RESPONSIBLE GROWTH

Protecting the Public Interest with a Natural Gas Severance Tax

Cartoon Source: *The Times-Tribune*, Scranton, PA, May 7, 2008.

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Executive Summary

The Commonwealth of Pennsylvania is rich in mineral resources and has a long history of extracting those resources for export. Since the drilling of the nation's first commercial oil well in Titusville in 1859, Pennsylvania fortunes have been made in the production and export of coal, oil, and natural gas.

Within the next decade, Pennsylvania is poised to enjoy a new mineral development boom. The rising price of natural gas and the advent of advanced drilling techniques have made it economically feasible to extract natural gas from the nation's vast oil shale formations, including the Marcellus Shale, a deep formation that underlies 54 of the 67 counties of Pennsylvania – all but the southeastern corner of the state.[1]

Like the mineral booms before it, gas production from the Marcellus Shale will likely spur substantial economic growth with the promise of revitalizing local communities. Evidence from the exploitation of similar formations in Texas and Arkansas suggests that both employment and incomes in mineral rich counties will rise.[2] Besides jobs for Pennsylvanians and economic development, there are other substantial benefits to the development of the shale. Natural gas can help lessen the nation's dependence on imported oil and, of all the fossil fuels, natural gas is the cleanest burning.[3] Natural gas use also produces fewer greenhouse gases (nitrogen oxides and carbon dioxide, in particular) than burning coal or oil.[4]

Still, the legacy of Pennsylvania's mineral extraction tradition is a mixed one. Coal and oil production created tens of thousands of jobs, built individual wealth, and sustained thriving communities for generations. At the same time, they imposed infrastructure costs that were paid for with tax dollars and

[1] John A. Harper, "The Marcellus Shale - An Old '"New'" Gas Reservoir in Pennsylvania," *Pennsylvania Geology*, Volume 38, Number 1, Pennsylvania Bureau of Topographic and Geologic Survey, http://www.dcnr.state.pa.us/topogeo/pub/pageolmag/pdfs/v38n1.pdf.

[2] The Perryman Group attributes gains of $4.9 billion in personal income and 84,000 jobs in the Fort Worth, Texas area to the development of natural gas in the Barnett Shale, see http://www.bseec.org/images/summaryreport.pdf. A March 2008 report from the University of Arkansas' Center for Business and Economic Research estimated that activity in the state's Fayetteville Shale added $2.6 billion in economic activity and created over 9,500 jobs in 2007, see http://cber.uark.edu/FayettevilleShaleEconomicImpactStudyEXECSUMMARY2008.pdf.

[3] Clean Air Online – Natural Gas, Environment Canada, August, 8, 2006, http://www.ec.gc.ca/cleanair-airpur/Natural_Gas-WS8BCA9C18-1_En.htm.

[4] U.S. Environmental Protection Agency, "Clean Energy – Natural Gas," December 28, 2007, http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html.

left behind mountains of slag and contaminated rivers and wells. Once booming communities slowly withered as mines were shuttered and wells ran dry.

Increased natural gas production will impose substantial costs on state and local governments for environmental permitting, monitoring, and damage (e.g., groundwater contamination and depletion, , forest fragmentation and other habitat loss, soil erosion, and noise and air pollution); worker and public safety in and around wells; emergency response teams; and, according to local officials, roads and bridges. Under the current system, these costs will not be fully paid for by the producers – as a result, they will not be taken fully into account by producers or consumers in making investment or consumption decisions. Instead, these costs will be borne substantially by state and local taxpayers.

Economists call these sorts of costs "externalities," as they are created by the economic activities of natural gas production but are not paid for by the firms and individuals enjoying the economic benefit. Severance taxes are a mechanism for "internalizing" these costs by properly imposing them on the activities that produce the costs. Thirty-five states have recognized that resource extraction produces externalities and impose severance taxes of some type to help recover these costs.

Currently, Pennsylvania is the only major fossil fuel-producing state that does not levy a mineral extraction, or severance, tax to recover some of the costs borne by citizens and to compensate them for the loss of a finite natural resource. Levying a tax on natural gas extraction will help achieve both of these goals. The revenue collected can serve as a bridge to the future – paying for unanticipated costs and helping to reinvent boom-time communities after the minerals are gone. As Governor Mike Beebe of Arkansas said when seeking a significant increase in his state's severance tax, "We do not want to hurt a wonderful industry and economic boon to our state that's providing jobs and resources. But we do want them to pay for posterity and fairness and equity; a severance tax that is designed to pay for a nonrenewable, finite resource that our children and grandchildren won't have the benefit of."[5]

In February 2009, Governor Ed Rendell proposed a severance tax on natural gas extraction in Pennsylvania as part of his proposed 2009-10 budget. The proposed tax would be levied based on price and volume, using the same rates in effect in neighboring West Virginia (5% of the sales price and $0.047 per thousand cubic feet of production). The tax would go into effect on October 1, 2009 and is projected to raise $107 million in new revenue for the state's General Fund in 2009-10. Increases in natural gas

[5] Bill Smith, "March 31 Special Session for Severance Tax Increase," ARRA News Service, March 22, 2008, http://arkansasgopwing.blogspot.com/2008/03/march-31-special-session-for-severance.html.

production in the state would boost collections from the proposed severance tax to $632 million by 2013-14.[6]

Mineral extraction activities can be a significant source of revenue for local governments, which generally include the value of minerals in property tax assessments. According to figures from the Perryman Group, the development of the Barnett Shale in Texas produced $379 million in new tax revenue to local governments in 2007.[7] Here in Pennsylvania, local governments are unable to recover infrastructure and other costs from natural gas drilling through local property taxes due to a court decision. In 2002, the Pennsylvania Supreme Court removed oil and gas from the list of assessable materials, although coal, gravel, and other minerals remain part of the property tax calculation.

Extraction taxes in Texas, Wyoming, and West Virginia have not deterred resource exploration or production, or the growth of related employment, in those states. Several studies have confirmed little impact on supply, demand, or commodity prices from raising severance taxes, which many states have done in recent years. States with mineral wealth and extraction taxes were spared the pain of budget cuts in 2008 as robust production and higher prices brought in significant revenue.

The northeastern states, including Pennsylvania, are the second biggest residential consumers of natural gas in the U.S. The natural gas used in the Northeast is currently imported through pipelines from western states, like Texas, Oklahoma, and Wyoming.[8] These consumers already pay state and local taxes imposed by those western producer states.

For northeastern U.S. markets, natural gas produced in Pennsylvania will be an attractive alternative to natural gas transported from Texas or other regions of the country because of lower transmission and distribution costs – even with a Pennsylvania severance tax. Transportation costs represent on average 48% of the cost of natural gas for consumers, making gas produced in Pennsylvania highly competitive with western producer states.[9]

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[6] Commonwealth of Pennsylvania, *Governor's Executive Budget, 2009-10*.

[7] The Perryman Group, *Drilling for Dollars: An Assessment of the Ongoing and Expanding Economic Impact of Activity in the Barnett Shale on Fort Worth and the Surrounding Area*, presentation at the Barnett Shale Expo, March 2008, http://www.bseec.org/images/summaryreport.pdf. These dollars represent direct and indirect activity associated with natural gas production in the region.

[8] U.S. Energy Information Administration, Share of Total U.S. Natural Gas Residential Deliveries, 2007, http://tonto.eia.doe.gov/dnav/ng/ng_cons_pns_a_epg0_vrp_pct_a.htm.

[9] Estimate of transportation costs as a portion of consumer natural gas prices taken from the U.S. Energy Information Administration, *Residential Gas Prices: What Every Consumer Should Know*, December 2008, http://www.eia.doe.gov/neic/brochure/oil_gas/rngp/index.html.

States use revenues from severance taxes in different ways. Every state that levies the tax uses a portion for current operations. Many states share a portion of state severance tax collections with the local governments that shoulder a large portion of the public costs generated by mineral extraction. In West Virginia, for example, roughly 6% of the state's severance tax is transferred to counties.

Some states also set aside a portion of the severance tax proceeds for environmental remediation, since resource extraction permanently changes the state's landscape. This can be in the form of an environmental fund, or a "permanent fund," from which fund earnings are spent with the fund principal lasting in perpetuity.

The reasons that a severance tax is a sensible option for natural gas suggest that the tax should be considered for other non-renewable resources, such as coal. At this time, a severance tax on coal in Pennsylvania would likely produce more revenue than a tax on natural gas, as the coal industry is more developed and Pennsylvania produces a much larger share of the nation's coal than gas supply.[10] It would also remove an artificial incentive for producing coal, a dirtier burning resource, if only natural gas producers paid a severance tax. Coal has produced substantial environmental costs which are borne by Pennsylvania taxpayers. Fairness would dictate that the Commonwealth should consider a uniform policy applying a severance tax on coal, oil, other mining, and even timber at a rate competitive with surrounding states.

Pennsylvania can learn much from the natural gas boom in Texas, Arkansas, and Wyoming about how to manage the development of this great resource.[11] Appropriate taxation of natural gas must be part of that learning and part of the plan to protect taxpayers and return some of the benefit of this resource to the citizens of Pennsylvania.

[10] Pennsylvania is currently the fourth largest producer of coal in the U.S. West Virginia produces more coal than Pennsylvania, but received 85% of its severance tax from coal in 2006, according to the *Charleston State Journal*, http://www.statejournal.com/story.cfm?func=viewstory&storyid=20383.

[11] Jeffrey Jacquet, *Energy Boomtowns & Natural Gas: Implications for Marcellus Shale Local Governments & Rural Communities*, NERCRD Rural Development Paper No. 43, The Northeast Regional Center for Rural Development, The Pennsylvania State University, University Park, PA, January 2009, http://nercrd.psu.edu/Publications/rdppapers/rdp43.pdf.

Natural Gas Production and the Marcellus Shale

Demand for natural gas in the United States is increasing for a number of reasons, including the rising cost of oil, the desire to reduce U.S. dependence on foreign fuel sources, and environmental concerns over the burning of other fossil fuels (such as coal and petroleum). Burning natural gas produces carbon dioxide, nitrogen oxides, and other greenhouse gases, but in lower quantities than the burning of oil or coal. According to the U.S. Environmental Protection Agency, power plants fueled by natural gas produce "half as much carbon dioxide, less than a third as much nitrogen oxides, and one percent as much sulfur dioxides" as coal-fired plants, on average.[12] Much of the increase in demand for natural gas has been fueled by its increasing use in electricity generation.

As demand has increased, so have efforts to identify and develop U.S.-based sources of natural gas. One of the largest natural gas deposits is found in the Marcellus Shale, a rock formation that underlies much of Pennsylvania.[13] It is thought to be perhaps the largest natural gas source in the United States. In October 2008, Pennsylvania State University professor Terry Engelder estimated that the 3,632 trillion cubic feet of gas locked in the Marcellus Shale could ultimately yield 363 trillion cubic feet of natural gas – an amount equal to 13 years of current U.S. natural gas demand.[14]

Increases in the market price and improvements in drilling technology have made harvesting natural gas from the Marcellus Shale financially viable. Natural gas prices soared to a high of $10.82 per

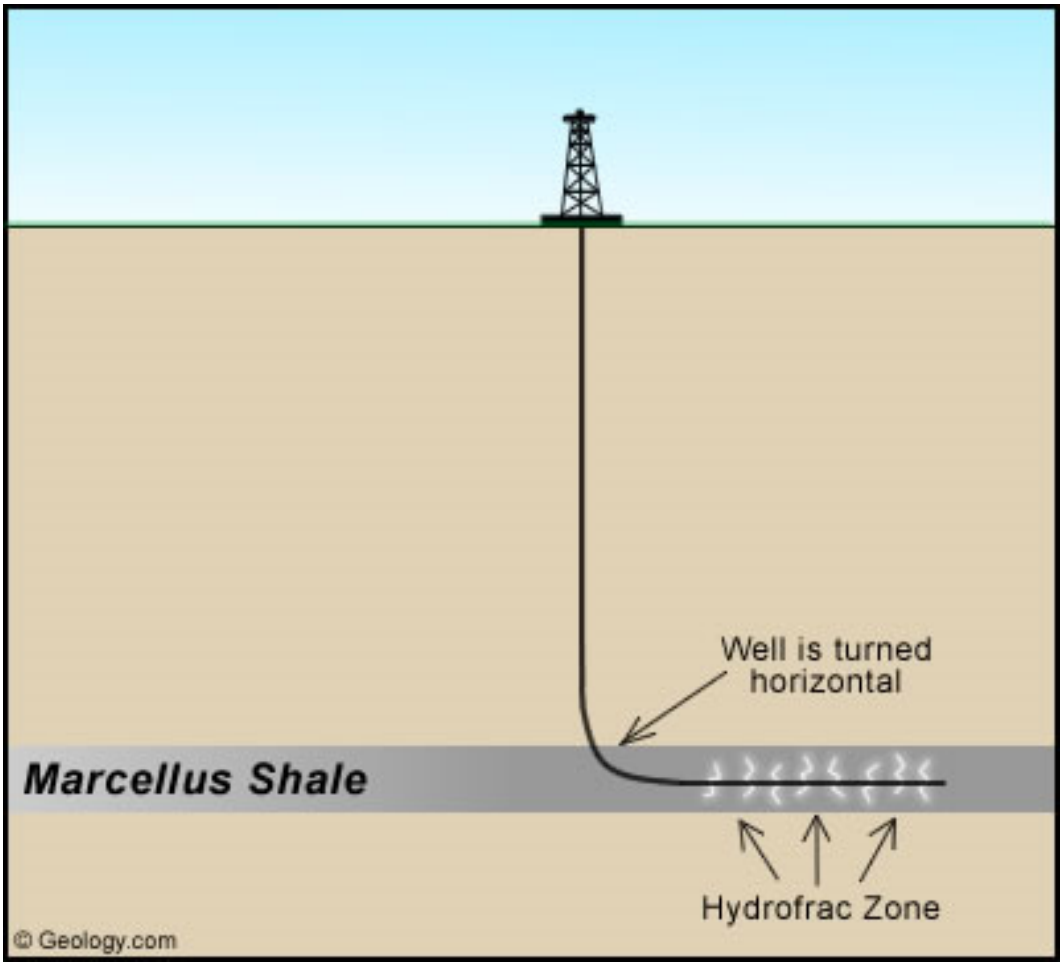
[12] U.S. Environmental Protection Agency, *Clean Energy: Natural Gas*, December 28, 2007, http://epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html.

[13] The Marcellus Shale also lies below much of West Virginia, western New York, and eastern Ohio.

[14] Pam Kasey, "Marcellus Recoverable Gas Estimate Doubles," *The State Journal*, Charleston, West Virginia, November 6, 2008, http://statejournal.com/story.cfm?func=viewstory&storyid=46575. The yield was clarified via an email from Dr. Engelder in March 2009. Dr. Engelder based this estimate on data provided by the Chesapeake Energy company at an investors' conference. Total natural gas in place in the Marcellus Shale equals 3,632 trillion cubic feet. Using an anticipated recovery factor of 30%, that would yield 1,089 trillion cubic feet of technically recoverable natural gas. Engelder then assumed that one-third of technically recoverable gas would be accessible, which yields the 363 trillion cubic feet of natural gas referred to in the text..

thousand cubic feet (MCF) in June 2008, spurring tremendous interest in the shale formation. The recession has since deflated these prices. In January 2009, the average price fell to $5.15 per MCF, low by current standards but still higher than the average price of $2.60 in 2000.[15] As the economy improves, natural gas prices are expected to increase.

Shale has long been known to contain natural gas, but until recently technology did not exist to commercially remove it. The new technology, developed and perfected in Texas to extract natural gas from the Barnett Shale, combines hydraulic fracturing with horizontal well drilling. During hydraulic fracturing large volumes of water, sand, and other chemicals are injected into a well under immense pressure to create fractures or splits in the surrounding rock formation, which releases natural gas trapped in the shale. Horizontal drilling techniques allow wells to reach gas formations that were previously inaccessible and to reduce the surface "footprint" of the well. (Unlike traditional well technology, horizontal drilling techniques use a single vertical well that can harvest natural gas from multiple horizontal pipes radiating out from the base. This allows each well to tap into natural gas within a much larger area of impermeable rock, like shale.)



[15] U.S. Energy Information Administration, *Natural Gas Navigator: U.S. Natural Gas Wellhead Price* (in nominal dollars), http://tonto.eia.doe.gov/dnav/ng/hist/n9190us3m.htm.

Pennsylvania's Natural Gas Industry

Pennsylvania is a state rich in natural resources. The Commonwealth is the fourth largest producer of coal, with smaller but active oil and gas production, timber exporting, gravel, and other mining industries.

Pennsylvania already has a modest natural gas production industry, which consists largely of shallow, relatively low-producing wells – called stripper wells by the industry – a marked difference from the new wells being drilled in the Marcellus Shale.[16] In 2007 Pennsylvania had the second highest number of active natural gas wells in the country (52,700)[17] and ranked 15th out of 32 gas-producing states, producing 182 billion cubic feet of natural gas (0.9% of total U.S. production).[18]

According to the U.S. Bureau of Labor Statistics, the natural resource and mining industry employed 21,200 people in Pennsylvania in 2007, making up four-tenths of 1% of the state's private workforce.[19] 5,829 of these worked in Pennsylvania's oil and gas extraction industry, which is 0.1% of total state employment and 0.2 % of employment in the 54 counties in the shale region.[20] This figure had grown to 7,148 people by September 2008, according to data from the U.S. Bureau of Labor Statistics – an increase of 23%.[21]

Natural gas exploration has grown in the Commonwealth. In 2000, 1,354 new oil and gas wells were drilled across the state. By 2007, drilling activity had more than tripled, to 4,148 new wells.[22] Most of the growth in drilling to date has been concentrated in the westernmost counties.

The development of the Marcellus Shale could increase Pennsylvania's production exponentially, as the shale is estimated to contain roughly 2,000 times the natural gas extracted in the state in 2007.

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[16] Pennsylvania Department of Environmental Protection, *DEP Fact Sheet: Oil and Gas Well Drilling and Production in Pennsylvania*, April 2007.
[17] U.S. Energy Information Administration, Number of Producing Gas Wells, February 28, 2009.
[18] U.S. Energy Information Administration, Natural Gas Annual 2007, http://www.eia.doe.gov/neic/experts/natgastop10.htm.
[19] U.S. Bureau of Labor Statistics, State and Area Employment, Hours, and Earnings, Annual estimates of statewide employees – Pennsylvania, http://data.bls.gov/cgi-bin/dsrv?sm.
[20] Author's calculations using data from the U.S. Bureau of Labor Statistics, "Quarterly Census of Employment and Wages," 2007, (data extracted on March 26, 2009).
[21] The North American Industry Classification System (NAICS) codes examined include: Oil and Gas Extraction (211), Drilling Oil and Gas Wells (213111) , and Support Activities for Oil and Gas Operations (213112).
[22] Pennsylvania Department of Environmental Protection.

Pennsylvania Natural Gas Wells by County, 2000 - 2005[23]

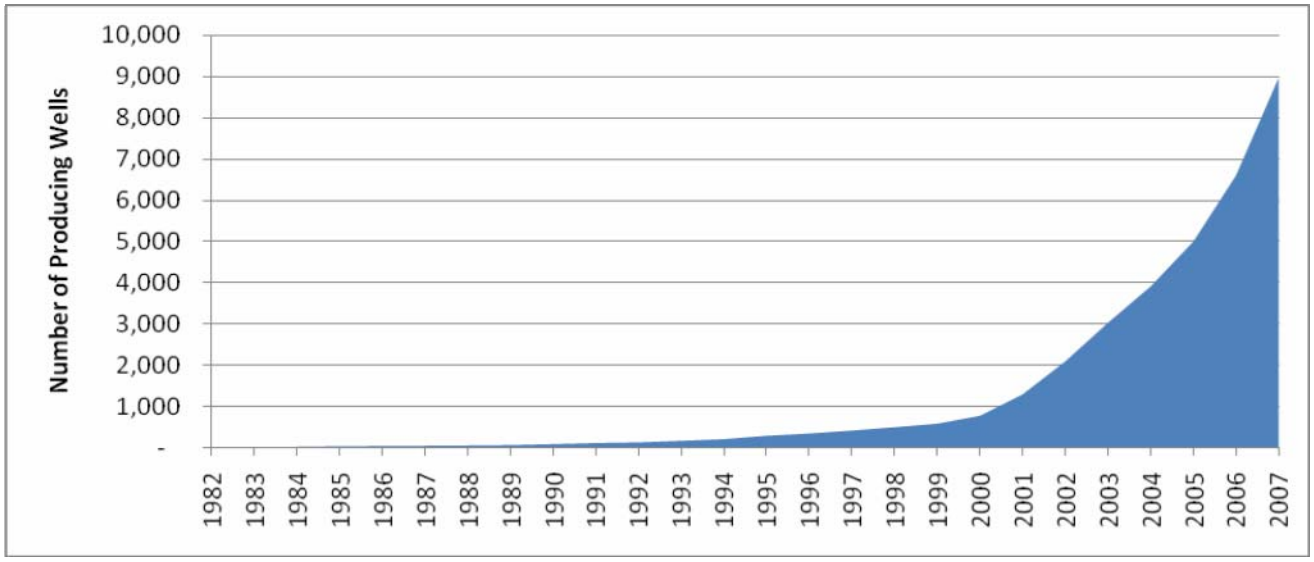
	2000	2001	2002	2003	2004	2005	Percentage Change
Armstrong	4,065	4,361	4,023	4,612	4,314	5,109	26%
Clearfield	2,066	2,821	2,740	2,416	2,804	2,853	38%
Fayette	451	607	672	1,002	1,231	1,598	254%
Indiana	6,934	7,785	7,600	7,999	7,071	7,189	4%
Jefferson	2,995	3,276	3,046	3,080	2,998	2,724	-9%
Mercer	1,558	1,903	1,864	1,919	2,107	2,254	45%
Warren	3,460	4,605	4,261	4,302	2,558	4,416	28%
Westmoreland	2,356	2,603	2,551	2,867	2,444	3,211	36%
Other	18,006	19,785	18,588	21,541	21,681	23,464	30%
Pennsylvania Total	41,891	47,746	45,345	49,738	47,208	52,818	26%

Source: Pennsylvania Department of Environmental Protection

The Marcellus Shale is similar to two other deep gas formations that have been developed during the last 10 years, the Barnett Shale in Texas and the Fayetteville Shale in Arkansas. The development of the natural gas in those regions filled the landscape with gas wells and quickly made an impact on the local economy of each. The number of producing natural gas wells in the Barnett Shale (which underlies Forth Worth, Texas) increased from 404 in 1997 to 8,960 in 2007. During that period, employment in the oil and gas extraction and support activities in Texas increased by 32% from 147,000 to 194,000.[24] Activity in the Barnett Shale is now estimated to make up 8.1% of the local economy.[25]

[23] Pennsylvania Department of Environmental Protection, "Production reported by county, 1991-2005," http://www.dep.state.pa.us/dep/deputate/minres/OILGAS/Prod%20by%20County%20since%201991-Public.xls.
[24] U.S. Bureau of Labor Statistics, "State and Area Employment, Hours, and Earnings, Annual estimates of number of statewide employees - Texas," http://data.bls.gov/cgi-bin/dsrv.
[25] Pennsylvania State University, College of Agricultural Sciences, Cooperative Extension, "Natural Gas Impacts: Economic Issues," December 16, 2008, http://naturalgas.extension.psu.edu/Economic.htm.

Growth in Producing Wells Increased Exponentially in the Fort Worth Basin



Source: Powell Barnett Shale Newsletter Research, 3/27/2008.

Development in the more rural Fayetteville Shale began in 2003. From 2003 to 2007, the number of drilling permits issued by regulators more than tripled each year, reaching 641 in 2007. Between January 2005 and December 2007, as the Fayetteville Shale was developed, employment in the natural resources and mining sector increased by 3200 jobs –a 50% increase—, a small number of jobs relative to the size of the Texas economy but a significant increase for the industry and for the region[26]

Leading Gas Producers

Pennsylvania's oil and gas wells are not operated by big oil companies such as ExxonMobil. Still there is significant concentration in the industry. According to DEP data, while no single company operates more than 5.5% of wells in the state (see Table 1), the top 10 producers account for almost a third of the market. And while many of the companies are long-time Pennsylvania operators, six of the top 10 are from outside Pennsylvania. In the future, there is likely to be more concentration in the industry, as larger producers best able to employ the newest horizontal drilling technology move in. Between 2007 and 2009 two companies, Atlas Resources of Pennsylvania and Exco North Coast Energy of Dallas, Texas, accounted 67% of the growth in well activity, together bringing 3,956 new wells on line over the two year period.

[26] Center for Business and Economic Research, *Projecting the Economic Impact of the Fayetteville Shale Play for 2008-2012*, Sam M. Walton College of Business, University of Arkansas, March 2008, http://arkansasedc.com/download/media/174976/fayetteville%20shale%20economic%20impact%20study%20(2008-2012).pdf.

Table 1: Top Ten Pennsylvania Oil & Gas Well Operators, January 2009[27]

Company	Headquarters	Market Share[28]	# of Wells in 2007	# of Wells in 2009	Change
Atlas Resources LLC	Moon Township, PA	5.4%	3,302	5,338	+2,036
Range Resources LLC	Fort Worth, TX	5.4%	5,190	5,313	+123
Exco North Coast Energy, Inc.	Dallas, TX	3.8%	1,792	3,712	+1,920
Snyder Bros., Inc.	Kittanning, PA	3.1%	2,902	3,069	+167
PC Exploration, Inc.	Warrendale, PA	3.0%	2,780	2,994	+214
Dominion Exploration & Production, Inc.	Richmond, VA	3.0%	2,720	2,922	+202
Seneca Resources Corp.	Houston, TX	2.7%	2,271	2,678	+407
Kriebel Minerals, Inc.	Clarion, PA	2.1%	1,899	2,082	+183
East Resources, Inc.	Vienna, WV	2.0%	1,855	1,982	+127
Belden & Blake Corp.	Houston, TX	1.8%	1,791	1,797	+6

The largest holder of leases in the Marcellus Shale is Chesapeake Energy, the nation's second-largest independent natural gas producer. Other expected major players in the development of the Marcellus Shale include Range Resources, Exco North Coast Energy, Chief Oil & Gas LLC, and East Resources.[29] Range Resources is a Fort Worth, Texas-based independent oil and gas company operating 12,000 wells in the southwestern, Gulf Coast, and Appalachian regions. They plan on focusing their natural gas development efforts in 2009 in the Barnett Shale in Texas, the Nora Field in Virginia, and the Marcellus Shale.[30] Exco North Coast Energy is a division of Dallas, Texas-based Exco Resources, a major independent oil and gas producer operating in Wyoming,

[27] Pennsylvania Department of Environmental Protection Report "OG Operators w GT 100 Active Wells Conditions," January 9, 2009, and 2007 Annual report. The Department of Environmental Protection does not differentiate between oil and gas wells in its reporting.

[28] Market share is based on reported operators in the Pennsylvania Department of Environmental Protection Report "OG Operators w GT 100 Active Wells Conditions," January 8, 2009,http://www.dep.state.pa.us/dep/deputate/minres/OILGAS/RIG09.htm. This is limited to operators with more than 100 wells in Pennsylvania.

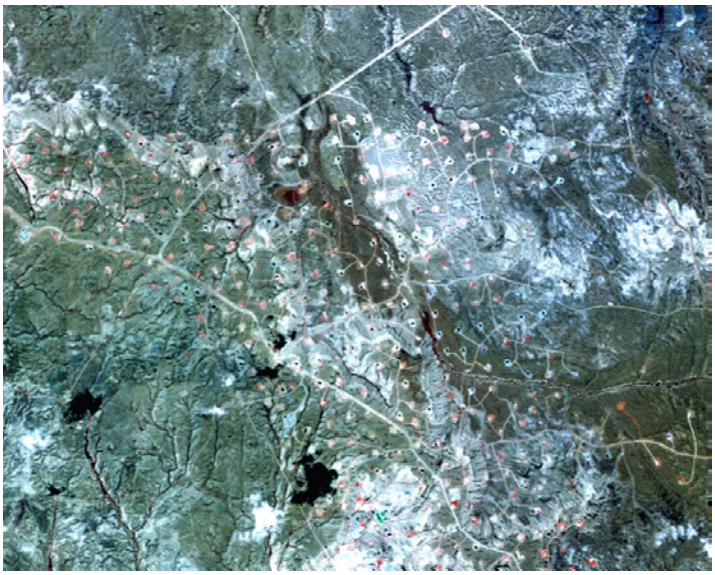
[29] Sherry Murray and Teri Ooms, *The Economic Impact of Marcellus Shale in Northeastern Pennsylvania*, Joint Urban Studies Center, May 2008.

[30] Range Resources, *2008 Annual Report*, http://www.rangeresourcesannualreport.com/.

Oklahoma, Texas, Louisiana, and the Marcellus Shale region.[31] Chief Oil & Gas is the second largest gas producer in the Barnett Shale region and has recently moved into central Utah and the Marcellus Shale region.[32] East Resources operates 2,400 oil and gas wells in Pennsylvania, West Virginia, New York, Colorado, and Wyoming; a natural gas utility in West Virginia; and a 400-mile pipeline system across Pennsylvania's Northern Tier.[33]

Natural Gas Production – Costs and Benefits

Natural gas development will likely bring jobs, investment, and money into Pennsylvania's rural communities. This is a welcome development that can help to restore once-vital communities and reverse an economic decline that goes back to the late 1970s or, in coal mining regions, to the 1950s. Development, however, will also impose additional costs on state and local governments and their taxpayers – just as it has in other states where natural gas production increased quickly. There are two types of costs governments must contend with: direct costs related to the production process, such as environmental damage and monitoring, increased spending on worker and public safety, and road maintenance; and indirect costs as a result of population growth, which include, housing infrastructure, schools, and health care. Local governments' ability to respond to these demands is made harder by the rapid rate of growth that characterizes economic booms related to mineral extraction.



Jonah gas field, Green River Valley, Wyoming, NASA/GSFC/METI/ERSDAC/JAROS and U.S./Japan ASTER Science Team http://asterweb.jpl.nasa.gov/gallery/images/gas2003-x.jpg.

Local Government Costs: Severance Taxes Help Governments Pay External Costs and Protect the Environment

Economists used the term "externalities" to classify costs generated by industry activities but not paid for by the firms and individuals enjoying the economic benefit of those activities.

Taxes are a mechanism for "internalizing" these costs by properly imposing them on the activities that produce the costs. The existing state and local tax structure fails to achieve this internalization because existing taxes will

[31] Exco Resources, "Company Profile," http://www.excoresources.com/company_history.htm.
[32] Chief Oil & Gas LLC, "History," http://www.chiefog.com/history.html.
[33] East Resources, Inc. "About Us," http://eastresourcesinc.com/east_about.html.

not produce enough additional revenue from the Marcellus Shale development to offset new costs. Instead, the costs would be imposed on society at large, not on the economic actors and activities that produce the costs associated with natural gas development.

Externalities can occur long after the economic activity ends. For example, coal mining activity in Pennsylvania peaked in 1918 and production has fallen to roughly a quarter of peak production.[34] In the course of the coal mining process, large portions of the state's water supply were exposed to pyrite, a waste material of coal production. The water reacted with the pyrite, dissolving metals into the water and significantly increasing the water's acidity.[35] Prior to 1968, there were few regulations on how mines operated around water. The legacy of this damage is huge, including 2,500 miles of streams polluted by acid mine drainage and 250,000 acres of unreclaimed surface mine land that will cost $15 billion to remediate.[36] As of 2004, roughly $270 million has been spent to address abandoned mine problems – the funds largely coming from the federal government, as many of the mine operators are long gone.

The new technology used to reach the gas in the Marcellus Shale has left a host of unresolved short-term environmental problems and long-term questions. These include questions about the safe storage and disposal of the waste water that result from the hydraulic fracturing process and questions about whether casings used to protect the water table from wells will last for 50 years or more.[37] If unforeseen problems arise, the burden falls on Pennsylvania and its citizens to address them.

Fairness and economic theory suggest a severance tax is the best way to assure that the costs created through the extraction process are borne by the producers and not left to others.

[34] According to data from the U.S. Geological Survey, 2007 coal production was 27% of the total tonnage mined in 1918. Historical data can be found here: http://pubs.usgs.gov/of/1997/of97-447/Appalachian.htm.
[35] Pennsylvania Department of Environmental Protection, *The Science of Acid Mine Drainage and Passive Treatment*, accessed January 16, 2009, http://www.depweb.state.pa.us/abandonedminerec/cwp/view.asp?a=1480&q=457768.
[36] Pennsylvania Department of Environmental Protection, Bureau of Abandoned Mine Reclamation, *Pennsylvania's Abandoned Mines: Problems and Solutions*, accessed January 16, 2009, http://www.depweb.state.pa.us/abandonedminerec/cwp/view.asp?a=1306&q=458069.
[37] Don Hopey, "State concerned about waste water from new gas wells," *Pittsburgh Post-Gazette*, December 21, 2008, http://www.post-gazette.com/pg/08356/936646-113.stm.

Photo of Jonah II Gas Field, Upper Green River Basin, Wyoming by Peter Aengst
http://www.uppergreen.org/gallery/map_large.php?print_id=5.

Environmental Risks and Environmental Protection Costs

The Pennsylvania Department of Environmental Protection (DEP) is the primary regulator of natural gas drilling in Pennsylvania. The DEP works in concert with several other regulatory agencies, primarily the Pennsylvania Fish and Boat Commission, the Delaware and Susquehanna River Basin Commissions, county conservation districts, and the U.S. Fish and Wildlife Service.

Drilling permits issued by the DEP are the primary vehicle to ensure compliance with environmental protection laws and regulations and to minimize environmental degradation. Natural gas producers must secure permits before drilling and detail their plans for well locations, water withdrawal, waste-water treatment, and erosion control.[38] As a result, permits seeking to drill exclusively in the Marcellus Shale are taking more time to process than permits for shallow-well drilling. The number of oil and gas well permit applications has increased substantially, from 2,000 to 8,000 per year between 1999 and 2008. In November 2008, the DEP reported that 566 Marcellus Shale applications had been approved since 2005, with 108 being approved since August 2008.[39]

[38] John Hanger, *Testimony before the Senate Majority Policy Committee*, November 18, 2008, http://jakecorman.com/pages/committee/111808/hanger-111808.pdf.
[39] John Hanger, *Testimony before the Senate Majority Policy Committee*, November 18, 2008, http://jakecorman.com/pages/committee/111808/hanger-111808.pdf.

New gas production activity will have an unavoidable negative impact on the environment. The construction of the well, pipelines, and access roads will temporarily degrade surface water quality (in streams) due to increased surface erosion. Without regulation of this surface erosion, the building of well infrastructure can permanently change surface water runoff patterns, altering the amount of water flowing in streams and changing the stream ecosystem. Surface erosion can also remove fertile topsoil from agricultural lands, reducing future soil productivity. The construction will fragment and disrupt natural habitat, causing localized declines in plant and animal populations.[40]

To prevent some of the issues resulting from soil erosion, the DEP is requiring drilling operations of five acres or larger to file for an erosion and sediment control permit. This requires drillers to create a plan for how they will control erosion, which must be approved by the local county conservation district. This aspect of the Marcellus Shale permitting process has been particularly contentious with drillers, as the Pennsylvania requirements are more stringent than nationwide standards.[41]

Both permitting and monitoring for compliance with environmental regulations impose substantial new costs on state and local government. In 2008 producers were pressing for the DEP to hire staff to accelerate the permit process. New staff will be necessary to monitor thousands of new wells that come on line and operate for 30 or 40 years, a cost that is currently born by state and local taxpayers. State government employment rolls have been shrinking and without new revenue it will be difficult for DEP to completely and fully monitor both existing shallow and new deep wells for compliance with environmental regulation.

The Marcellus Shale region coincides with some of Pennsylvania's most pristine rural regions that host hunters and sports fishermen. Natural gas well development spoils the scenic vistas and the heavy truck traffic required to remove wastewater, coupled with the noise and lights from these 24 hour operations, will undermine Pennsylvania's investment in building the tourism upon which rural communities increasingly rely.

Groundwater Contamination is a Serious Concern

The typical horizontal well requires approximately 5 million gallons of water, which is mixed with sand and other chemicals and injected into the well to fracture the shale.[42] While the chemicals are a small portion of the overall mixture, less than 0.5% by weight, a well using 2 million gallons of water may require 80,000 pounds of chemicals.[43] Wastewater must then be disposed of in a sound manner and, if mishandled, could be introduced into the environment.

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[40] New York State Department of Environmental Conservation, *Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*, Chapter 19, 1992, http://www.dec.ny.gov/docs/materials_minerals_pdf/dgeisv2ch19.pdf.

[41] John Hanger, *Testimony before the Senate Majority Policy Committee*, November 18, 2008, http://jakecorman.com/pages/committee/111808/hanger-111808.pdf.

[42] Pennsylvania Department of Environmental Protection, "Marcellus Shale," 0100-FS-DEP4217, November 2008, www.dep.state.pa.us/dep/deputate/minres/oilgas/new_forms/**marcellus**/0100-FS-DEP4217%20**Marcellus**%20**Shale**1.pdf.

[43] Jennifer Goldman & Lisa Sumi, *Hydraulic Fracturing Facts*, Earthworks, February 2, 2009, http://www.earthworksaction.org/publications.cfm?pubID=383.

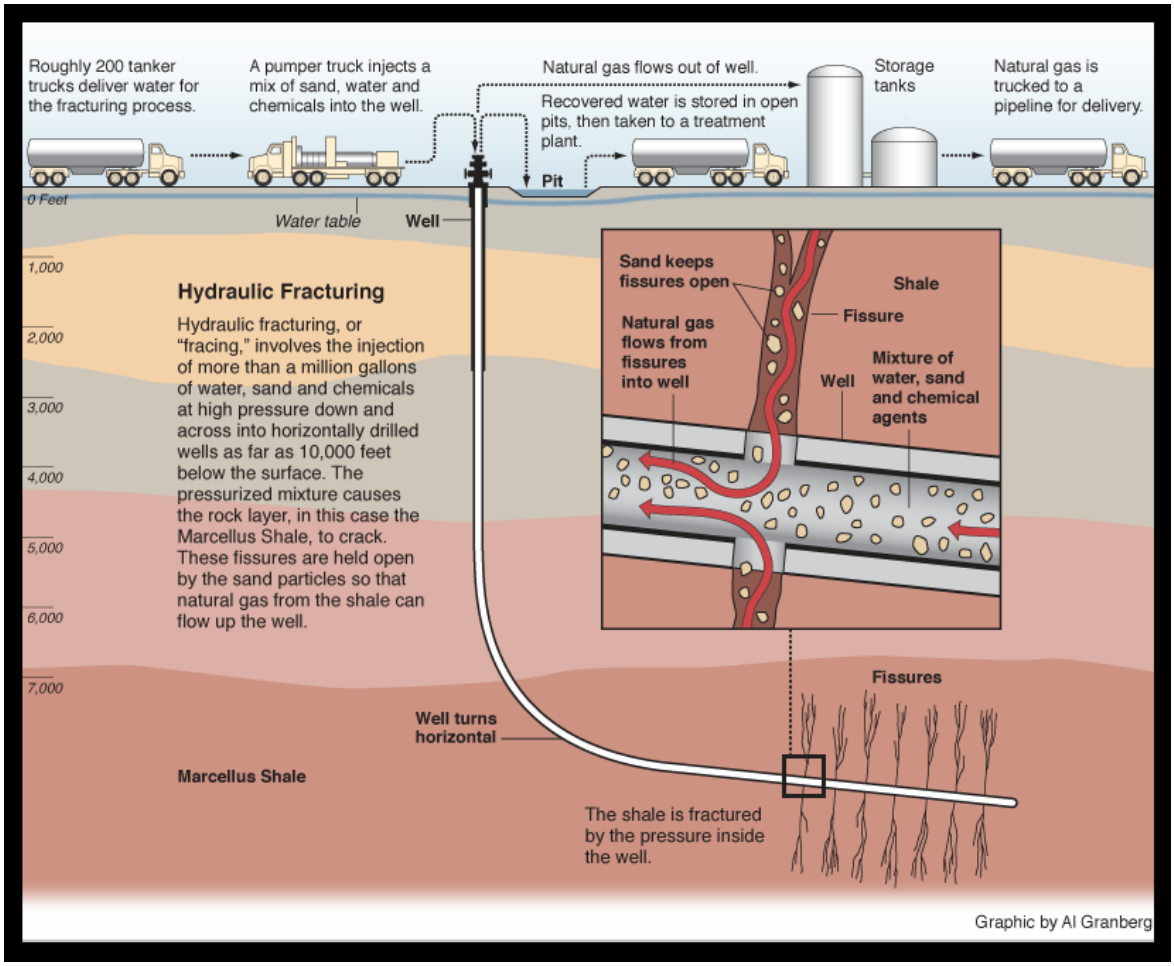
The DEP requires that drillers insert a steel or concrete casing for the portion of a well that passes through layers of rock containing groundwater to protect against contamination.[44] Still, the creation of new fractures in the shale may allow previously trapped materials to rise closer to the surface, possibly endangering groundwater supplies and changing groundwater patterns.[45]

Once the water has been used to fracture the shale, it contains the fracturing chemicals, brine, hydrocarbons, and other trace minerals (including potentially dangerous metals) found in the rock.[46] According to a marketing manager at GE Water & Processes Technologies, which develops filtering technologies used to clean the water, "the Marcellus water is the worst water on the planet."[47]

. . . the Marcellus water is the worst water on the planet.

Mark Wilson, a marketing manager with GE Water & Process Technologies

[44] Pennsylvania Department of Environmental Protection, *Drilling for Natural Gas in the Marcellus Shale Formation: Frequently Asked Questions*, http://www.dep.state.pa.us/dep/DEPUTATE/MINRES/OILGAS/new_forms/Marcellus/MarcellusFAQ.pdf.
[45] Ben Cramer, *Natural gas causes as many problems as it solves*, Sierra Club – Pennsylvania Chapter, August 2008, http://pennsylvania.sierraclub.org/PA_Chapter_2008/Conservation/Energy/Threats-from-increased-gas-consumption.html.
[46] Michael Brownell, *Gas Well Drilling and Development - Marcellus Shale*, Presentation by the Susquehanna River Basin Commission, June 12, 2008 Commission Meeting Elmira, New York, http://www.srbc.net/whatsnew/docs/Marcellusshale61208ppt.PDF.
[47] Laura Legere, "Natural gas drillers facing Ocean-size problem – millions of gallons of wastewater," *The Times-Tribune* (Scranton), August 25, 2008, http://www.thetimes-tribune.com/articles/2008/08/25/news/sc_times_trib.20080825.a.pg1.tt25water_s1.1882104_top2.txt.



Graphic courtesy of Pro Publica, Inc. (http://www.propublica.org/special/hydraulic-fracturing)

Waste water, also called "frac water", is often collected in settling ponds next to the drilling platforms prior to being treated. While the ponds are lined, there remains a risk that the waste water could leak, contaminating the soil beneath and possibly entering the water supply. The severity of the contamination depends on the amount of liquid spilled and the types of chemicals used in the hydraulic fracturing process. The open pits also pose a danger to livestock and wildlife, if the waste water is ingested.[48]

In Texas, waste water is pumped directly into the ground for disposal. In order to protect Pennsylvania's groundwater supplies, waste water used in Pennsylvania drilling will need to be treated. Drillers need to state how they plan to deal with waste water in their drilling application. Information that must be provided in the application includes the temporary method of waste water storage (tank or open pit), the location of the water

[48] New York State Department of Environmental Conservation, *Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*, Chapter 16, 1992, http://www.dec.ny.gov/docs/materials_minerals_pdf/dgeisv2ch16.pdf.

treatment facility, the method of water treatment, and the plans for reintroduction of the treated water back into the water supply.[49]

Pennsylvania has only five facilities capable of handling the waste water produced by hydraulic fracturing.[50] Traditional sewage treatment plants are generally not equipped to handle massive amounts of this type of waste water, but have been called to do so as more specialized plants are being built.

In October 2008, the DEP forced nine traditional treatment plants in southwestern Pennsylvania to reduce the amount of oil and gas waste water processed to 1% of the total volume, as levels of dissolved solids rose above the maximum water quality standard. While these solids are not considered a threat to human health, they do affect the taste of water and can interfere in industrial processes requiring very clean water, such as steel production.[51]

Processing wastewater may be economically viable for some Pennsylvania wastewater plants, although it creates significant challenges for municipal sewer authorities. The high chloride concentration in the frac water could destroy the biological agents used to process municipal waste, putting the whole system into imbalance. Many plants are unable to process the wastewater to meet DEP standards and can't afford the investment to upgrade. Some wastewater plants might be able to treat frac water and sell the partially-treated water back to the producer for reuse, creating a new revenue stream that could help keep residential sewer rates low.

One problem is that the industry has been reluctant to share the composition of its frac water, which makes environmental enforcement very difficult. DEP wants to require wastewater manifests to list all of the chemical present but has not gotten agreement from industry to share the amount of chemicals in the water. This makes treatment difficult and poses greater risk to the plan and the environment.[52]

Drilling in the Marcellus Shale has the potential to threaten drinking water in Southeastern Pennsylvania counties. Fully half the source for Philadelphia's drinking water is underlain by the Marcellus. Philadelphia water officials, while expressing confidence in DEP ability to protect natural resources through the regulatory system, claim that existing regulations relating to site restoration are inadequate to protect Philadelphia's water supply. State regulations do not require sites be restored to their pre-drilling condition, and leave the exact details of site restoration to the land owners and the gas drillers.

According to Pennsylvania's Stormwater Best Practices Manual, once sites are cleared and drilling operations are completed, soil compaction will limit forest re-growth. The use of heavy construction equipment can compact soil so significantly that the soil bulk density of lawn soil approaches the bulk density of concrete. The result is a

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[49] John Hanger, *Testimony before the Senate Majority Policy Committee*, November 18, 2008, http://jakecorman.com/pages/committee/111808/hanger-111808.pdf.

[50] Laura Legere, "Natural gas drillers facing Ocean-size problem – millions of gallons of wastewater," *The Times-Tribune* (Scranton), August 25, 2008, http://www.thetimes-tribune.com/articles/2008/08/25/news/sc_times_trib.20080825.a.pg1.tt25water_s1.1882104_top2.txt.

[51] Pam Kasey, "Pa. Sewage Plants Ordered to Refuse Gas Well Drilling Water," *The State Journal* (Charleston, WV), November 13, 2008, http://www.statejournal.com/story.cfm?func=viewstory&storyid=46862.

[52] Telephone interview with John Brosious, Pennsylvania Municipal Authorities Association, April 25, 2009.

surface that is functionally impervious because the water absorbing capacity of the soil is so altered and reduced.[53]

The Marcellus Shale drilling sites will use similar heavy construction equipment and have significant heavy-truck traffic, according to Philadelphia officials.[54]

Officials have advocated for a more comprehensive approach to site restoration. "Without this, there can be long term degradation of water quality due to forest clearing and soil compaction."[55]

The concerns of Pennsylvania are not unique. In New York State, the Marcellus Shale extends underneath the Catskills Mountains – which contain the untreated water source for New York City. A number of New York City elected officials have called for a drilling moratorium in this area to protect the water supply. While no permit applications have been filed for drilling in the watershed area, the state's environmental regulator, the Department of Environmental Conservation (DEC) has pledged not to rush into opening the area for development.

At a public hearing in New York City in September 2008, the DEC Commissioner said, "We are in a position where we can conduct the careful and deliberate public process we believe necessary to examine potential environmental impacts of horizontal drilling in this formation, and take the appropriate regulatory actions to continue to ensure that gas drilling in New York State, including drilling in the New York City watershed, is conducted in an environmentally sound way, without risk to surface water or groundwater."[56]

Competition for Water

Water in the drilling process competes with other preexisting uses, such as municipal water supplies, homeowner wells, agricultural activities, and supplying natural surface water basins (streams and lakes). The Delaware and Susquehanna River Basin Commissions are required to analyze water withdrawals from the watersheds they oversee. The two commissions work with the DEP to determine the impact of prospective wells on the local water supply – as well as the cumulative impact of all wells on the overall water supply – to ensure that adequate resources are maintained for other uses.

DEP and the two river basin commissions require a withdrawal application for every project that involves Marcellus Shale, regardless of the size of the withdrawal and this approval is necessary in order to meet the DEP permit requirements to drill. In the Ohio and the Potomac river basins, which have no river basin commission, DEP requires projects to follow the SRBC model and get withdrawal approval from DEP to meet permit requirements. A drought could be invoked to stop withdrawals, and at times the SRBC instructs a company to withdraw from a different stream in the case of a potential overwithdrawl.

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[53] Pennsylvania Stormwater Best Management Practices Manual

[54] Testimony of Howard M. Neukrug, P.E, Director, Office of Watersheds, City of Philadelphia Water Department, before the House Environmental Resources and Energy Committee, March, 2009

[55] Ibid

56 New York State Department of Environmental Conservation, Commissioner's Testimony at NYC Council Hearing on Natural Gas Drilling in the New York City Drinking Water Watershed, September 10, 2008 http://www.dec.ny.gov/energy/46795.html.

Drilling Places New Demands on Local Communities

One of the biggest concerns of local government officials is the impact of gas drilling on local roads and bridges. Some of the equipment used to drill natural gas wells weighs over 100 tons, far in excess of the weight limits of many rural roads and bridges.[57] The movement of drilling equipment from site to site puts significant stress on local infrastructure. The heavy truck traffic continues through the gas production process. Many of the wells have no on-site water source for the hydraulic fracturing process which requires huge volumes of water. Much of the water must be trucked in and waste water must be trucked out of the well site. Estimates regarding the number of truck trips per well range from 350 to 1,000 per well.[58] While the final access roads will be built by the production companies, much of the journey of this water from its source to the well will be on public roads – as the Marcellus Shale is located in some of the more rural parts of Pennsylvania, these public roads were often not designed for this level of truck traffic.

Local governments can require drillers to post bonds of up to $12,000 per road mile to help pay for damage caused to local roads. However, this amount has not been adjusted in 30 years and falls very short of the actual cost to replace a roadway (in excess of $100,000 per road mile).[59] Truck traffic from a well site is not limited to the municipality where the site is located. In these other municipalities, it can be difficult to get drillers to post road bonds. In any case, when damage to the roads exceeds the bond amount, the cost of fixing roads and bridges gets shifted to taxpayers – likely resulting in higher property taxes.

Heavy Truck carrying natural gas waste water on a rural Pennsylvania road

Courtesy of Donnan.com

Drilling operations place demands on public safety services which are paid for by local communities. From fire protection to help combat well fires (which is often provided by volunteer fire companies) to police protection (responding to traffic accidents, protecting property and residents), to emergency services (providing emergency responders to deal with drilling accidents or spills), local governments will find their capabilities stretched as drilling activity increases. These services are often provided without charge to the user.

In September 2008, a natural gas well fire in rural Clinton County illustrates some of the demands placed on local emergency responders. The Kettle Creek Fire Company and Ambulance Company were the first to responds on the scene. Fighting the fire required the coordination of efforts from Clinton County Emergency

[57] Jill Ercolino, "Riding out the rush for riches," *PA Township News*, June 2008, http://jakecorman.com/pages/committee/111808/herr-2.pdf.

[58] Michele Rogers, et al., *Marcellus Shale: What Local Government Officials Need to Know*, Penn State College of Agricultural Sciences, Agricultural Research and Cooperative Extension, 2008.

[59] Elam Herr, "Testimony by the Pennsylvania State Association of Township Supervisors before the Senate Majority Policy Committee on Marcellus Shale Exploration," Dallas, PA, November 18, 2008.

Services, the Pennsylvania State Police, the Federal Aviation Administration (to restrict the airspace around the fire), in addition to the specialized company-hired firefighters.[60]

To help reshape the local labor force to the requirements of the natural gas industry, local education institutions will need to develop new training programs for adults, as well as provide classroom facilities and instruction for the children of new residents.

County government, itself, plays a vital function in the exploration of natural gas, as it records the ownership of surface and subsurface rights. The demands placed on local recorder of deeds offices have pushed these systems to their limits as producers search county records for available properties to develop.[61]

Social Impact

The experience of other states suggest that natural gas drilling may lead to large increases in population growth in certain communities that local governments in smaller and more rural communities are ill equipped to handle. Sociologists have even coined a term, "the Gillette Syndrome," named after the town of Gillette, Wyoming, to describe the social dysfunction that can occur in oil and gas producing towns. [62]

As the drilling operations progress, there will be a demand for specialized labor that exceeds the local supply. This will likely bring higher wages and an influx of workers possessing the needed skills from other areas.[63] The influx of a transient workforce and higher industry wages can affect local retail inventories and housing stock and can lead to inflation in both. Long-term residents are often unable or unwilling to pay for increased costs for infrastructure and government services.

The literature finds that economic benefits are often overstated and not equitably shared. Communities incurring the costs may not necessarily be the ones deriving additional revenue from the activity. Gilmore has described four distinct stages of local government response to a mineral boom:

1. Enthusiasm (positive response to potential economic growth)
2. Uncertainty (development starts to occur, accompanied by some of the negative aspects of development - changing the town)
3. Near panic (rapid change in the community, government unable to meet new needs, anger among residents)

[60] Jim Runkle, "Police set restrictions at gas well fire," Lock Haven Express, September 19, 2008, http://www.lockhaven.com/page/content.detail/id/505648.html.
[61] Douglas E. Hill, *Testimony on Marcellus Shale Exploration Issues, presented to the Senate Majority Policy Committee*, County Commissioners Association of Pennsylvania, November 18, 2008.
[62] James Kelly, William Rademaekers, and Richard Woodbury, "Rocky Mountain High," Time Magazine, December 15, 1980, http://www.time.com/time/magazine/article/0,9171,922203-8,00.html.
[63] Michele Rogers, et al., *Marcellus Shale: What Local Government Officials Need to Know*, Penn State College of Agricultural Sciences, Agricultural Research and Cooperative Extension, 2008.

4. Adaptation (where the major problems are identified and plans to address the needs are formulated, and progress overcomes problems created by the development).[64]

Some Pennsylvania communities are already exhibiting the classic signs of the boom economy. Hotel tax revenue in Bradford county was at its highest ever in 2008, 20% higher than 2007, as a result of housing for what is now a transient gas workforce. County officials have expressed concerns about increased demand on the criminal justice system and on social services budgets that are already under strain because of the recession.[65]

History makes a powerful case for slower, more deliberate growth and for establishing clear regulatory authority and tax structures to account for the costs.

BOOM AND GROWING PAINS IN A WYOMING NATURAL GAS COUNTY

While not from shale deposit, Sublette County in Wyoming is also going through a boom in natural gas development – and some growing pains, as well.[66] Its experience could provide some insight into the types of issues in store for rural Pennsylvania communities as Marcellus Shale gas is developed. [67]

As the number of gas wells drilled per year exploded from 100 in 2000 to more than 500 in 2007, the population in Sublette County swelled by 24%. During that same period, Wyoming's population grew by just 4%, indicating that workers and their families were flocking to the area to meet the new labor demands. The largest increase in population came from teens and younger adults, aged 15 to 24, followed by adults aged 25 to 44. Driven by the high wages of workers in the mining sector and their increased demand for goods and services, local prices increased by twice the national rate over the six-year study period.

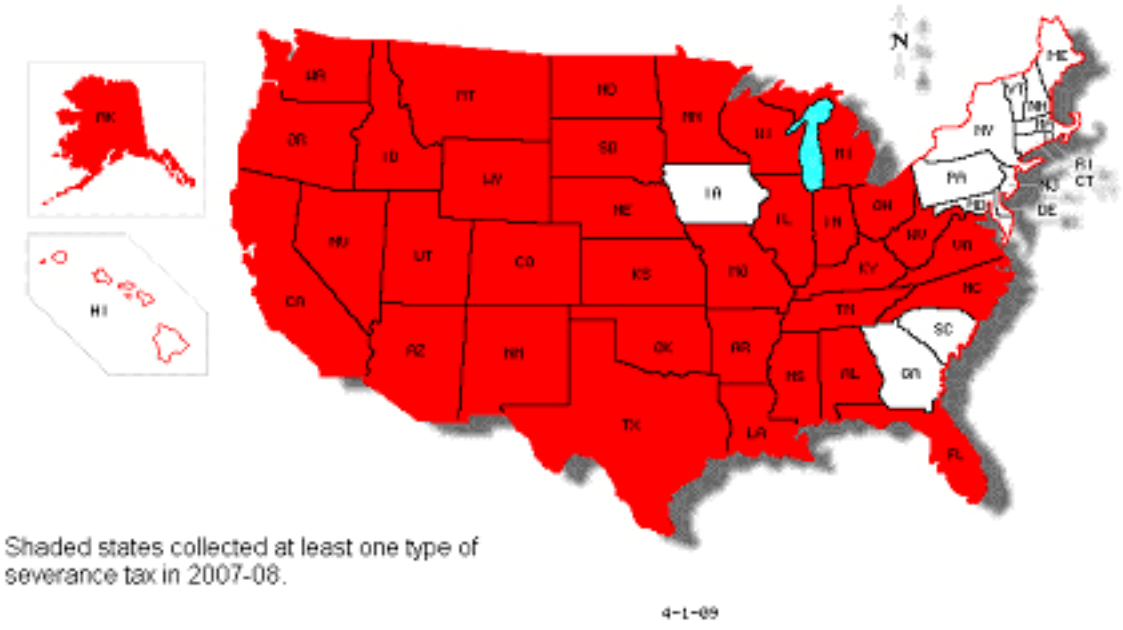
Local services were strained as the area worked to catch up with this rapid development. School districts in the county scrambled for classroom space as the number of students and staff increased. Traffic on major roads in the county increased, as did the number of traffic accidents, likely due to the new drilling activity and new residents. Other documented increases occurred in emergency response runs, building permit applications, and arrests.[68]

[64] Jeffrey Jacquet, "Wyoming Boomtowns: Local government impacts & natural gas drilling," Presentation for the Natural Gas Drilling and Local Government Workshop, Penn State University, November 18, 2008.
[65] Mark W. Smith, Bradford County Commissioners Office, Testimony before the State Senate Policy Committee, April 9, 2009.
[66] Michele Rogers, et al., *Marcellus Shale: What Local Government Officials Need to Know*, Penn State College of Agricultural Sciences, Agricultural Research and Cooperative Extension, 2008.
[67] Jeffrey Jacquet, *Energy Boomtowns & Natural Gas: Implications for Marcellus Shale Local Governments & Rural Communities*, NERCRD Rural Development Paper No. 43, The Northeast Regional Center for Rural Development, The Pennsylvania State University, University Park, PA, January 2009, http://nercrd.psu.edu/Publications/rdppapers/rdp43.pdf.
[68] Ecosystem Research Group, Sublette County Socioeconomic Impact Study, Phase I Final Report, January 2008, http://www.ecosystemrg.com/sublette/08-01-28%20Final%20Report.pdf.

Understanding Extraction or Severance Taxes

A severance tax is a charge imposed by a government on the extraction of resources from the earth. In most states with a severance tax, the tax applies to non-renewable resources (like coal, stone, oil, and natural gas), but it can also include renewable resources like timber or fish.

Mineral-rich states across the country have adopted severance taxes to help offset the external costs imposed on their states by the resource extraction industry. According to the U.S. Census, 35 states collect some type of severance tax, with 27 taxing natural gas production.[69] Despite its mineral riches and its long history of natural resource extraction, Pennsylvania has no severance tax.



Source. U.S. Census, Quarterly *Summary of State and Local Government Tax Revenue*.

[69] The number of states with severance taxes taken from the U.S. Census Bureau's *Quarterly Summary of State and Local Government Tax Revenue*, Table 3: Quarterly summary of state government tax collections by state and by detailed tax item, 2007Q3 to 2008Q2, http://www.census.gov/govs/www/qtax.html. The number of states with taxes on natural gas extraction is determined using a list of severance taxes by state published by the National Conference of State Legislatures and a review of individual state taxation department websites.

Severance Taxes are a Significant Revenue Source for State and Local Governments

The 35 states that collect severance taxes received a total of $16.7 billion in severance tax revenue in 2007-08. The severance tax can represent a minor fraction of the total taxes collected or a major revenue source, for example representing 77% of state revenue in Alaska.[70] On average, those states with a severance tax received 3.1% of their total tax revenue from severance taxes in 2007-08.

States use severance tax revenue for a variety of purposes. Most states use a portion of the revenue for general government operations. Others earmark a portion of the tax revenue for specific purposes, such as education or conservation projects.

Ten states direct funds for environmental cleanup or conservation (California, Colorado, Florida, Louisiana, Montana, New Mexico, Ohio, Oklahoma, West Virginia, and Wyoming).[71] Ohio uses approximately two-thirds of its coal severance tax (at $0.24 per ton) for mine remediation and reclamation.[72]

Eight states use severance tax dollars to aid public schools (Minnesota, Montana, Nebraska, North Dakota, Oklahoma, Oregon, Texas, and Utah).[73]

Several western states put a portion of their severance tax revenues into a permanent fund, including, Alaska, New Mexico, and Wyoming.

Alaska sets aside approximately 11% of the proceeds it receives from oil and gas companies into the Alaska Permanent Fund. As of 2007, the fund had grown to more than $40 billion.[74] New Mexico transfers approximately 12.5% of its severance tax to its Severance Tax Permanent Fund. This fund, in turn, transfers 4.7% of its five-year average balance to the state's General Fund.[75] Wyoming earmarks 1.5% of its severance tax collections for the Permanent Wyoming Mineral Trust Fund.[76]

The permanent funds were created to give the state an alternate revenue source once the finite energy resources are exhausted and severance taxes revenue declines. As the name implies, the balance of the permanent fund (or corpus) cannot be spent. However, the earnings from the fund are used for various purposes, including:

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[70] Author's calculations based on the U.S. Census Bureau's *Quarterly Summary of State and Local Government Tax Revenue*, Table 3: Quarterly summary of state government tax collections by state and by detailed tax item, 2007Q3 to 2008Q2, http://www.census.gov/govs/www/qtax.html.
[71] Judy Zelio and Lisa Houlihan, *State Energy Revenues Update*, National Conference of State Legislatures, June 2008, http://www.ncsl.org/programs/fiscal/severtax05.htm.
[72] Ohio Department of Taxation, *Severance Tax*, 2007, http://www.tax.ohio.gov/divisions/communications/publications/annual_reports/2007_Annual_Report/severance_tax_07.pdf.
[73] Judy Zelio and Lisa Houlihan, *State Energy Revenues Update*, National Conference of State Legislatures, June 2008, http://www.ncsl.org/programs/fiscal/severtax05.htm.
[74] Sovereign Wealth Funds Institute, http://www.swfinstitute.org/swf.php.
[75] New Mexico, State Investment Council, http://www.sic.state.nm.us/severance.htm.
[76] Sovereign Wealth Funds Institute, http://www.swfinstitute.org/swf.php.

- Current operating costs (Alaska and Wyoming),
- Bond repayments (New Mexico),
- Reinvestment in the permanent fund (Alaska and Wyoming),
- Dividends to citizens (Alaska)[77]

Most States Share Severance Tax Revenue with Local Governments

Fifteen states share a portion of their collected severance taxes with local governments. Those states are Colorado, Florida, Kansas, Kentucky, Louisiana, Mississippi, Montana, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Tennessee, West Virginia, and Wyoming.[78] The state-local split varies widely. For example, Colorado transfers half of its severance tax collections to local governments, but collections are low due to the structure of their tax.[79] Montana uses a complex formula and funding structure to allocate 46% of its tax from oil and gas extraction to local governments.[80]

Kentucky transfers half of its coal severance tax collections to counties for economic development projects (35% of the total) and direct economic assistance (15% of the total tax). Two-thirds of the economic development funds are apportioned to counties based on their production activity, and the final third goes into a state-wide pool. Ninety percent of the direct economic assistance goes to the counties where the coal is produced, with 30% of these funds earmarked for coal road repair.[81]

Neighboring West Virginia transfers about 6% of its severance tax collections to counties ($24 million in 2006). Seventy-five percent goes to coal-producing counties, and the remaining 25% is divided based on population across the state.[82]

How Are Severance Taxes Structured?

Severance taxes on natural gas are levied in one of two ways. The tax rate can be levied based on volume, such as $1 per thousand cubic feet. This form of tax on natural gas or oil is commonly called a wellhead tax. Conversely, severance taxes can be levied as a percentage of the price of the resource, such as 5% of the selling price of natural gas. This type of tax is often called a fixed-rate tax. Some states, such as West Virginia, structure

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[77] Don Richards, *Permanent Mineral Trust Funds: Wyoming, New Mexico, and Alaska*, Wyoming Legislative Service Office, October 19, 2004.
[78] Judy Zelio and Lisa Houlihan, *State Energy Revenues Update*, National Conference of State Legislatures, June 2008, http://www.ncsl.org/programs/fiscal/severtax.htm.
79 Gargi Chakrabarty, "Severance tax overhaul considered," *Rocky Mountain News*, January 17, 2007, http://www.rockymountainnews.com/drmn/energy/article/0,2777,DRMN_23914_5284162,00.html.
[80] North Dakota Legislative Council, *Oil-producing states' funding allocation to political subdivisions*, October 2008, http://www.legis.nd.gov/assembly/60-2007/docs/pdf/99450.pdf.
[81] Kentuckians for the Commonwealth, *Understanding Kentucky's Coal Severance Tax Fund*, accessed January 17, 2009, http://www.kftc.org/our-work/tax-justice/high-road/coal-severance-tax.
[82] Beth Gorczyca Ryan, "Coal taxes support communities Across West Virginia," *The State Journal*, Charleston, West Virginia, February 22, 2007, http://www.statejournal.com/story.cfm?func=viewstory&storyid=20383.

their tax to include both components. Pennsylvania's proposed tax includes both a wellhead tax and a fixed-rate tax.

Both tax types are relatively simple for producers and tax administrators, as volume and price data are collected at the time of sale.

An example of a volume tax is the gasoline tax. While volume-based taxes are predictable if demand is steady, they fail to keep up with increasing prices and have no logical connection to the economic benefit received by the producer for the sale.[83]

A fixed rate-based tax is like a sales tax, where the amount of tax fluctuates with the price of the commodity. With an exhaustible resource like natural gas, as the resource becomes scarcer, its price is likely to rise. A sales price-based tax would better capture this increase of value. Conversely, the producer pays a lower amount of tax if prices fall.

A study comparing sales price-based and per-unit tax rates on oil and natural gas in Oklahoma showed that sales price-based rates produced higher long-term revenue growth than per-unit tax rates.[84] Sales price-based taxes are also relatively easy to compute and administer. However, tax revenue is less predictable as prices can vary over time.

Most states that levy a severance tax on natural gas use a sales price-based rate. Only four of the 27 states with natural gas severance taxes use per-unit rates exclusively. Tax rates of the largest 15 producers of natural gas are listed in Table 2 and range from 2% to 9.5% for taxes based on price.

Most states with severance taxes also have other corporate taxes. Of the 15 top gas producing states, all but one, Wyoming, have corporate income or franchise taxes.

[83] The first issue can be seen in the state's liquid fuels tax on gasoline, which is levied on a per gallon basis. Even as gasoline prices rise, the state gets the same revenue per gallon. In fact, consumers react to increasing fuel prices by reducing usage and buying vehicles with better mileage. This generates less and less money each year, limiting the amount available for road repair.

[84] Kent Olson and James Kleckley, "Severance Tax Stability," *National Tax Journal*, Vol. XLII, No. 1 (March 1989), p. 69-78.

Table 2. Severance Tax Rates and Corporate Taxes in the Top 15 Natural Gas Producing States.

Rank	State	2007 Natural Gas Production	Current Severance Tax Rate	Corporate Taxes
1	Texas	6,091,724	7.5% of market value of gas produced	Franchise Tax*
2	Wyoming	1,923,224	6% of taxable value (gross sales minus certain processing and transportation costs)	No
3	Oklahoma	1,744,393	7% of average monthly price of gas plus 0.095% excise tax	Income Tax
4	New Mexico	1,544,830	8.67-9.5%, depending on county and school district[85]	Income Tax
5	Louisiana	1,363,538	$0.269 per MCF[86]	Income Tax
6	Colorado	1,242,571	2% to 5% based on gross income	Income Tax*
7	Alaska	433,485	25% to 50% of net income	Income Tax*
8	Utah	376,409	5% when gas over $1.50 MCF	Income Tax*
9	Kansas	365,877	4.33%	Income Tax*
10	California	307,160	Conservation fee of $0.0079076 per MCF [87]	Income Tax*
11	Alabama	270,407	8%	Income Tax
12	Arkansas	269,886	5%	Income Tax
13	Michigan	264,907	5.75%	Income Tax*
14	West Virginia	231,184	5% + $0.047 per MCF	Income Tax*
15	Pennsylvania	182,277	None	Income Tax

Sources: U.S. Energy Information Administration and state tax department websites.

*- Indicates that the state uses combined reporting for corporate taxation.

[85] New Mexico levies several different severance taxes on natural gas. This is an approximation of the combined rate.
[86] MCF stands for thousand cubic feet.
[87] California levies no general severance tax on oil and natural gas. This listed tax is a conservation fee levied by the California Department of Conservation to offset its operating costs.

Pennsylvania's Proposed Severance Tax

In his 2009-10 Governor's Executive Budget, Governor Rendell proposed enacting a severance tax on natural gas production effective October 1, 2009. This tax would be levied using the same rates as West Virginia – a combination of 5% of the value of the natural gas at the wellhead and $0.047 per thousand cubic feet of production. The administration estimated that this levy would produce $107 million in 2009-10 with gas at $6.40 per MCF,, with collections steadily increasing to $632 million by 2013-14, based on increased development of the Marcellus Shale and gradual increases in the price of natural gas.[88] Proceeds from the tax are proposed to go exclusively to the state's General Fund.

Governor Rendell did not propose applying the severance tax to other minerals, such as oil and coal. Had these resources been included, the tax would generate significantly more revenue now than the current proposal, as these industries are more developed in Pennsylvania. As the Commonwealth is the fourth largest producer of coal in the U.S., a tax of 5% of sales price in 2007 (with no deductions) would have generated $180 million.

Pennsylvania Can Learn from Other States in Structuring a Severance Tax

A severance tax in Pennsylvania should be structured as simply as possible. Deductions and exemptions should be kept at a minimum, which would allow for easier compliance and administration. Crafting the tax law in clear, unambiguous language can eliminate loopholes that cost tax revenue and favor some companies over others.

The governor's proposal for a Pennsylvania severance tax uses rates that mirror those in West Virginia, the neighboring state with the most developed extraction industry. This eliminates tax incentives or disincentives for well development between the two states.

The experience in Arkansas illustrates what can happen when a severance tax rate is set too low. In 1957, Arkansas set its natural gas severance tax rate at 0.3 cents per thousand cubic feet of natural gas, making it the lowest rate of any state that levies a tax on natural gas.[89] This equated with approximately 0.04% of market value in 2006.[90] The Arkansas Joint Committee on Economic and Tax Policy calculated that had Texas' natural gas severance tax rate been used (7.5% of sales price), the state would have collected $99.3 million in tax revenue, rather than the $620,000 it collected.[91] Arkansas Advocates for Children and Families estimates that Arkansas lost $839 million over 25 years from setting the rate at 0.3 cents per thousand cubic feet, rather than

[88] Commonwealth of Pennsylvania, *Governor's Executive Budget, 2009-10*, General Fund Revenue Summary, February 2009.
[89] John Henry, "State's tax structure hinders gain from new gas activity," *Arkansas Business*, October 10, 2005, accessed online at http://www.redorbit.com/modules/news/tools.php?tool=print&od=293820.
[90] James Metzger, "Digging Deeper: Reforming the Arkansas Severance Tax for Working Families," Arkansas Advocates for Children and Families, *Paychecks and Politics, Issue 40:* December 2006.
[91] Bond Buyer.com, "Natural gas tax: too tiny?" *Southwest Bond-Watch*, Bondbuyer.com, October, 9, 2007, p.9.

using a 5%-of-sale-price rate.[92] After wrangling with the natural gas industry, Arkansas policymakers changed the natural gas tax rate to 5% of the sales price, less the cost of transportation, effective January 1, 2009.[93]

Several states allow specific deductions from the severance tax or rate reductions for specific types of wells. These can have a significant impact on the amount of tax collected.

As production incentives, some states reduce their tax rate for low-producing wells (often called stripper wells), highly speculative "wildcat" wells, newly drilled wells, and restarted wells.[94] While low-producing wells may be less profitable to operate at full tax rates, a tiered rate structure can make the verification of well activity significantly more complex, requiring more field tax administrators. According to Dr. Mason Gaffney, a professor of economics at the University of California, Riverside, only "the most backward systems allow low rates or exemptions for stripper wells, and perhaps for low-volume or high-cost wells."[95]

Colorado allows producers to reduce their severance tax liabilities by offering a credit for 87.5% of the local property taxes they pay. This drops their statutory tax rate by almost half. [96]

Wyoming and New Mexico allow producers to deduct some royalty and transportation costs from the selling price to get to the production value that is subject to the tax.

Alabama takes it a step further, allowing producers to deduct depreciation, return on investment, labor costs, materials, fuel costs, other taxes, insurance, administrative overhead, and transportation costs to get to the gross production value subject to the tax.[97] As a result, although the stated tax rate is high, it raises much less revenue than states with lower rates and few or no deductions.

Ambiguous legislative language can also reduce collections. Utah's law states that a producer "shall pay the state a severance tax equal to 4% of the value, at the well, of the oil or gas produced, saved, and sold or transported from the field where the substance was produced." [98] ExxonMobil had been operating wells in the state for a number of years and petitioned the state for a refund of a large portion of the tax they paid from 1993 to 1998. Despite selling the natural gas after the removal of a number of impurities, ExxonMobil claimed that they should be paying a severance tax from the sale based on the significantly lower value of the raw material found "at the well," prior to processing, even if that pre-processing raw material is rarely sold. The Utah Supreme Court sided with ExxonMobil, based on the letter of the law, but denied their refund petition,

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[92] James Metzger, p. 1.
[93] Seth Blomeley, "As tax on natural gas kicks in, intake unclear," *Arkansas Democrat Gazette*, January 1, 2009, http://www.nvanews.com/adg/News/248190/ (accessed January 5, 2009).
[94] Utah, in fact, charges no tax on these types of wells.
[95] Samuel Western, "Does Wyoming Get Enough for Its Mineral Riches? Severance Tax Reform in the Cowboy State," WyoFile.com: Wyoming Politics and Policy, February 8, 2009, http://www.wyofile.com/wyoming_mineral_severance_taxes.htm.
[96] Marc Carey and Todd Herreid*, Memorandum to Representative Kathleen Curry on Effective Severance Tax Rates*, Colorado Legislative Council Staff, November 8, 2006.
97 Alabama Department of Revenue, Oil and Gas Severance Tax Rules, 810-8-6.-.01, http://www.ador.state.al.us/severancetax/8601.html.
[98] Utah Code Ann. § 59-5-102(1)(a) (2000).

saying “large refunds of money already collected and spent would pose a great burden.” The ruling that the tax would be based on oil and gas in its natural state was applied prospectively.[99]

Why Have a Severance Tax?

Most states with significant mineral resources levy a tax on the extraction of those resources. State severance taxes compensate state residents for the extraction of valuable mineral resources.[100]

A severance tax would have substantial benefits and few drawbacks. As Pennsylvania is the only state in the nation with significant mineral wealth that does not have a severance tax it will not make Pennsylvania uncompetitive. The creation of a severance tax could compensate state and local governments for costs associated with natural gas production, provide funds to mitigate potential environmental hazards, and serve as a valuable source of revenue. The tax would be paid by oil and gas developers, many of whom are from out-of-state. Evidence from other states suggests that takes changes have little effect on well construction.

Natural Gas Produced in Pennsylvania Will Be Competitively Priced

The cost of natural gas produced in Pennsylvania will be an attractive alternative to natural gas from Texas or other regions, even with the severance tax. Pennsylvania’s proximity to the lucrative natural gas market in the Northeast will result in much lower transmission and distribution costs than gas from southern and western states. Since distribution costs represent on average 48% of the cost of natural gas to consumers, this is a tremendous price advantage, which will ensure Pennsylvania gas is competitive.[101]

The northeastern and Midwestern states are the biggest residential consumers of natural gas, which is currently imported through pipelines from places like Texas, Oklahoma, and Wyoming.[102] These consumers, including Pennsylvanians, already pay state and local taxes imposed by western producer states.

Recent studies also have shown that severance taxes in other states have had little negative impact on the development of energy resources. It seems unlikely that the experience in Pennsylvania would be uniquely different.

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[99] Justice Wilkins, ExxonMobil Corporation v. Utah State Tax Commission, 2003 UT 53, November 23, 2003.
[100] U.S. Census, *2007 Survey of State Government Finances*, November 2008 http://ftp2.census.gov/govs/statetax/07staxss.xls. Severance taxes exist on the books of two other states,
[101] Estimate of transportation costs as a portion of consumer natural gas prices taken from the U.S. Energy Information Administration, *Residential Gas Prices: What every consumer should know*, December 2008, http://www.eia.doe.gov/neic/brochure/oil_gas/rngp/index.html.
[102] U.S. Energy Information Administration, Share of Total U.S. Natural Gas Residential Deliveries, 2007, http://tonto.eia.doe.gov/dnav/ng/ng_cons_pns_a_epg0_vrp_pct_a.htm.

Most States with Severance Taxes Have Other Business Taxes, Like Pennsylvania

In most states with severance taxes, natural gas producers also pay some other business tax. Twenty-seven of the 35 states with severance taxes levy them against natural gas, as is proposed in Pennsylvania. Of these 27 states, 23 of them also have a corporate income tax. Looking at all 35 states with severance taxes, 30 levy a corporate income tax and Texas has a corporate franchise tax (Table 3).[103]

Table 3. Thirty-One States Have Severance and Corporate Taxes

Alabama	Kentucky	Ohio
Alaska	Louisiana	Oklahoma
Arizona	Michigan	Oregon
Arkansas	Minnesota	Tennessee
California	Mississippi	Texas*
Colorado	Missouri	Utah
Florida	Montana	Virginia
Idaho	Nebraska	West Virginia
Illinois	New Mexico	Wisconsin
Indiana	North Carolina	
Kansas	North Dakota	

Many Large Well Operators in Pennsylvania Don't Have to Pay Corporate Net Income Tax

Oil and gas production companies are subject to the same state taxes in Pennsylvania as other businesses. If they are set up as "regular" corporations, producers pay the 9.99% corporate net income tax on any profit they earn.[104] But a survey of Pennsylvania Department of Environmental Protection well ownership reports indicates that many of the largest well operators are established as limited liability companies or limited partnerships.[105] These types of companies pay tax on profits at the personal income tax rate, which is much lower – 3.07%.[106] The companies may also be subject to the state's capital stock and franchise tax, but this tax is scheduled to be eliminated by 2011.

[103] Author's calculations comparing states reporting severance tax collections as reported by the U.S. Census and states with corporate income taxes taken from Thomson Reuters/RIA, *2009 All States Tax Handbook*, New York, 2009.
[104] Profit or net income is income that is left over after subtracting the expenses of the business.
[105] Pennsylvania Department of Environmental Protection Report "OG Operators w GT 100 Active Wells Conditions," January 8, 2009, http://www.dep.state.pa.us/dep/deputate/minres/OILGAS/RIG09.htm.
[106] Subchapter S corporations also pay the personal income tax rate rather than the higher corporate net income tax rate. It cannot be determined from public records how many natural gas producers who are corporations are organized as S corporations.

Multi-state corporations and those that are part of vertically integrated corporate groups (which are common in the oil and natural gas business) have opportunities to legally avoid the 9.99% corporate net income tax rate. This can be done by shifting income to other states or to other companies within the group, sometimes by setting transfer prices (the prices charged when goods and services are sold by one business unit to another business unit in another state) to minimize taxable income in states with higher tax rates.

Those Who Benefit from the Resource Pay the Tax

The severance tax would be levied against the companies drilling for natural gas. These include some local producers, but much of the harvesting of natural gas will likely be done by out-of-state production companies that will come into the state, remove the natural gas, and move on to the next deposit.

As the tax would likely be passed on in the cost of the product, much of the tax would be passed on to consumers of these resources. While Pennsylvania is currently an importer of natural gas, the development of the Marcellus Shale could enable more of the natural gas to be exported to neighboring states, particularly those in the Northeast. To the extent that the tax is passed on to Pennsylvania consumers, this is likely to be more than offset by the cheaper price of Pennsylvania-produced natural gas, as transportation costs are a large portion of the final cost to consumers. Currently, natural gas consumed in Pennsylvania comes from states levying severance taxes and includes significant transportation costs.

In most instances, oil and gas production companies lease property and mineral rights from landowners and pay landowners a royalty Pennsylvania law guarantees that land owners are entitled "to at least one-eighth royalty of all oil, natural gas or gas of other designations removed," but fails to define how royalties are to be calculated.

In general, the structure of the lease agreement will determine the incidence of the tax. If a landowner signs an agreement that permits producers to deduct some of the costs associated with drilling, a portion equal to the agreed up royalty percentage may be passed on to the landowner through lower royalty payments. Under a different agreement, the tax is fully borne by the producer.[107]

This is based solely on the agreement between the producer and the landowner. Most landowners are individuals and pay the personal income tax rate of 3.07% on their royalty income.

Some academic literature suggests that severance taxes may be paid by the owner's mine and drilling companies in the short run and by royalty holders in the long run, through lower returns.[108] If this is indeed the case, the tax would not fall on working and lower-income Pennsylvanians.[109]

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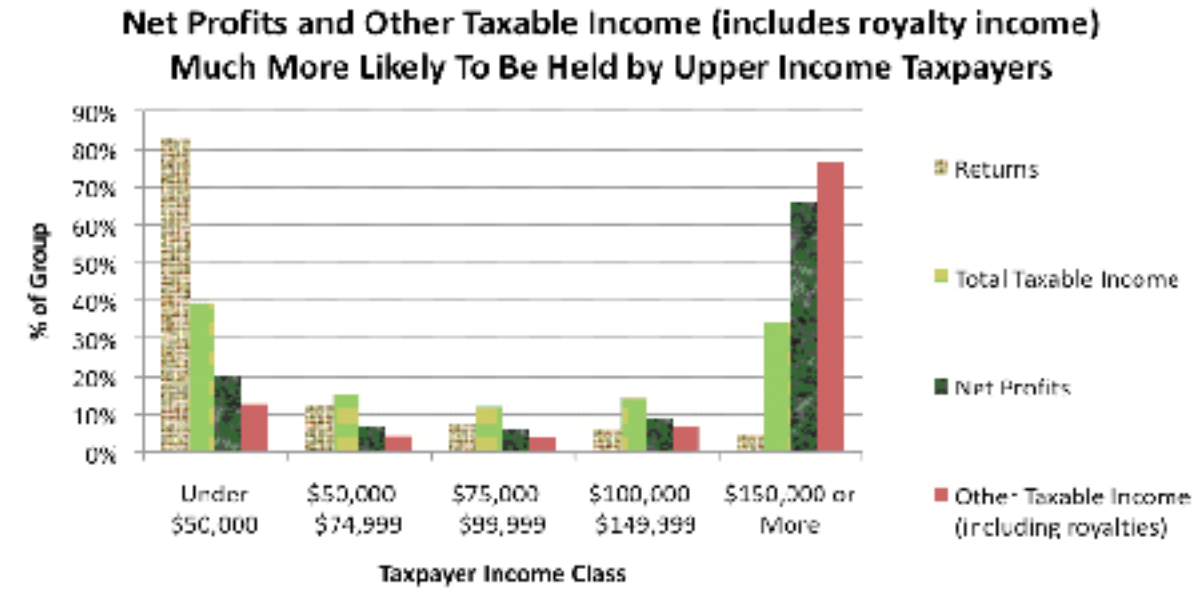
[108] Edward Ranck, "On the incidence of ad valorem severance taxes," *National Tax Journal*, Volume XXXVIII, No. 2.

[109] As can be seen in the following figure, 66% of business income and 76% of what the Pennsylvania Department of Revenue defines as "other taxable income" – which includes royalties – is held by taxpayers reporting $150,000 or more in income in 2006. This means that while most taxpayers earn less than $50,000 annually, taxpayers at the higher end of the income scale hold the lion's share of income from business and other taxable activities.



Source: Author's calculations based on Pennsylvania Department of Revenue Personal Income Tax Data

Oil and Gas Drilling Will Remain a Small Share of Overall Employment

The jobs that will be created by natural gas drilling are welcome and will help revitalize Pennsylvania's older and more rural communities. However oil and gas employment is a small share of overall state employment and is likely to remain so.

A 2008 study by the Pennsylvania Economy League pegged the contribution of the oil and natural gas industry to the state economy at $7.1 billion per year – accounting for 26,559 related jobs, $1 billion in wages, and $200 million per year in payments to landowners.[110] Oil and gas drilling activities accounted for 10,538 jobs. Using an econometric model called IMPLAN, the report claims that drilling activities indirectly added 5,260 jobs through supply chain activity (heavy equipment, iron and steel, pipelines, real estate, attorneys, cement, and machinery manufacturers). More than 40% of the jobs in the estimate, a total of 10,761 jobs, were imputed based on the consumption of those related to the industry and include employment and spending on utilities, higher education, housing, entertainment, food, and travel.

An analysis of employment data from the U.S. Bureau of Labor Statistics regarding the oil and gas extraction industry suggests that direct employment impact of the IMPLAN study may overstate the number of direct jobs by 25%, as only 7,143 jobs were accounted for in the oil and gas extraction industry as of September 2008.[111] While this figure grew by 23% from 2007, it still represents a small fraction (0.14%) of private employment in the state.

[110] Pennsylvania Economy League of Southwestern Pennsylvania, LLC, Economic Impact of the Oil and Gas Industry in Pennsylvania, November 2008, http://alleghenyconference.org/PEL/PDFs/EconomicImpactOilGasInPA1108.pdf.
[111] Flat file extraction of Pennsylvania employment data through September 2008 from the U.S. Bureau of Labor Statistics, "Quarterly Census of Employment and Wages."

If the number of workers in the oil and gas extraction industry increased by ten-fold over the course of the development of the Marcellus Shale, it would still make up less than 2% of private employment in the state.

While employment growth is important, particularly in challenging economic times, it is important to have a realistic assessment of employment claims and job growth must be balanced against the direct and indirect costs of the economic activity.

Market Price – Not Taxes – Will Drive Development of Marcellus Shale

If natural gas production were solely driven by state and local tax rates, one would think Pennsylvania would be the U.S. leader in natural gas. Thirteen of 14 states that currently produce more natural gas than Pennsylvania levy a state severance tax on gas production. All 14 levy some sort of property tax on equipment used in natural gas production, the value of natural gas produced, or the amount of gas likely to be produced by a specific property.

> **. . . we gladly pay a severance tax in every state where we're active, except New York and Pennsylvania.**
>
> Matthew Sheppard, spokesperson for Chesapeake Energy Corp.

Companies fully expect to pay the tax. According to a spokesperson from Chesapeake Energy Corporation, one of major companies developing the Marcellus Shale, "we gladly pay a severance tax in every state where we're active, except New York and Pennsylvania."[112]

Studies of severance taxes in other states have shown that changing tax rates have little effect on production. A Wyoming, study found that a 2 percentage point reduction in the state oil severance tax would increase production by only 0.7% over the next 60 years while decreasing government revenues significantly. Conversely, raising tax rates contributed greatly to government revenues, with negligble impact on production. The authors concluded, "production of (as contrasted with exploration for) oil and gas is driven mainly by reserves, not by prices, production tax rates, or production tax incentives."[113]

A more recent study using historical data of industry response to oil and gas severance tax changes in Utah found a similar result: changes in severance tax rates, even significant ones, had a large impact on government revenues but not industry production.[114]

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[112] Jay Gallagher, "Gas-drilling tax proposal stirs protest in Albany," *Elmira Star-Gazette*, March 26, 2009 http://www.stargazette.com/article/20090326/NEWS01/903260391&referrer=FRONTPAGECAROUSEL.
[113] Shelby Gerking, et al, Mineral Tax Incentives, *Mineral Production and the Wyoming Economy*, December 2000.
[114] Gabriel Lozada and Michael Hogue, *The Effect of Proposed 2009 Tax Changes on Utah's Oil and Gas Industry,* University of Utah, December 18, 2008.

A Wyoming, study found that a 2 percentage point reduction in the state oil severance tax would increase production by only 0.7% over the next 60 years while decreasing government revenues significantly.

Rather than severance and property taxes, the biggest factors in the development of the Marcellus Shale will be the market price for natural gas, the availability of credit for producers to secure property rights and buy equipment, and the availability of equipment and personnel to drill and operate new wells.

If the market price of natural gas remains "low," companies are unlikely to spend significant resources to develop new reserves, particularly if they are expensive to develop, as the Marcellus Shale is expected to be. Over time, increasing world demand for natural gas should cause prices to rise, making the development of the Marcellus Shale more attractive.

The resolution of the national credit crunch will also influence, much more than the existence of a severance tax, whether producers have access to cash to purchase the rights to develop wells, build infrastructure to move the natural gas to market, and purchase new drilling equipment.

Still, natural gas production is a lucrative industry. A 2005 analysis claimed that Arkansas' Fayetteville Shale wells were considered economical when natural gas prices were as low as $3 per MCF. At $6 per MCF one analyst estimated that the typical Fayetteville Shale well would return five times its initial investment over its lifetime and pay back investors in less than one year.[115]

Is the Severance Tax a Good Tax?

Widely accepted tax principles emphasize that taxes should promote three basic objectives.[116]

- Equity, taking into account taxpayers' ability-to-pay and also considering which taxpayers benefit from the public spending for which a given tax pays.
- Efficiency: taxes should ensure that externalities do not distort market decision-making. Policymakers should also consider the impact of taxes on competitiveness through their impact on tax rates relative to other states or localities, and through their influence on the availability of revenue to invest in public goods that benefit all businesses and individuals.

[115] Gerlyn Terzo, "Arkansas Gas Field Emerges From Shadow," *Investment Dealers' Digest Magazine*, 2005, http://www.zenzebra.net/_fayettevilleshalegas/.
[116] Pennsylvania 21st Century Tax Policy Project, *Moving Pennsylvania's Tax System Into the 21st Century*, December 2003.

- Administration, including compliance costs, voluntary compliance—will taxpayers voluntarily pay the tax, and the predictability of tax liabilities.

These tax principles suggest that a severance tax would be smart state fiscal policy.

The severance tax would promote equity by ensuring that rural localities with incomes below the state average do not get stuck with environmental costs without adequate additional revenue. Ensuring that producers compensate all Pennsylvanians for negative environmental externalities also promotes basic fairness.

In terms of efficiency, if a severance tax rate were set at the level of West Virginia and other states in the Marcellus Shale region, the tax would not impair Pennsylvania competitiveness compared to other natural gas regions. In addition, with few exemptions and rising energy prices over time, the tax can be set at a low rate and produce adequate revenue to help pay for environmental damage and state and local public goods. Lastly, ensuring the internalization of environmental externalities also promotes efficiency: investment decisions made without taking into account environmental costs are economically inefficient.

Turning to administration, if the tax is based on sale prices and is levied with few deductions, the tax would be simple to calculate for taxpayers, transparent to the public, and easily verifiable. While the market price fluctuations would change the amount of tax due, it would be predictable in that it is always the same percentage of the selling price.

A large portion of the tax could also be exported to other states in the future. Currently, Pennsylvania uses more natural gas than it produces. This could easily change as production in the Marcellus Shale region increases. Considering Pennsylvania sits at the gateway to the Northeast, one of the major regions for natural gas use, and roughly half of the costs of natural gas consumers pay are due to transportation of the gas, it seems likely that new natural gas produced in Pennsylvania will be an attractive alternative to natural gas from Wyoming, Texas, or other regions.[117] The more Pennsylvania natural gas is shipped out-of-state, the more the taxes would be exported, too, in the price of the natural gas.

Property Taxes on Natural Gas Extraction

Local governments have no way of effective way of recovering costs from natural gas production. Prior to 2002, oil and gas leases were subject to property taxes at the local level like other minerals (such as coal, sand, gravel, etc.), providing funding for counties, municipalities, and school districts. Because of the structure of the lease agreements, the property taxes were paid by producers rather than property owners.

As is common in other oil- and gas-producing states, the assessment (or valuation for tax purposes) of these interests was based on a widely-accepted methodology using three factors: income produced by the well, costs

[117] Estimate of transportation costs as a portion of consumer natural gas prices taken from the U.S. Energy Information Administration, *Residential Gas Prices: What every consumer should know*, December 2008, http://www.eia.doe.gov/neic/brochure/oil_gas/rngp/index.html.

incurred, and comparable sales.[118] This method is currently employed for assessing coal and other mineral reserves and is comparable to the income-based method used to tax other industrial and commercial properties.[119]

In 2002, the Pennsylvania Supreme Court ruled that oil and gas interests are not subject to the main type of tax levied by local governments in Pennsylvania – the property tax.[120] While some buildings and other real property owned by natural gas producers would still be subject to local property taxes, the amounts collected would be relatively small compared to the value of taxing the interests.

Earned Income Taxes Don't Capture Income from Gas Production

Many municipalities and school districts levy an earned income tax, which would collect tax from people earning wages due to gas activity. Municipalities that host gas drilling will receive increased income tax receipts only to the extent that new workers live in that municipality, a concern for rural areas that may have lots of drilling activity but few places for people to live. Some municipalities have enacted a local services tax, which can be levied on people who work in the municipality, but it is limited by state law to $52 per person, per year.

Landowners who receive royalty and lease payments for having natural gas harvested from their land would not pay local income tax on these payments in most jurisdictions, as royalty and leasing income are not considered "earned income."

Allowing Property Taxation of Oil and Gas Production Could Help Communities Most Affected by Drilling

In addition to instituting a severance tax at the state level, Pennsylvania could help local governments pay for the public costs of drilling and make the overall tax system fairer by allowing them to assess property taxes on leases to extract oil and natural gas. The taxes would be levied separately from the surface property and paid by the holder of the lease. In terms of widely accepted tax principles, both the severance tax and a property tax on oil and gas interests would be considered "good taxes."

The companies extracting the natural gas – not the landowners – would pay property taxes on the oil and gas leases. Thoroughly- tested and transparent methods of determining assessment values for property taxes on those interests were used in many counties of Pennsylvania prior to 2002 and are currently in use in other states.

States with severance taxes typically impose state or local property taxes on oil- and gas-producing properties. In neighboring West Virginia, oil and gas properties are classified as "natural resources property" and are taxed

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[118] Telephone conversation with Jeffrey R. Kern, February 20, 2009.
[119] Douglas E. Hill, *Testimony on Marcellus Shale Exploration Issues, presented to the Senate Majority Policy Committee*, County Commissioners Association of Pennsylvania, November 18, 2008.
[120] Robert Swift, "Counties see cash in oil, gas. Assessments would ease property taxes," *The Times-Tribune*, Scranton, PA, November 26, 2008.
http://www.scrantontimes.com/articles/2008/11/26/news/sc_times_trib.20081126.a.pg11.tt26gas_s1.2118340_loc.txt.

based on the present worth of future revenues expected to be realized over the life of the well.[121] In New York, oil and gas properties are assessed as "economic units," which are based on production of the well in the previous year and the profile of the well (which includes the region in which the well is located and the type of well).[122] Texas and California also assess the value of minerals in the ground.[123]

According to the Pennsylvania School Boards Association, restoring local government authority to assess oil and gas leases would provide a significant boost to the tax bases of many Pennsylvania school districts. Of the 250 school districts below the state's median aid ratio, 207 are found in the area overlaying the Marcellus Shale.[124] This authority could be granted by an act of the Pennsylvania Legislature.

As wells are developed in the Marcellus Shale, the corresponding value of the land on which the wells are situated will increase. Permitting property tax assessments on those valuable interests will generate additional revenue to help local communities offset the external costs that come with more drilling, such as road wear and tear from increased traffic, a greater demand for educated workers and suitable housing, more stress on local water and sewer infrastructure, and an increased need for local public safety services.

Creating this authority will also treat the owners of oil and gas reserves the same as coal and other mineral reserve owners, increasing the fairness of the property tax system.

[121] West Virginia State Tax Department, Property Tax Division, *Guide for County Assessors*, Section 16, May 2007.
[122] New York State Office of Real Property Services, State Valuation Services, *Overview Manual for Valuation and Assessment of Oil and Gas Producing Properties in New York State*, January 2008, http://www.orps.state.ny.us/sas/oil_gas.
[123] Shelby Gerking, et al, Mineral Tax Incentives, *Mineral Production and the Wyoming Economy*, December 2000.
[124] Tim Allwein, *Testimony before the Senate Republican Policy Committee*, Pennsylvania School Boards Association, November 19, 2008.

Recommendations

Pennsylvania should institute a severance tax on natural gas and provide the authority for local governments to levy property taxes on oil and gas deposits. The production of natural gas imposes infrastrastucture, environmental, and other signficant costs on governments that are currently paid by other taxpayers. The creation of a severance tax at the state level and re-enabling property taxes at the local level on these activities would help rebalance the scale.

A portion of the tax should be dedicated to environmental protection. Natural gas production creates substantial risk of environmental degredation and requires continuous and long-term monitoring to protect both surface and underground water.

A portion of the severance tax should be set aside in a permanent fund that allows for a predictable income stream and provides resources to help gas-producing communities adjust when the industry begins to decline.