textsuperscript{238} Secretary Hanger voiced his concerns about the lack of a severance tax and Corbett's anti-tax stance:

Failing to tax the Marcellus makes no sense and is a major piece of undone business. The Marcellus gas industry is now huge, with billions of foreign investment pouring into Pennsylvania and with tax free profits going back to China, Norway, India, and Great Britain. Every state has a drilling tax and none of those states has killed their golden goose. And the Marcellus goose is the most golden of all because the gas here is comparatively low cost to produce, low-cost to deliver to markets in New York and Boston, and high profit. We must tax it and use at least one-third of the revenues to fund Growing Greener and other environmental programs.\textsuperscript{239}

In February 2011, Democratic legislators, led by Representative Greg Vitali (D-Delaware), proposed House Bill 33 in an attempt to revive debate over the severance tax.\textsuperscript{240} House Bill 33 includes a severance tax that takes into account the fluctuations of the gas

\begin{footnotes}
\item[236] See Paul King, Protecting Pa. in Hard Times, PA. ENVT. COUNCIL (Jan. 28, 2011), http://www.pecpa.org/news/protecting-pa-hard-times (referring to numerous environmental programs that have been cut in order to support a growing state deficit).
\item[239] Head, supra note 32 (quoting Secretary Hanger's advice for incoming administration).
\end{footnotes}
market. The fluctuating tax would levy five percent on every thousand cubic feet of gas extracted. House Bill 33 also includes a fixed tax of 4.6 cents per thousand cubic feet, which would be applied regardless of price fluctuations. The bill allocates one third of the tax revenue to the general state fund, one third to environmental programs, and the final third to the county and municipal governments of drilling locations. Representative Vitali argues the revenue earned from such a tax could be applied as an alternative to the funding cuts proposed by the Corbett administration. The proposed bill would yield an estimated $245 million for the fiscal year 2011-12, and could grow to $570 million in 2015. Although the bill has gathered support from environmental groups, it will likely succumb to strong opposition from House Republicans—possibly meeting the same fate as Governor Rendell’s previous attempt to pass a severance tax.

E. Conclusion: The Future of Fracking Regulation and Pennsylvania’s Marcellus Shale Drilling Under New Leadership

The future of hydraulic fracturing governance is evolving at this very moment. The EPA recently announced it has reopened the 2004 study on the effects of hydraulic fracturing on local water supplies. In Pennsylvania, new leadership must continue to implement stringent state regulations to control the rapidly growing Marcellus Shale development. Both on a federal and state level,

241. See id. (indicating proposed bill will account for market fluctuations).
242. Id. (stating proposed tax for H.B. 33).
243. See id. (outlining constructs of H.B. 33).
244. See id. (explaining how tax revenue would be appropriated).
245. See Vitali Introduces Marcellus Drilling Tax Bill, PA. HOUSE OF REPRESENTATIVES (Feb. 8, 2011), http://www.pahouse.com/PR/166020811.asp (explaining proposed H.B. 33 to help fill budget deficit, support environmental programs, and compensate municipalities); see Barnes, supra note 240 (explaining severance tax could compensate for Corbett budget cut proposals).
246. See Vitali Introduces Marcellus Drilling Tax Bill, supra note 245 (illustrating effect of H.B. 33 bill if enacted). It is estimated Pennsylvania would have collected $130 million if a severance tax was passed when first proposed in October 2009. Id.
247. See id. (detailing support for H.B. 33). The bill has 57 co-sponsors. Id.
248. For discussion of the re-opened EPA study, see infra notes 252-263 and accompanying text.
249. See id. (outlining parameters of new study).
250. For a discussion on Governor Corbett’s environmental policy and 2011 budget, see infra notes 264-274 and accompanying text.
the next few months may greatly affect the future of the gas drilling industry and the process of hydraulic fracturing.251

1. Federal Regulations: Reopening the EPA Study

In response to public scrutiny of the Halliburton loophole, and in large part due to contamination claims from the fracking process, the EPA announced in March 2010 it would reopen its 2004 hydraulic fracturing study.252 The EPA held a number of public meetings across the country in the summer of 2010, focusing on areas most affected by fracking, in order to receive broad input for the study’s direction.253 The EPA revealed plans to take a “life-cycle” approach and examine the potential impact of each stage of the fracking process on drinking water.254 The EPA established a March 2011 review of the draft and it estimates the report will not be completed until 2014, but initial results may be released by the end of this 2011.255 Currently, the EPA plans to utilize several case studies for the report focusing on potential fracking sites in Texas, Colorado, North Dakota, and possibly two sites in Pennsylvania.256

251. For a discussion on the evolving issues over Marcellus Shale regulation and severance tax, see infra notes 252-281 and accompanying text.
252. See Orford, supra note 26 (explaining industry expansion, inability to pass disclosure bills for drilling companies, and evidence of pollution have led to reopening of 2004 study).

Congress adopted a conference report for EPA’s funding bill in 2009 that urge[d] the [EPA] to carry out a study on the relationship between hydraulic fracturing and drinking water, using a credible approach that relies on the best available science, as well as independent sources of information . . . to be conducted through a transparent, peer-reviewed process that will ensure the validity and accuracy of the data.

Id.

253. See Opportunity for Stakeholder Input, supra note 67 (seeking input for proposed criteria for case study selection).


255. Nicholas Kusnetz, EPA Wants to Look at Full Lifecycle of Fracking in New Study, PRO PUBLICA (Feb. 9 2011, 3:32 PM), http://www.propublica.org/article/epa-wants-to-look-at-full-lifecycle-of-fracking-in-new-study (describing recent announcements regarding study). Scientific board will meet on March 7-8, 2011 to review the draft plan. Id. The preliminary report is expected by the end of 2012. Id. The draft asserts the study will look at the full lifecycle of two or three case studies, including two potentials in Pennsylvania’s Marcellus Shale, and one in Texas, Colorado, and North Dakota. Id.

256. See id. (stating potential site for EPA case studies).
The EPA, however, has cautioned this study does not guarantee imminent regulations.257

Many remain skeptical that the study will successfully rectify the shortcomings of the past EPA initiative.258 Although the life-cycle approach may sound broad, it is significantly limited in scope.259 Recently published drafts of the EPA study reveal the Agency abandoned plans to test for radioactivity in wastewater discharged into rivers from the current draft study—a practice receiving particular attention in Pennsylvania.260 Suggested as a high priority by the EPA, the new approach, named the “River Model,” would have examined contaminated runoff from disposed drilling waste to determine if rivers can sufficiently dilute the discharge.261

If the EPA study indicates a need for more regulation, the 2009 legislation known as the “Frac Act” may be the conduit through which the additional regulations are implemented.262 The currently stalled Frac Act proposed to bring hydraulic fracturing under the SDWA, which would effectively close the Halliburton loophole by requiring drillers to disclose the chemical makeup of the fracking fluids.263


258. See Urbina, Pressure Limits Efforts, supra note 92 (analyzing EPA’s past efforts to regulate gas industry). “More than a quarter-century of efforts by some lawmakers and regulators to force the federal government to police the industry better have been thwarted, as E.P.A. studies have been repeatedly narrowed in scope and important findings have been removed.” Id.

259. See id. (pointing to pressure from gas-producing states keeping EPA study focus narrow). Pro-drilling lobby supports natural gas as an environmentally friendly way to reduce our dependence on foreign fuel, and a job generating industry. Id.


261. See Urbina, Pressure Limits Efforts, supra note 92 (explaining “high priority” river model was cut from study).


263. See Deweese, supra note 155, at 6 (explaining effect of FRAC Act).
2. Pennsylvania’s Regulations and the Growing Need for a Severance Tax

Whether the practice of hydraulic fracturing in the Marcellus Shale comes under federal regulation or continues to be solely state-regulated, drilling in Pennsylvania is not likely to cease any time soon.\textsuperscript{264} The pressure to tap into domestic fossil fuel reserves to avoid the foreign markets coupled with the increased cost of oil instills an urgency for alternative energy sources and spurs natural gas production and drilling in the Marcellus Shale.\textsuperscript{265} Moreover, the increase in natural gas production necessitates heightened oversight and tightened regulations.\textsuperscript{266}

Despite the valiant efforts of the Rendell Administration to increase the safety of drilling practices, recent state reports indicate that more stringent regulations must be implemented, especially with regards to post-fracking wastewater disposal.\textsuperscript{267} The already understaffed DEP cannot provide the necessary oversight to ensure wastewater is adequately treated and not merely diluted before it returns to the waterways.\textsuperscript{268} The new Corbett administration must take a hard line approach with the drilling industry to guarantee the public safety of Pennsylvania citizens and the preservation of natural resources.\textsuperscript{269} The results of the EPA study, expected to be

\textsuperscript{264} See New Research, supra note 24 (describing large amount of gas within Pennsylvania’s Marcellus Shale); see also Natural Gas Climbs to 6-week High on Cold Late March Forecast, FUTURESPROS.COM, (Mar. 22, 2011), http://www.futurespros.com/news/energy-news/natural-gas-climbs-to-6-week-high-on-cold-late-march-forecast-100009209 (indicating market predicts increased demand for natural gas).

\textsuperscript{265} See John Broder & Clifford Krauss, Calls Mount to Tap U.S. Oil Reserves, N.Y. TIMES, Mar. 3, 2011, available at http://www.nytimes.com/2011/03/04/business/energy-environment/04oil.html (explaining increasing oil prices put pressure on domestic reserves). Quoting Senator Jeff Bingaman (D-NM), “Between the lost production in Libya, the crude oil dislocation associated with additional Saudi production and the prospect of further turmoil in the region . . . we are now unquestionably facing a physical oil supply disruption that is at risk of getting worse before it gets better.” Id.

\textsuperscript{266} See Marcellus Shale Directory, PAGASDIRECTORY.COM, http://www.pagadirectory.com/ (last visited Oct. 15, 2011) (indicating as of December 2010, 3,341 permits have been issued, with 1,386 wells drilled).


\textsuperscript{268} See Hopey, supra note 267 (explaining lack of oversight).

released in 2012, will likely contribute to the already growing pressure to regulate the natural gas industry.\textsuperscript{270}

The DEP proclaimed a desire to “direct the Department of Environmental Protection to serve as a partner with Pennsylvania business, communities and local governments.”\textsuperscript{271} Departing DEP Secretary Hanger, however, advised “the single most important thing” is for the agency to be a “professional, independent watchdog.”\textsuperscript{272} He stated, “Sometimes I hear some in the industry and some in the business say the DEP should be the partner of the gas industry, or should treat the gas industry as a customer or a client . . . . That’s not correct. The gas industry companies have partners. They are called investors.”\textsuperscript{273}

The growing need for hydraulic fracturing regulations and the Pennsylvania deficit of $4.3 billion, makes a severance tax even more necessary.\textsuperscript{274} Governor Corbett’s recent budget proposal, nevertheless, cuts funding by $160 million from the DEP environmental programs.\textsuperscript{275} Despite the cuts, Corbett has retained a strong anti-severance tax policy and maintained that “[i]t’s important to get this industry rooted in Pennsylvania.”\textsuperscript{276} If Representative Vi-

\begin{footnotesize}
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\item[270.] See EPA 2004 Study, supra note 50 (detailing study guidelines).
\item[271.] See Corbett, supra note 232 (explaining environmental policy).
\item[272.] Legere, supra note 168 (quoting Secretary Hanger’s recommendations for incoming Corbett administration).
\item[273.] Id. (explaining DEP should not act as partners with gas drilling industry); but see Donald Gilliland, Industry Fills Majority of Seats on Corbett’s Gas Drilling Panel, THE PATRIOT NEWS (Jul. 22, 2011, 7:45 PM), http://www.centre daily.com/2011/05/22/2597591/industry-fills-majority-of-seats.html (indicating partnership with gas industry).

This budget fails to protect our environment by continuing to allow gas drillers to destroy our environment while taxpayers foot the bill for the drillers’ mess. Every other state with natural gas drilling protects taxpayers from paying for the damage created by drillers—Pennsylvania should not stand alone on this. This threatens our environment, infrastructure and public health.

\textit{Id.}

\item[276.] Krawczeniuk, supra note 274 (quoting Gov. Corbett’s reasons for resisting severance tax).
\end{enumerate}
\end{footnotesize}
tali’s tax proposal were implemented, it would generate an estimated $245 million for fiscal year 2011-12 and produce nearly $570 million by 2015, thereby helping to compensate the budgetary cuts. Furthermore, the tax would not discourage further Marcellus Shale development in the already flourishing industry. One gas industry representative echoed this truth stating, “The industry will probably hate me for saying this, but as far it goes in my world of spreadsheets, the severance tax is not a deal-breaker. [sic] I don’t believe it will have a huge impact on drilling. It’s not that large.” To avoid making the same mistakes of the past, a proper balance between economic growth and environmental protection is needed. Pennsylvania must learn from the environmental devastation of the coal industry, or it will again be dealt the same fate of costly cleanup efforts and polluted waterways.

Kristen Allen*

277. Vitali Introduces Marcellus Drilling Tax Bill, supra note 245 (detailing benefits from imposition of HB-33).

278. See Wood, Unintended Consequences, supra note 190 (explaining lack of deterrent effect of severance tax on gas industry).

279. Id. (quoting gas industry analyst stance on severance tax).

280. For further discussion of Pennsylvania’s coal history, see supra notes 1-7 and accompanying text.

281. See id. (detailing environmental consequences of coal industry in Pennsylvania).

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