Independent Fiscal Office

Natural Gas Extraction:

An Interstate Tax Comparison

March 2014

Special Report 2014-2

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Independent Fiscal Office
Rachel Carson State Office Building, 2nd Floor
400 Market Street
Harrisburg, PA 17105

Telephone:	**717-230-8293**
E-mail:	**contact@ifo.state.pa.us**
Website:	**www.ifo.state.pa.us**
Staff Contacts:	**Matthew Knittel, Director**
	Mark Ryan, Deputy Director

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INDEPENDENT FISCAL OFFICE

Second Floor, Rachel Carson State Office Building
400 Market Street
Harrisburg, Pennsylvania 17105

March 17, 2014

The Honorable David Argall:

Data from the U.S. Energy Information Administration show that Pennsylvania was the third largest extractor of natural gas from shale formations for 2012. Preliminary production data from state regulatory authorities suggest that Pennsylvania is now the second largest producer, trailing only Texas. The rapid expansion of this industry has conferred substantial economic benefits to the state economy in terms of employment and income gains.

Pennsylvania is the only state with significant natural gas production that does not impose a traditional severance tax based on the volume or market value of gas production. In lieu of a severance tax, Pennsylvania levies a tiered annual impact fee per well over a 15 year period. As requested, this report compares this unique tax structure to those used by other states. The report also considers other taxes that may be levied on natural gas producers such as real and personal property, corporate and personal income, sales and use and miscellaneous fees. Due to the complexity of the analysis, readers are encouraged to thoroughly review the methodology and assumptions contained in Section 1 of this report.

Per the policy of the Independent Fiscal Office, this report will be posted to the office website no later than three days following transmittal. The office welcomes any questions or comments regarding this analysis. Inquiries can be submitted to contact@ifo.state.pa.us.

Sincerely,

MATTHEW J. KNITTEL
Director

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Introduction

Pennsylvania has a long history of natural gas production, but did not levy a severance tax or fee on the extraction of that resource. This policy changed in February of 2012 when Act 13 was signed into law. Among other provisions, the act authorizes a tiered annual impact fee on natural gas wells for the first 15 years after the wells are drilled.[1] The impact fee is unique because it is determined primarily by the age of the well, and it is not affected by the volume of gas extracted or its price, except in limited circumstances.

The taxation of natural gas extraction has been a source of debate since the significance of the Marcellus shale natural gas formation became widely known. The debate has many facets, but the severance tax rates of other gas producing states often serve as reference points. These statutory tax rates alone are not comparable due to the unique features inherent in each state's tax code. For example, many states grant various exemptions or special provisions to natural gas wells that meet certain criteria. These features make it difficult to generate an "apples to apples" comparison of state severance tax systems.

States also levy corporate net income, personal income, sales and use and tangible personal property taxes that may be paid by natural gas extractors. Those tax bases and rates will vary across states, as will tax administration, tax compliance costs and regulatory compliance costs. These dissimilarities further complicate attempts to compare tax policies related to natural gas extraction.

This report provides an objective framework to facilitate an interstate comparison of severance taxes or fees. It constructs a single metric, the effective tax rate, which allows the Pennsylvania impact fee to be compared to the severance or production taxes levied in other states. While sufficient information is not available to consolidate other types of taxes into the effective tax rate measure, the report does provide discussion and context about the non-severance tax policies applicable to natural gas extractors.

The analysis proceeds as follows. Section 1 discusses the methodology and assumptions used in the report. Section 2 presents an interstate comparison of taxes levied on natural gas production. Section 3 presents an interstate comparison of other taxes and fees paid or remitted by natural gas extractors. Section 4 concludes with a summary of effective tax rate comparisons across states. Two appendices provide additional state detail and miscellaneous data tabulations.

[1] In a recent decision, the Pennsylvania Supreme Court declared certain aspects of Act 13 to be unconstitutional. See the opinion in Robinson Township, et al. v. PA. Public Utility Commission and Attorney General (December 19, 2013) at http://www.pacourts.us/assets/opinions/Supreme/out/J-127A-D-2012oajc.pdf?cb=1. In addition, the Supreme Court remanded various issues to Commonwealth Court; the status of the impact fee is one of the issues that may be determined by the lower court. On March 13, 2014, Commonwealth Court issued a memorandum order listing the provisions of Act 13 the parties have agreed to argue before the court. The impact fee is not included among the provisions listed in the order. See the order at www.ifo.state.pa.us/resources/PDF/SR2014-02-ccorder.pdf.

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Section 1: Methodology and Assumptions

This section describes the methodologies, price and production assumptions and comparison metric used by this report. The appendices provide further detail regarding the methodologies and assumptions, as well as tabulations of production data submitted by natural gas extractors to the Pennsylvania Department of Environmental Protection (DEP).

Overview and Scope

This report compares various taxes and fees levied on the extraction of natural gas from shale formations across 11 states. The analysis examines two production (high and low) and two price (high and low) scenarios. These four scenarios provide a reasonable framework to facilitate interstate tax comparisons.

As discussed in the subsections below, the analysis holds price and production levels constant across states. However, it is important to reflect the unique tax characteristics of each state. Many state tax systems contain special provisions for wells that meet certain criteria. For example, the statutory severance tax rate for Texas is 7.5 percent of the market value of gas produced, but "high-cost gas" qualifies for a reduced tax rate that could last for up to 10 years based on drilling and completion costs. Data from Texas reveal that nearly all new shale wells qualify for the reduced tax rate. For each state, the analysis uses an applicable tax rate that reflects any exemptions, deductions or reduced rates that are unique to the state. The analysis bases the computation of the applicable tax rate on published data or conversations with state officials who regulate natural gas wells. Section 2 provides additional detail on applicable tax rates used for comparison states.

The scope of this report is limited to an interstate comparison of taxes levied upon the extraction of natural gas. The following cautionary notes apply:

- The report cannot be used to assess whether severance tax systems cause one state to appear more or less attractive for investment relative to other states because it does not include other relevant costs such as labor, transportation and drilling. A state may levy a relatively high severance tax, but still attract significant investment due to low non-tax costs. Alternatively, a state could levy a low severance tax, but appear less attractive because other tax and non-tax costs are relatively high. State severance taxes are only one factor among many that motivate investment decisions.
- The report should be used to compare state severance taxes prospectively, rather than retrospectively. Various technological advancements, such as additional fracturing stages and longer laterals, have led to a dramatic increase in the volume of gas that can be extracted from a single well. The production scenarios used by this report reflect a Pennsylvania Marcellus shale well that would be drilled in 2014, and the report should not be used to draw inferences for legacy wells.
- The report cannot be used to determine whether a tax system is set at an appropriate level because that determination is subjective. It can only be used to compare relative tax levies across states given assumed price and production levels.

Comparison States

The analysis compares tax systems across Pennsylvania and 10 other states. Two criteria were used to identify comparison states: (1) the state produces significant quantities of natural gas from shale formations and/or (2) the state is in close proximity to Pennsylvania. Comparison states include: Arkansas, Colorado, Louisiana, Michigan, North Dakota, Ohio, Oklahoma, Texas, Virginia and West Virginia. Although California and New Mexico produce significant quantities of natural gas from shale formations, their distance from Pennsylvania and the presence of larger shale gas producers preclude them from the analysis.

Table 1.1 ranks states based on total marketed production of natural gas. Total marketed production represents gross gas withdrawals less gas used in production, gas vented or flared and non-hydrocarbon gases (e.g., carbon dioxide and nitrogen) removed during processing. The table also displays gross withdrawals and withdrawals from shale formations. Certain states produce significant amounts of natural gas, but relatively small amounts originate from shale formations (e.g., Alaska, Kansas, Utah and Wyoming). For that reason, those states are not included in this analysis.

For 2012, the U.S. Energy Information Administration (EIA) ranks Pennsylvania third in total marketed production of natural gas and first in the share of withdrawals from shale formations (90.5 percent). Preliminary production data for 2013 suggest that Pennsylvania likely surpassed Louisiana to become the second largest extractor of natural gas from shale formations.[2]

[2] Based on the IFO's analysis of data from the EIA at http://www.eia.gov/dnav/ng/ng_prod_sum_dcu_sla_a.htm and preliminary data from the Pennsylvania DEP, Oil and Gas Reporting website at https://www.paoilandgasreporting.state.pa.us/publicreports/Modules/Welcome/Agreement.aspx.

Table 1.1
Natural Gas Production in 2012
(million cubic feet)

State	Comparison State	Rank[1]	Marketed Production[2]	Gross Withdrawals[3]	Withdrawals from Shale[3]	Share from Shale
Texas	Yes	1	7,475,495	8,143,510	3,662,933	45.0%
Louisiana	Yes	2	2,955,437	2,955,437	2,130,551	72.1
Pennsylvania	Yes	3	2,256,696	2,256,696	2,042,632	90.5
Oklahoma	Yes	4	2,023,461	2,023,461	503,329	24.9
Wyoming	No	5	2,022,275	2,225,622	9,252	0.4
Colorado	Yes	6	1,709,376	1,709,376	228,796	13.4
New Mexico	No	7	1,215,773	1,276,296	127,548	10.0
Arkansas	Yes	8	1,146,168	1,146,168	1,021,484	89.1
West Virginia	Yes	9	539,860	539,860	141,071	26.1
Utah	No	10	490,393	490,393	1,333	0.3
Alaska[4]	No	11	351,259	3,164,791	0	0.0
Kansas	No	12	296,299	296,299	0	0.0
California	No	13	246,822	246,822	55,344	22.4
Alabama	No	14	215,710	215,710	0	0.0
North Dakota	Yes	15	179,004	258,568	218,873	84.6
Virginia	Yes	16	146,405	146,405	17,212	11.8
Michigan	Yes	17	129,333	129,333	107,822	83.4
Kentucky	No	18	106,122	106,122	0	0.0
Ohio	Yes	19	84,482	84,482	12,773	15.1
All Other	No	n.a.	210,014	599,086	15,619	2.6
U.S. Total[5]	**-**	**-**	**25,307,949**	**29,542,313**	**10,296,572**	**34.9**

Source: U.S. Energy Information Administration (EIA).

[1] Based on total marketed production.
[2] Excludes gas used in production, quantities vented or flared and non-hydrocarbon gases.
[3] All compounds extracted from the wellhead. If data are limited, gross withdrawals may equal marketed production.
[4] A significant share of gross withdrawals in Alaska is used for repressurizing.
[5] U.S. Total includes federal offshore production in the Gulf of Mexico.

Production Scenarios

The analysis models a Pennsylvania Marcellus shale well that begins production on January 1, 2014 and is representative of active gas wells that produce in tight gas or impermeable formations throughout the Marcellus shale region. The well is an unconventional, horizontal well that extracts dry natural gas via hydraulic fracturing techniques.[3] Gas wells in other shale formations generally share these characteristics, although they may vary in terms of depth and output.

[3] Taxation of natural gas liquids (non-gaseous hydrocarbons such as ethane and butane) found in wet gas, a mixture of natural gas liquids and methane gas, varies across states. For example, North Dakota and Texas classify natural gas liquids as oil and tax the compounds using the oil severance tax rate. The analysis only examines dry gas (i.e., methane) production across states and applies the gas severance tax rate.

The analysis uses two production scenarios that reflect a reasonable upper and lower bound for a Pennsylvania Marcellus shale well drilled in 2014. Production levels must be held constant across states because different severance tax systems will appear to generate more or less tax revenue relative to other states as production levels change. For example, production levels generally do not affect the Pennsylvania impact fee, but would affect severance tax collections in nearly all other states.

Total estimated production over the life of a well is referred to as a well's estimated ultimate recovery (EUR). The EUR is a crucial parameter that helps determine whether a gas well will be economically viable. In order to estimate the EUR of a prospective well, analysts apply historical production data from similar wells to a statistically fitted decline curve that forecasts production over a well's lifetime.[4] Decline curve analysis typically assumes that the productive life of a well spans 30 years.[5]

Based on various data sources, the report assumes that the EUR of a Pennsylvania Marcellus shale well drilled in 2014 ranges from 5.0 billion cubic feet (Bcf, low production scenario) to 10.0 Bcf (high production scenario).[6,7] The analysis uses a relatively large range to reflect the fact that EURs can vary substantially for wells within the same shale play. The range is generally higher than the Marcellus shale EUR computed by the EIA in recent publications.[8] However, those EURs are not prospective and are based on historical data from 2008 through 2011.

Recent industry estimates suggest that EURs have increased dramatically since 2011 due to additional fracturing stages that increase the lateral length of horizontal wells. Industry presentations from February 2014 estimate average Marcellus shale EURs for 2013 wells that range from 8.0 (Range Resources, Southwestern Energy and National Fuel) to 9.8 (EQT, southwestern wells only) to roughly 16.0 (Cabot Oil and Gas, Southwestern Energy).[9] Non-industry sources that use actual production data from the DEP estimate an EUR of approximately 7.0 Bcf for historical

[4] For further discussion, see Decline Curve Analysis, Appendix 2.C, Oil and Gas Supply Module of the National Energy Modeling System: Model Documentation 2013, EIA at http://www.eia.gov/forecasts/aeo/nems/documentation/ogsm/pdf/m063(2013).pdf and Decline Curves at http://www.hamiltongroup.org/documents/Decline%20Curves%20-%20Dr%20Stephen%20Poston.pdf.

[5] However, some industry analysis may assume longer life spans. Data from mature shale plays suggest that productive lifetimes could also be shorter.

[6] This EUR range is generally consistent with very recent production data reported to the Pennsylvania DEP. However, in order to project EURs, decline curve analysis requires the specification of three variables: initial production, initial decline rate and the long-term decline rate. Insufficient data exist to quantify the long-term decline rate (hyperbolic decline exponent), so that parameter is an estimate, and ultimate EURs in the Marcellus shale remain undetermined.

[7] Natural gas extractors must file production reports with the Pennsylvania DEP every six months. Although the department publishes gas production data for January 2000 through December 2013, specific data related to natural gas extraction in the Marcellus shale are only available since July 2009. Hence, historical data that could be used to inform estimates of the EUR for a new well are limited.

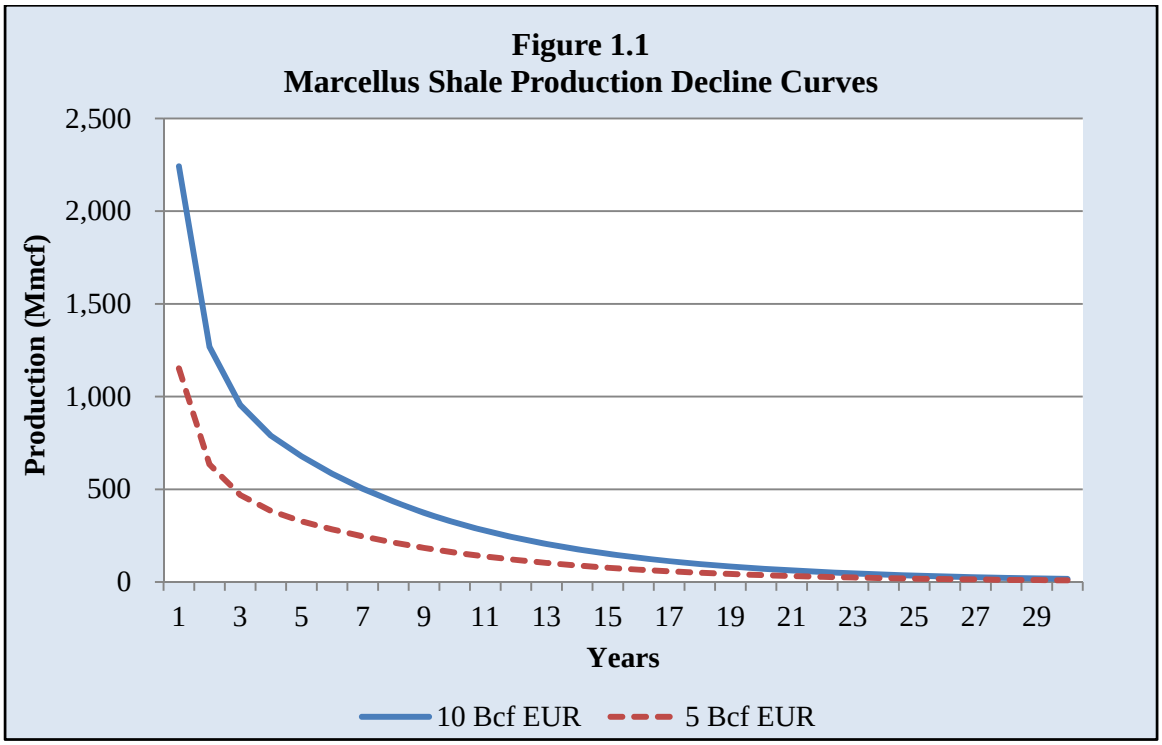
[8] See EIA, "Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays, Appendix A: Onshore Lower 48 Oil and Gas Supply Submodule" at http://www.eia.gov/analysis/studies/usshalegas/pdf/usshaleplays.pdf.

[9] See Range Resources investor presentation at http://phx.corporate-ir.net/phoenix.zhtml?c=101196&p=irol-presentations. Cabot Oil and Gas investor presentation at http://www.cabotog.com/investors/. Chesapeake Energy investor presentation at http://www.chk.com/Investors/Pages/Presentations.aspx.EQT investor presentation at http://ir.eqt.com/. Southwestern Energy investor presentation at http://www.swn.com/investors/LIP/latestinvestorpresentation.pdf.

wells.[10] Prospective EURs would likely be higher due to technological advancements.

In addition to total production, severance taxes may also depend upon the time pattern of production. For example, some states levy reduced tax rates in the early years of production when output is at its highest level. The analysis uses typical industry decline curves where production declines at a hyperbolic rate (i.e., the percentage rate of decline falls dramatically each year) but switches to an exponential decline (constant percentage) after four to five years. Under this modeling, roughly 60 percent of production occurs during the first five years and more than 80 percent occurs during the first ten years of a well's assumed productive life. Table 1.2 displays the high and low production scenarios used for this analysis, and Figure 1.1 presents those data graphically.

Figure 1.1
Marcellus Shale Production Decline Curves



Price Scenarios

Natural gas prices can reflect different phases of production or points of transaction and can be expressed in dollars per million British thermal units (MMBtu, based on heat content) or dollars per thousand cubic feet (Mcf, a volume measure).[11] For example, a wellhead price reflects the wholesale value at the point of severance in dollars per Mcf. A spot price reflects a sales price at a specific time and location in dollars per MMBtu given prevailing market conditions.[12] The Henry Hub spot price is considered a national spot price and serves as the delivery point for natural gas

[10] See Marcellus and Utica Shale Development Databook, Volume 3 2013, at http://marcellusdrilling.com/databook. Data compilations and computations made by the Marcellus Center for Outreach and Research at Pennsylvania State University.
[11] A British thermal unit is the heat required to raise the temperature of a pound of water by one degree Fahrenheit.
[12] See American Gas Association at http://www.aga.org/Kc/winterheatingseason/Pages/NaturalGasPrices.aspx.

futures contracts on the New York Mercantile Exchange (NYMEX) due to its strategic location on the Louisiana Gulf Coast and connections to Midwest, Northeast and Southeast markets.[13]

For all comparison states, the taxable value of natural gas is determined at either (1) the point of severance (i.e., the wellhead) or (2) the point of sale, less deductions for post-production costs (which approximates the wellhead price). Post-production costs include gathering (i.e., moving the gas via smaller transmission lines to a processing facility or pipeline), processing (i.e., removing liquid hydrocarbons and impurities) and transportation (i.e., compressor costs along pipelines).[14] When determining the taxable value of gas, the analysis treats all states uniformly. It assumes that the wells produce dry natural gas only and firms deduct post-production costs related to gathering and transportation, but not processing. The analysis assumes average gathering and transportation costs of $0.77 per Mcf in 2014, which is grown by a general inflation factor and deducted from a forecast of the national spot price.[15]

The EIA's Henry Hub spot price forecast serves as the national spot price that is used for all states. The analysis uses two price scenarios (high and low) that each reflect a 10 percent deviation from the EIA Henry Hub spot price forecast.[16] Historical data show that the Henry Hub spot price shares a very high correlation with the average U.S. wellhead price reported by the EIA. The analysis converts the EIA's forecast to dollars per Mcf in order to apply a volume-based price to production and subtracts an estimate for post-production costs.[17] Gas prices may vary by geographic region, but the analysis must apply the same high and low price scenarios across all states to facilitate a meaningful interstate comparison.

Table 1.2 displays (1) the EIA's Henry Hub forecast (MMBtu) and (2) the same forecast converted to a net price based on volume and adjusted to reflect the deduction of certain post-production costs.

[13] See Sabine Pipeline website at http://www.sabinepipeline.com/Home/Report/tabid/241/default.aspx?ID=52.
[14] See EIA website at http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/process.html#processing_plant.
[15] Industry data suggest that gathering and transportation costs were approximately $0.76 per Mcf in 2013. See Range Resources Corporation Company Presentation, February 4, 2014 at http://www.rangeresources.com/rangeresources/files/b6/b64ba539-281b-41bb-8ad5-936d5ba06f58.pdf.
[16] See EIA Annual Energy Outlook 2014, Early Release at http://www.eia.gov/forecasts/aeo/er/index.cfm.
[17] For conversion formula and average heat content see EIA Frequently Asked Questions at http://www.eia.gov/tools/faqs/faq.cfm?id=45&t=8. The analysis holds the average heat content of gas at 1,023 Btu per cubic foot for future years.

Table 1.2
Production Profiles and Price Assumptions

Calendar Year	Production (MMcf)[1]		Henry Hub (MMBtu)[2]	Net Henry Hub (Mcf)[3]
	High	Low		
2014	2,242	1,152	$4.44[4]	$3.77
2015	1,269	634	4.14[4]	3.45
2016	956	470	4.41	3.71
2017	790	384	4.76	4.06
2018	678	327	5.27	4.56
2019	585	284	5.19	4.47
2020	503	246	4.96	4.22
2021	435	213	5.37	4.62
2022	373	184	5.64	4.88
2023	321	159	5.90	5.14
2024	277	138	6.20	5.43
2025	239	119	6.45	5.67
2026	205	103	6.72	5.93
2027	177	89	7.00	6.20
2028	152	77	7.26	6.45
2029	131	67	7.63	6.81
2030	113	58	8.12	7.29
2031	97	50	8.47	7.63
2032	84	43	8.91	8.06
2033	72	37	9.41	8.55
2034	62	32	9.83	8.96
2035	53	28	10.31	9.43
2036	46	24	10.93	10.04
2037	40	21	11.23	10.33
2038	34	18	11.53	10.61
2039	29	16	12.04	11.11
2040	25	14	12.69	11.75
2041	22	12	13.22	12.27
2042	19	10	13.77	12.80
2043	16	9	14.35	13.37
Total EUR	**10,000**	**5,000**	**n.a.**	**n.a.**

[1] MMcf stands for million cubic feet.
[2] Forecast for Henry Hub spot price in nominal dollars from EIA Annual Energy Outlook 2014, Early Release. High (low) price scenario assumes spot price is ten percent higher (lower).
[3] Henry Hub spot price converted to dollars per Mcf, less deductions for gathering and transportation costs.
[4] Taken from EIA Short Term Energy Outlook, March 2014.

Taxes for Analysis

Natural gas extractors remit or pay various taxes including severance, income, property and other miscellaneous taxes and fees. The analysis focuses on severance taxes because those taxes are more easily quantified once production and price scenarios have been determined. Local real property taxes that are levied on the value of natural gas reserves (Arkansas, Ohio, Texas and West Virginia) or gross receipts (Colorado and Virginia) are also quantified because those taxes are triggered by production activity.

It is much more difficult to quantify any income taxes that would be levied on the profits from extraction. In order to quantify those amounts, the analysis must specify the profit margin on total sales. The analysis must then identify the type of entity to which the income ultimately accrues. If the entity is a corporation and subject to the corporate net income tax, the relevant apportionment formula and factor must be specified. Many large natural gas extractors are multistate corporations that have unique factors to apportion firm-wide income to the states in which they operate. Hence, even if total profits could be identified, it is unclear how much would be taxed at a particular state corporate income tax rate.

Natural gas extractors also pay or remit sales taxes and miscellaneous fees. The analysis displays state sales tax rates, but it is not possible to quantify the tax paid due to the various rates, policies and broad exemptions relevant in most states. When applicable, the presence of a personal property tax is also noted, but the analysis does not attempt to quantify those amounts.

Time Assumptions

The analysis quantifies and compares severance and local real property taxes that would be remitted over a 30 year time frame across comparison states. That time frame reflects standard industry convention and is also used by the EIA. However, that convention does not ensure that a Marcellus shale well drilled in 2014 will have a productive life during that entire span. The actual productive life of a Marcellus shale well remains unclear because insufficient data exist to reliably estimate the lifespan. Because such a large share of production occurs during the first 10 to 15 years of a well's life, a shorter lifetime would not alter the general results of this analysis.[18]

Comparison Metric: The Effective Tax Rate

To facilitate meaningful interstate comparisons, the analysis uses a summary statistic referred to as the effective tax rate. The effective tax rate is equal to the net present value of severance and property taxes levied upon a well divided by the net present value of the market value of natural gas sales from that well over the 30 year time frame. The computed rate should not be treated as either an annual measure or an average rate across all wells.

The effective tax rate computation uses net present values to control for timing issues. When computing net present values, an important parameter is the choice of discount factor. The analysis uses a discount factor of 4.5 percent across all states. That rate approximates the long-run rate to borrow funds for the Commonwealth. Due to discounting, taxes paid in early years retain much

[18] A simulation that ends the analysis after 15 years has a negligible impact on the effective tax rates.

more of their value than taxes paid in later years. For example, $10,000 of taxes paid in ten years has a net present value of only $6,440 using a discount factor of 4.5 percent.

For most comparison states, severance and property taxes will generally comprise a constant share of natural gas sales. In those cases, the effective tax rate is unaffected by production or price assumptions and the computation is "scalable." For example, if production or price doubles, then the market value of output and taxes will double as well, and the effective tax rate will not change. If the severance tax is levied purely on volume (e.g., Ohio), then the effective tax rate is unaffected by volume, but would change based on price assumptions. Louisiana and North Dakota adjust their volume-based severance tax rate annually by the price of gas in response to this phenomenon. Because Pennsylvania levies an impact fee, it is the only state where the effective tax rate is affected by both price and production assumptions.

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Section 2: Severance & Other Production Taxes

This section quantifies severance and certain other production taxes paid or remitted by natural gas extractors across comparison states. All state taxes and fees that are levied on the basis of production are considered a severance tax. For each state, the analysis computes the relevant tax base, applicable tax rate and tax liability under the four scenarios discussed in the previous section. Because the analysis imposes price and production scenarios that may not be representative of each state, readers should use the effective tax rate computation for the purpose of interstate comparisons of severance tax systems. Further detail regarding state effective tax rate computations can be found in Appendix A.

Severance taxes use the market value of output or production volume as the tax base. States that levy tax based on market value usually tax the gross value at the point of severance, or the market value after deductions for preparation and transportation costs.[19] States that levy tax based on production volume tax per thousand cubic feet of gas extracted. In this analysis, six states (Arkansas, Colorado, Michigan, Oklahoma, Texas and West Virginia) levy a value-based severance tax, three states (Louisiana, North Dakota and Ohio) levy a volume-based severance tax and one state (Virginia) authorizes counties to levy a gross license tax. [20] (See Table 2.1.) Pennsylvania is the only state that levies a tiered impact fee based on the age of the well and the price of natural gas.

The subsections that follow use the same format across the comparison states. The text provides (1) a brief description of the tax base and tax rate, (2) the production incentives modeled by this analysis and (3) the effective tax rate computation. Additional detail and commentary is provided for Pennsylvania.

[19] National Conference of State Legislators, "State Revenues and the Natural Gas Boom, An Assessment of State Oil and Gas Production Taxes," June 2013 at http://www.ncsl.org/documents/energy/pdf_version_final.pdf.

[20] Because Virginia does not levy a state severance tax, a description is not included in this section. Section 3 includes an effective tax rate computation for the local tax levy.

Table 2.1
State Severance Taxes on Natural Gas[1]

State	Statutory Rate[2]	Base	Modeled Production Incentives[3]
PA	Impact Fee	unconventional well per annum	exemption for low-producing wells
AR	5.0%	market value of gas produced	reduced rate for high-cost wells and low-producing wells
CO	2.0% - 5.0%	gross annual income from the sale of gas	credit for property taxes paid on gas and exemption for low-producing wells
LA	11.8¢	Mcf of gas produced	exemption for horizontal wells and reduced rate for low-producing wells
MI	5.0%	gross cash market value of gas produced	none
ND	8.33¢	Mcf of gas produced	none
OH	2.5¢	Mcf of gas produced	none
OK	7.0%	gross market value of gas produced	reduced rates for horizontal wells
TX	7.5%	market value of gas produced	reduced rate for high-cost wells
VA[4]	1.0% - 3.0%	gross receipts from gas produced	none
WV	5.0%	gross value of gas produced	exemption for low-producing wells

[1] States may also levy minor administrative/conservation fees. More detail is provided in state sections.
[2] Tax rates are for FY 2013-14. Certain states adjust severance tax rates at the beginning of the fiscal year.
[3] See Appendix A for information on all production incentives.
[4] Virginia does not levy a state-level severance tax but authorizes local units to levy a gross license tax.

Pennsylvania

Preliminary production data for 2013 suggest that Pennsylvania is second to Texas in withdrawals of natural gas from shale formations. The state has a long history of natural gas production, but its climb to a top producer began in 2008, when the first unconventional shale wells commenced production in Pennsylvania's Marcellus shale formation. For the period 2007 through 2013, Pennsylvania natural gas production increased at an average rate of more than 60 percent per annum.

Pennsylvania Natural Gas Production
(MMcf)

	2007	2008	2009	2010	2011	2012	2013
Gross Withdrawals	182,277	198,295	273,869	572,902	1,310,592	2,256,696	3,094,413[1]
from Gas Wells	182,277	188,538	184,795	173,450	242,305	210,609	-
from Oil Wells	-	-	-	-	-	3,456	-
from Shale Wells	-	9,757	89,074	399,452	1,068,288	2,042,632	-
Liquids Production[2]	859	1,008	1,295	4,578	8,931	12,003	-
Dry Production	181,418	197,287	272,574	568,324	1,301,661	2,244,693	-

Sources: U.S. Energy Information Agency and Pennsylvania Department of Environmental Protection.

[1] Estimate based on recent data from Pennsylvania Department of Environmental Protection.
[2] Gaseous equivalents.

Prior to 2012, Pennsylvania did not levy a severance tax or fee on natural gas extraction. The enactment of Act 13 of 2012 authorized an impact fee on gas wells. The impact fee is levied annually for 15 years (beginning in the year in which the well is drilled) and is imposed on unconventional gas wells according to a published schedule. The amount of the fee is determined by the age of the well, the type of well (horizontal or vertical) and the average annual price of natural gas on the New York Mercantile Exchange (NYMEX) (i.e., the Henry Hub spot price in dollars per MMBtu). The fee may be adjusted by the regional consumer price index for all urban consumers, if after the first year there is a year-over-year increase in the number of Pennsylvania unconventional wells drilled.[21]

Pennsylvania Impact Fee Schedule for Horizontal Wells Spudded in 2013
(based on NYMEX price)

	$0.00-$2.25	$2.26-$2.99	$3.00-$4.99	$5.00-$5.99	≥$6.00
Year 1	$40,000	$45,000	$50,000	$55,000	$60,000
Year 2	30,000	35,000	40,000	45,000	55,000
Year 3	25,000	30,000	30,000	40,000	50,000
Years 4-10	10,000	15,000	20,000	20,000	20,000
Years 11-15	5,000	5,000	10,000	10,000	10,000

Source: Pennsylvania Public Utility Commission, Act 13 Impact Fee.

[21] 58 Pa.C.S. § 2301, 2302.

Modeled Production Incentives

- **Minimum Daily Production:** Wells producing less than 90,000 cubic feet per day are exempt after three years of mandatory impact fee payments.[22] A well that resumes production after suspension of the fee and produces less than 90,000 cubic feet per day remains exempt.[23] The analysis identifies the year in which the exemption becomes effective by dividing the projected annual production by 365 days.

Effective Severance Tax Rates

For Pennsylvania, the numerator of the effective tax rate equals the net present value of the impact fee. The effective tax rate responds to changes in production because the impact fee does not vary with changes in well output. For example, the effective tax rate of a well under the low price scenario with an estimated ultimate recovery (EUR) of 2.0 billion cubic feet (Bcf) is almost double the effective tax rate of a well with an EUR of 4.0 Bcf (4.1 percent versus 2.1 percent). (See Figure 2.1.) In this example, the effective tax rate falls with output because the net present value of the impact fee (numerator) does not change, but the net present value of market value (denominator) doubles. The rate would also fall by approximately one half again if the assumed EUR doubles from 4.0 Bcf (2.1 percent) to 8.0 Bcf (1.0 percent).

The Pennsylvania effective tax rate also responds to changes in price assumptions. The analysis uses high and low price scenarios that differ by 20 percent. For a given level of production, effective tax rates will also differ by roughly the same order of magnitude. For example, at an EUR of 2.0 Bcf, the effective tax rate for the high price scenario (3.2 percent) is roughly 20 percent lower than the effective tax rate for the low price scenario (4.1 percent). The effective tax rate for a well with an EUR of 8.0 reflects a similar differential between the high and low price scenarios. For other comparison states, the effective tax rate is less sensitive to price and production assumptions because tax liability is a function of production volume or market value of output. Therefore, tax liability adjusts proportionately to changes in production and price.

The analysis assumes no year-over-year growth in the number of unconventional wells drilled (i.e., no inflationary adjustment is made to the current impact fee schedule). Appendix A presents an alternative scenario that assumes year-over-year growth in the number of unconventional wells. Because the impact fee is generally fixed across the four scenarios, the effective tax rate is inversely related to production and price levels.

Pennsylvania Effective Severance Tax Rate

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Total Market Value (000s)[1]	$51,901	$40,914	$26,010	$20,506
Computed Tax Liability (000s)[1]	310	310	310	310
Effective Tax Rate[2]	0.6%	0.8%	1.3%	1.6%

[1] Amounts unadjusted for time value. See Appendix A for net present value computations.
[2] Equal to net present value of computed tax liability divided by net present value of market value.

[22] See Pennsylvania Bulletin at http://www.pabulletin.com/secure/data/vol42/42-21/998.html.
[23] 58 Pa.C.S. § 2302 (b.1).

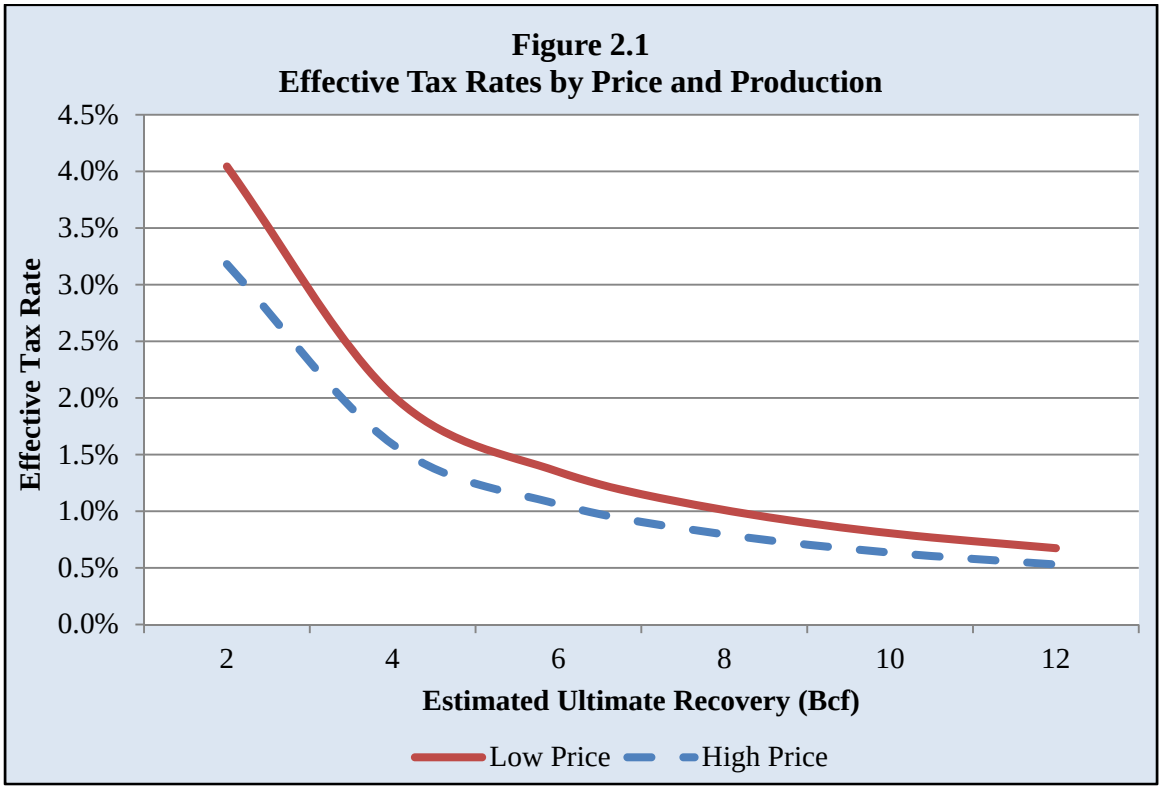
Figure 2.1
Effective Tax Rates by Price and Production
Effective Tax Rate
4.5%
4.0%
3.5%
3.0%
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
2
4
6
8
10
12
Estimated Ultimate Recovery (Bcf)
Low Price
High Price

Arkansas

Arkansas levies a severance tax of 5.0 percent on the market value of natural gas produced.[24,25] In addition, the Arkansas Oil and Gas Commission levies a monthly assessment fee of $0.009 per thousand cubic feet (Mcf).[26]

Modeled Production Incentives

- **High-Cost Well:** High-cost gas wells, defined as wells located in shale formations or drilled at a depth that exceeds 12,500 feet, qualify for a reduced severance tax rate of 1.5 percent for the first 36 months of production or until payout of drilling, completion and operating costs, whichever occurs first. Such wells can apply for a 12 month extension of the reduced rate if payout is not achieved within the first 36 months of production.[27]
- **Minimum Daily Production:** A high-cost well that produces less than 100,000 cubic feet of gas per day qualifies for a reduced rate of 1.25 percent after the initial reduced tax rate expires. [28] The analysis identifies the year in which the reduced rate becomes effective by dividing the projected annual production by 365 days.

Effective Severance Tax Rates

The effective tax rate varies by scenario due to quicker payout of well costs under the high production and high price scenario, which reduces the time period the firm qualifies for the high-cost well tax rate. Under the low production scenarios, the wells more quickly fall below the minimum daily production requirement and qualify for a reduced tax rate, thereby reducing the effective tax rate.

Arkansas Effective Severance Tax Rate

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Total Market Value (000s)[1]	$51,901	$40,914	$25,010	$20,506
Computed Tax Liability (000s)[1]	1,972	1,477	880	704
Effective Tax Rate[2]	3.6%	3.3%	3.2%	3.2%

[1] Amounts unadjusted for time value. See Appendix A for net present value computations.

[2] Equal to net present value of computed tax liability divided by net present value of market value.

[24] Ark. Code. Ann. §26-58-111.

[25] Ark. Code. Ann. §26-58-101. Market value of gas is defined as the producer's actual cash receipts from the sale of natural gas to the first purchaser, less the actual costs to the producer for dehydrating, treating, compressing and delivering the gas to the purchaser.

[26] Ark. Code. Ann. §15-71-107,108,110. See Rule D-14 Gas Assessment at http://www.aogc.state.ar.us/onlinedata/forms/rules%20and%20regulations.pdf.

[27] Ark. Code. Ann. §26-58-101. Based on a conversation with the Arkansas Department of Finance and Administration, most high-cost gas wells do not achieve payout during the reduced rate period. The analysis assumes payout after the first 36 months of production under the high production and high price scenario only.

[28] Ibid.

Colorado

Colorado levies a graduated severance tax on the gross annual income of the producer.[29,30] The severance tax uses the following tax rate schedule:

- Gross Income < $24,999: tax rate equals 2.0 percent
- Gross Income ≥$25,000 and <$99,999: tax equals $500 plus 3.0 percent over $24,999
- Gross Income ≥$100,000 and <$299,999: tax equals $2,750 plus 4.0 percent over $99,999
- Gross Income ≥$300,000: tax equals $10,750 plus 5.0 percent over $299,999

The Colorado Oil and Gas Commission also levies a 0.7 mill tax on the taxable value of gas to fund the agency.[31]

Modeled Production Incentives

- **Minimum Daily Production:** Wells producing less than 90,000 cubic feet of gas per day are exempt from the severance tax.[32] The analysis identifies the year in which the exemption becomes effective by dividing the projected annual production by 365 days.

Local Property Tax Credit

Local units in Colorado may levy a real property tax on natural gas using the same tax base as the state severance tax. Firms may apply a credit of up to 87.5 percent of local property taxes paid on gas production in the prior year towards their state severance tax liability.[33] The credit serves as a mechanism to divert revenues from the state to local entities. Although these revenues accrue to local units, the analysis includes them with state severance taxes because the credit merely transfers revenues between two levels of government.

Effective Severance Tax Rates

The effective tax rate is slightly higher under the high production scenario because the well requires more years to qualify for the minimum daily production exemption.

Colorado Effective Severance Tax Rate

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Total Market Value (000s)[1]	$51,901	$40,914	$26,010	$20,506
Computed Tax Liability (000s)[1]	2,451	1,908	1,127	869
Effective Tax Rate[2]	4.8%	4.8%	4.6%	4.5%

[1] Amounts unadjusted for time value. See Appendix A for net present value computations.
[2] Equal to net present value of computed tax liability divided by net present value of market value.

[29] Colo. Rev. Stat. §39-29-105.
[30] Colo. Rev. Stat. §39-29-102(3). Gross income is the net amount realized by the taxpayer for the sale of gas, whether the sale occurs at the wellhead or after transportation, manufacturing and processing of the product.
[31] Rule 310, Colorado Oil and Gas Conservation Commission, Form 8 Mill Levy.
[32] Colo. Rev. Stat. §39-29-105(1) (b).
[33] Colo. Rev. Stat. §39-29-105.

Louisiana

Louisiana levies a volume-based severance tax at a base rate of 7 cents per thousand cubic feet (Mcf) and an annual rate adjustment to account for changing market conditions.[34] For FY 2013-14, the tax rate is 11.8 cents per Mcf of natural gas produced.[35] Louisiana also levies an Oil Field Restoration Fee on both oil and gas production, currently at $0.003 per Mcf of natural gas produced.[36]

Modeled Production Incentives

- **Horizontal Well:** Severance tax on a horizontally drilled well that commences production after July 31, 1994 is suspended for 24 months from the date of production or until payout of drilling and completion costs is achieved, whichever occurs first.[37]
- **Minimum Daily Production:** A well that that is incapable of producing an average of 250,000 cubic feet per day during the entire taxable month qualifies for a reduced severance tax rate of 1.3 cents per Mcf.[38]

Effective Severance Tax Rates

The base rate, which has been constant over the past several years, is multiplied by the gas base rate adjustment to calculate the applicable tax rate. The effective tax rate is higher in the high production and high price scenario due to an accelerated well payout, and lower in the low production scenarios due to longer periods in which wells are taxed at 1.3 cents per Mcf.

Louisiana Effective Severance Tax Rate

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Total Market Value (000s)[1]	$51,901	$40,914	$26,010	$20,506
Computed Tax Liability (000s)[1]	1,730	1,328	630	519
Effective Tax Rate[2]	3.3%	3.2%	2.4%	2.6%

[1] Amounts unadjusted for time value. See Appendix A for net present value computations.

[2] Equal to net present value of computed tax liability divided by net present value of market value.

[34] The adjustment is a fraction, the numerator of which is the Henry Hub spot price in dollars per MMBtu for the 12-month period ending March 31st, and the denominator of which is the price of gas fuels delivered into pipelines in Louisiana as reported by the Natural Gas Clearing House for the 12-month period ending March 31, 1990. See bulletin, State of Louisiana, Department of Revenue at http://www.revenue.louisiana.gov/forms/lawspolicies/RIB%2013-011.pdf.

[35] La. Rev. Stat. Ann. §47:633.

[36] See Oilfield Site Restoration (OSR) Program at http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=155#Funding.

[37] La. Rev. Stat. Ann. §47:633(7)(c)(iii). Based on a conversation with representatives from the Louisiana Department of Natural Resources, the analysis assumes payout in 12 months in the high production and high price scenario and 18 months in the high production and low price scenario.

[38] La. Rev. Stat. Ann. §47:633(9)(c).

Michigan

Michigan levies a severance tax of 5.0 percent on the gross cash market value of natural gas produced and an additional fee, not to exceed 1.0 percent of the gross cash market value, for oil and gas conservation.[39,40] The conservation fee is calculated each year based on the state's production forecast. For calendar year 2014, the fee is 0.92 percent of gross cash market value.[41] The analysis holds the fee constant at 0.92 percent for all future years.

Modeled Production Incentives

Michigan does not offer any significant production incentives for natural gas extraction.

Effective Severance Tax Rates

The effective tax rate is invariant to the price and production scenarios because the tax is levied upon market value without any significant production incentives.

Michigan Effective Severance Tax Rate

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Total Market Value (000s)[1]	$51,901	$40,914	$26,010	$20,506
Computed Tax Liability (000s)[1]	3,073	2,422	1,540	1,214
Effective Tax Rate[2]	5.9%	5.9%	5.9%	5.9%

[1] Amounts unadjusted for time value. See Appendix A for net present value computations.

[2] Equal to net present value of computed tax liability divided by net present value of market value.

[39] Mich. Comp. Laws §205.303.

[40] Mich. Comp. Laws §205.303(1). Gross cash market value of all production shall be computed as of the time when and at the place where the production was severed or taken from the soil immediately after the severance.

[41] See State of Michigan, Department of Treasury, Notice of Oil and Gas Fee Rate, 2014 at http://www.michigan.gov/documents/taxes/OilGasRate2014_443092_7.pdf.

North Dakota

North Dakota levies a volume-based severance tax that is adjusted on an annual basis. For FY 2013-14, the rate is 8.33 cents per thousand cubic (Mcf) feet of natural gas produced.[42] The tax rate is adjusted each fiscal year based on the annual increase in the average producer price index for gas fuels, as published by the U.S. Bureau of Labor Statistics.[43]

Modeled Production Incentives

North Dakota does not offer any significant production incentives for natural gas extraction.

Effective Severance Tax Rates

The analysis assumes that the producer price index grows at the same rate as the EIA's forecast of the Henry Hub spot price because the producer price index for gas fuels is highly correlated with the Henry Hub spot price. The effective tax rates vary slightly in response to the price scenarios.

North Dakota Effective Severance Tax Rate

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Total Market Value (000s)[1]	$51,901	$40,914	$26,010	$20,506
Computed Tax Liability (000s)[1]	1,214	1,013	608	507
Effective Tax Rate[2]	2.3%	2.5%	2.3%	2.5%

[1] Amounts unadjusted for time value. See Appendix A for net present value computations.

[2] Equal to net present value of computed tax liability divided by net present value of market value.

[42] N.D. Cent. Code §57-51-02.2.

[43] See State of North Dakota, Office of State Tax Commissioner, Gas Tax Rate Notice at http://www.nd.gov/tax/oilgas/pubs/gasrate.pdf?20140115115335. The gas fuels price index is divided by the denominator specified in the statute (75.7) and the quotient is then multiplied by $0.04 to calculate the adjusted severance tax rate.

Ohio

Ohio levies a volume-based severance tax. The tax rate is 2.5 cents per thousand cubic feet (Mcf).[44] An additional gas regulatory cost recovery assessment fee of 0.5 cents per Mcf is imposed on the well owner.[45]

Modeled Production Incentives

Ohio does not offer any significant production incentives for natural gas extraction.

Effective Severance Tax Rates

The 3.0 cent per Mcf tax is applied to projected volume under the four scenarios. The effective tax rate increases under the low price scenarios because the market value decreases, but tax liability does not change.

Ohio Effective Severance Tax Rate

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Total Market Value (000s)[1]	$51,901	$40,914	$26,010	$20,506
Computed Tax Liability (000s)[1]	301	301	150	150
Effective Tax Rate[2]	0.6%	0.8%	0.6%	0.8%

[1] Amounts unadjusted for time value. See Appendix A for net present value computations.

[2] Equal to net present value of computed tax liability divided by net present value of market value.

[44] Ohio Rev. Code Ann. §5749.02.

[45] Ohio Rev. Code §1509.50(A). The owner may designate a severer who must pay the owner's assessment on their behalf on the severance tax return. The severer may then recoup from the owner the amount of the assessment.

Oklahoma

Oklahoma levies a severance tax of 7.0 percent on the gross market value of natural gas.[46,47] In addition, the Oklahoma Tax Commission levies an 0.095 percent excise tax for regulatory purposes on the gross market value of gas and the Oklahoma Corporation Commission levies an oil and gas production fee of $0.00015 per thousand cubic feet (Mcf) to fund certain activities.

Modeled Production Incentives

- **Horizontal Well:** Natural gas production initiated on or after July 1, 2011, and prior to July 1, 2015 from a horizontal well is subject to a reduced rate of 1.0 percent for a period of 48 months from the date of initial production.[48]

Effective Severance Tax Rates

The effective tax rate does not vary across the four scenarios because under each scenario, the well qualifies for the reduced tax rate. The computed effective tax rate of 3.9 percent represents a weighted average of the 7.0 percent statutory rate and the 1.0 percent reduced rate.

Oklahoma Effective Severance Tax Rate

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Total Market Value (000s)[1]	$51,901	$40,914	$26,010	$20,506
Computed Tax Liability (000s)[1]	2,363	1,869	1,183	936
Effective Tax Rate[2]	3.9%	3.9%	3.9%	3.9%

[1] Amounts unadjusted for time value. See Appendix A for net present value computations.

[2] Equal to net present value of computed tax liability divided by net present value of market value.

[46] Okla. Stat. tit. 68, §1001.B (4)(5).

[47] Rule 710:45-9-100. A producer of natural gas may deduct the marketing costs for the gas produced when computing the gross value subject to the state's gross production tax. Marketing costs are the nonproduction costs incurred by the producer to enable the producer to transport the gas from the well to the market.

[48] Okla. Stat. tit. 68, §1001.E(3) (4).

Texas

Texas levies a severance tax of 7.5 percent on the market value of gas produced and an Oil and Gas Field Clean-Up Regulatory Fee of $0.00067 per thousand cubic feet (Mcf).[49, 50,51]

Modeled Production Incentives

- **High-Cost Well:** High-cost wells qualify for a reduced tax rate.[52] The reduced rate is computed by subtracting from the statutory tax rate the product of the statutory tax rate and the ratio of (1) drilling and completion costs incurred for the new well to (2) twice the median drilling and completion costs for high-cost wells spudded or completed during the previous fiscal year. (For example, if the cost of the well is equal to the median cost from the previous year, then the applicable tax rate is 3.75 percent. If the cost is twice the median, then the applicable tax rate is zero.) The rate reduction remains effective for 120 months from the date of production or until the savings from tax reduction exceed 50 percent of the drilling and completion costs.[53] The analysis assumes a reduced tax rate of 2.8 percent based on data from the Texas Legislative Budget Board.[54]

Effective Severance Tax Rates

The effective tax rate is invariant to price and production assumptions because the tax base uses market value and producers qualify for the reduced tax rate for 120 months under all scenarios.

Texas Effective Severance Tax Rate

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Total Market Value (000s)[1]	$51,901	$40,914	$26,010	$20,506
Computed Tax Liability (000s)[1]	2,168	1,715	1,094	866
Effective Tax Rate[2]	3.7%	3.7%	3.7%	3.7%

[1] Amounts unadjusted for time value. See Appendix A for net present value computations.
[2] Equal to net present value of computed tax liability divided by net present value of market value.

[49] Texas Natural Resources Code - Section 91.111. Oil-Field Cleanup Fund.
[50] Tex. Tax Code Ann. §201.052.
[51] Tex. Tax Code Ann. §201.101. Market value is the value of the gas at the mouth of the well from which it is produced. This is determined by ascertaining the producer's actual marketing costs and subtracting those costs from the producer's gross cash receipts from the sale of gas.
[52] High cost wells are defined based on geological formations or the processes used to produce the gas, including: wells that exceed a depth of 15,000 feet; geo-pressured brine operations; occluded natural gas produced from coal seams; gas from Devonian shale; and other conditions deemed to be high-cost by the Federal Energy Regulatory Commission. The Texas Legislative Budget Board notes that all wells in the Barnett and Eagle Ford shale plays qualify as high-cost wells regardless of actual drilling costs. See "Modify the High-Cost Gas Tax Rate Reduction to Increase Its Cost Transparency and Effectiveness," at http://www.lbb.state.tx.us/Documents/Publications/GEER/Government%20Effectiveness%20and%20Efficiency%20Report%202012.pdf#ModifyTheHighCost.
[53] Tex. Tax Code Ann. §201.057. Based on a conversation with Texas officials, the analysis assumes payout is not achieved within 120 months in all scenarios of the analysis.
[54] For FY 2009, the data suggest an average reduced rate of 3.6 percent. For FY 2011, the Texas Legislative Budget Board estimates an average reduced rate of 1.8 percent, due to the unusually large differential (82 percent) between the average and median cost used in the computation. The analysis assumes a 25 percent differential between the average and median costs, which implies an average reduced rate of 2.8 percent.

West Virginia

West Virginia levies a severance tax of 5.0 percent on the gross value of gas.[55] The state also levies a volume-based tax of 4.7 cents per thousand cubic feet (Mcf) of gas to service debt for workers' compensation payments.[56] As per current law, the analysis assumes that the volume-based levy expires at the end of calendar year 2018.

Modeled Production Incentives

- **Minimum Daily Production:** Wells producing less than 5,000 cubic feet of gas per day are exempt from severance tax.[57] The analysis identifies the year in which the exemption becomes effective by dividing the projected annual production by 365 days.

Effective Severance Tax Rates

The effective tax rates are slightly higher in the low price scenarios due to the workers' compensation tax. The workers' compensation tax is not dependent on price assumptions; therefore, the tax comprises a higher share of market value under the low price scenarios.

West Virginia Effective Severance Tax Rate

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Total Market Value (000s)[1]	$51,901	$40,914	$26,010	$20,506
Computed Tax Liability (000s)[1]	2,874	2,325	1,440	1,165
Effective Tax Rate[2]	5.7%	5.8%	5.7%	5.8%

[1] Amounts unadjusted for time value. See Appendix A for net present value computations.

[2] Equal to net present value of computed tax liability divided by net present value of market value.

[55] W. Va. Code §11-13A-3a. Gross value is the value of the natural gas at the wellhead immediately preceding transportation and transmission.

[56] Ibid. Based on a conversation with the West Virginia Department of Revenue, Research and Development Division, the provision sunsets after 2018. The analysis assumes that the levy is not extended.

[57] W.Va. Code §11-13A-3a.

Section 3: Other Taxes and Fees

This section discusses other taxes and fees that may be paid or remitted by natural gas extractors. Many taxes and fees, such as sales and use taxes, are not easily quantified and do not lend themselves to interstate comparisons. In those instances, the analysis merely describes the levies in a particular state. In certain states, local units levy tax on the market value of natural gas sales (Colorado and Virginia) or the value of natural gas reserves (Arkansas, Ohio, Texas and West Virginia). For those states, the analysis computes a local effective tax rate. Section 4 combines the effective tax rates for state severance and certain local taxes into a single metric that can be used across comparison states. This methodology is consistent with existing reports that make interstate comparisons.[58]

Local Taxes: Real Property and Other Taxes

Local units in six comparison states levy local taxes on the fair market value of natural gas reserves or annual sales. (See Table 3.1.) For these states, the analysis estimates tax liability and an effective tax rate. Like severance taxes, local tax levies on natural gas reserves are triggered by production activity.[59]

For the six states where local units levy a tax, Appendix A provides a description of the computation. Local units reassess the value of natural gas reserves every year based on recent production and price data. The assessment provides a rough approximation of the fair market value of the gas reserves. Alternatively, the assessment approximates (1) the present value of all profits from the future sale of natural gas reserves or (2) the price an investor would be willing to pay for the right to receive all future income from the property. The effective tax rate computation uses the same methodology as the severance tax computations from the previous section. (See Table 3.2.) The numerator is equal to the net present value of all future local tax liability and the denominator is equal to the net present value of output or sales from the well.

[58] See "Unconventional Oil and Natural Gas Production Tax Rates: How Does Oklahoma Compare to Peers?," Headwaters Economics, August 2013 at http://headwaterseconomics.org/wphw/wpcontent/uploads/State_tax_comparison_study.pdf and "Analysis of Ohio Severance Tax Provisions of H.B. 487," Ernst & Young, May 2012.at http://jobs-ohio.com/images/Ernst-Young-Severance-Tax-Analysis-Prepared-for-the-Ohio-Business-Roundtable-5-15-12.pdf.

[59] Local units do not levy property tax until production begins because the value of the reserves cannot be determined until that time.

Table 3.1
Local Real Property Taxes on Natural Gas Reserves and Other Levies

State	Status	Description
PA	Exempt	Natural gas reserves are not included in the assessed value of real property.
AR	Taxable	Assessed at up to 20 percent of full market or actual value, mineral rights held separately from surface rights are assessed separately.
CO	Taxable	Gas properties are assessed at 87.5 percent of the selling price of gas from the preceding year.
LA	Exempt	Taxes on gas leases or rights in addition to the severance tax, or the addition of value to an assessment due to gas, are prohibited.
MI	Exempt	Severance tax imposed in lieu of most taxes on gas.
ND	Exempt	Gross production tax in lieu of ad valorem tax on gas property.
OH	Taxable	Specified percentage of true value in money, counties may increase/decrease assessment if gas present.
OK	Exempt	Gross production tax in lieu of real property tax.
TX	Taxable	Assessment varies and can be based on future sales, production or ownership.
VA	Taxable	All mineral lands and improvements are assessed at fair market value. A county or city may impose the gross license tax as an alternative.
WV	Taxable	Valuation of gas property determined through capitalization of income.

Source: Wolters Kluwer CCH.

Table 3.2
Effective Local Tax Rates[1]

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
Pennsylvania	n.a.	n.a.	n.a.	n.a.
Arkansas	0.9%	1.0%	0.9%	1.0%
Colorado[2]	0.9	0.9	1.0	1.1
Louisiana	n.a.	n.a.	n.a.	n.a.
Michigan	n.a.	n.a.	n.a.	n.a.
North Dakota	n.a.	n.a.	n.a.	n.a.
Ohio	0.8	1.0	0.8	1.0
Oklahoma	n.a.	n.a.	n.a.	n.a.
Texas	0.9	0.9	0.9	0.9
Virginia	3.0	3.0	3.0	3.0
West Virginia	1.8	1.7	1.5	1.4

[1] Equal to net present value of total tax liability divided by net present value of market value.
[2] Effective tax rates exclude property tax liability used as a credit against state severance tax.

Income Taxes

Table 3.3 lists the corporate and personal income tax rates for the 11 comparison states. The table shows that Pennsylvania levies the highest statutory corporate income tax rate (9.99 percent) and the lowest personal income tax rate (3.07 percent), yielding a differential of 6.92 percentage points. However, the effective differential is likely less stark. If the natural gas extractor is a multistate C corporation, then it is possible that the effective tax rate on Pennsylvania profits could be less than 9.99 percent for reasons discussed below. Conversely, various limitations likely increase the effective Pennsylvania personal income tax rate above 3.07 percent.

Corporate Income Tax

Under the simplest scenario of corporate income tax liability, a firm operates only in Pennsylvania and reports a profit. In that case, a firm would remit tax using the statutory 9.99 percent rate.[60] However, the vast majority of corporate natural gas extraction is reported by multistate corporations. For those firms, the effective corporate income tax rate on Pennsylvania profits could be very different than the statutory rate of 9.99 percent for the following reasons:

- A multistate firm must apportion income to Pennsylvania based only on sales. For example, if 20 percent of total sales occur in Pennsylvania, then only 20 percent of firm-wide profits are apportioned to Pennsylvania and are subject to the 9.99 percent tax rate. Data from the Pennsylvania Department of Revenue suggest that the weighted average apportionment factor for natural gas extractors and related firms that report a profit ranges from 5 to 15 percent.[61]
- If the computed apportionment factor yields actual profits attributable to Pennsylvania, then the statutory rate of 9.99 percent would be applicable. However, if the apportionment factor yields a tax base that understates profits attributable to Pennsylvania operations, then the effective rate is less than 9.99 percent. Because states use different apportionment formulas, it is also possible that Pennsylvania profits could be taxed more than once or not at all.
- State corporate income taxes are deductible for federal income tax purposes. For most profitable corporations, the statutory federal tax rate is 35 percent. Deductibility reduces the net "cost" of the state corporate income tax by 35 percent. For Pennsylvania, federal deductibility reduces the net rate from 9.99 percent to 6.50 percent for most profitable firms.

State statutory corporate income tax rates can only be compared if the income that is apportioned across the various states provides an accurate representation of the profits that originate in those states. That outcome is highly unlikely because states use many different apportionment formulas that reflect choices of state policymakers. Due to these complications, the exact effective corporate income tax rate levied on profits attributable to Pennsylvania operations cannot be computed because it will depend upon the tax codes of the other states in which the firm operates, the states' apportionment rules (e.g., double weighted sales) and the firm's sales, property and payroll factors in various states.

[60] If a firm reports a tax loss, the loss may be carried forward to future tax years to offset taxable income in those years. Net operating loss deductions may not exceed the lesser of $5 million or 30 percent of taxable income for tax year 2015 and later. The restriction on net operating loss deductions increases the effective corporate income tax rate.

[61] Using a 100 percent sales factor formula. Includes Pennsylvania-only firms that do not apportion income.

Ohio and Texas do not levy a corporate income tax. For those states, any comparison is further complicated by their unique tax regimes:

- In Ohio, all natural gas companies are subject to a public utility excise tax imposed on taxable gross receipts. This tax is imposed in lieu of Ohio's corporate franchise and commercial activities taxes. Receipts derived entirely from interstate business and sales to other public utilities for resale are exempt from tax.[62]
- Texas imposes a franchise tax, also known as a business margins tax, on the gross receipts of most entities (including C corporations, S corporations, partnerships and limited liability companies) doing business within the state. The tax calculation allows deductions for compensation paid or the cost of goods sold. Gross receipts are apportioned to Texas using a single sales factor.

Personal Income Tax

Entities that are not organized as a C corporation are known as pass through entities. These entities include S corporations, partnerships, sole proprietorships and limited liability companies. Firms that use these business structures are not taxed at the entity level. Rather, the firm passes profits to individual owners, shareholders or partners of the firm who then remit the taxes to which they are subject. C corporations may be passive or active partners in a partnership, and if income is passed through to them, then the firm would apportion the income and remit corporate income tax. Although many extractors that operate in the Marcellus shale are organized as pass through entities, it is not known (1) what share of income is passed through to a corporate partner or (2) the amount of that income that would be reported on a Pennsylvania tax return.

Table 3.3 reveals that Pennsylvania levies the lowest personal income tax rate among comparison states. However, for owners and shareholders of pass through entities, the effective tax rate may be higher due to certain limitations imposed by the Pennsylvania tax code:

- For Pennsylvania income tax purposes, losses of pass through entities can only be used in the year of the loss to offset other business income. This restriction likely raises the long-term effective personal income tax rate to some level above 3.07 percent because many firms may not be able to utilize tax losses, and those tax losses represent legitimate business expenses that cannot be deducted from income.
- The treatment of intangible drilling costs (IDCs) may also increase the effective personal income tax rate. These costs include resource surveying, site preparation, engineering, repairs and various labor costs necessary to prepare a well for production.[63] At the state level, the IDC deduction is dependent upon the business structure of the taxpayer. Integrated C corporations can deduct 70 percent of their IDCs in the year incurred to determine taxable income; the remainder is amortized over five years. However, partners or shareholders of pass-through entities may only deduct up to one-third of their IDCs for personal income tax purposes and must amortize the remainder over ten years.[64,65]

[62] See Ohio Department of Taxation publication at http://www.tax.ohio.gov/Portals/0/communications/publications/annual_reports/2012_annual_report/2012_AR_Section_2_Public_Utility_Excise_Tax.pdf.
[63] The American Petroleum Institute notes that IDCs typically comprise 60 to 80 percent of total well cost.
[64] Information Notice: Personal Income Tax 2013-04, Intangible Drilling and Development Costs, Pennsylvania Department of Revenue. (December 02, 2013).

Table 3.3
Corporate and Personal Income Tax Rates
(Tax Year 2014)

State	Apportionment	Corporate	Personal
PA	Single Sales Factor	9.99%	3.07%
AR	Double Weighted Sales	6.50	7.00[1]
CO	Single Sales Factor	4.63	4.63
LA	Three Factor	8.00	6.00
MI	Single Sales Factor	6.00	4.25
ND	Three Factor	4.53	3.22
OH	N/A	4.75[2]	5.42
OK	Three Factor[3]	6.00	None
TX	Single Sales Factor	0.975[4]	None
VA	Double Weighted Sales	6.00	5.75
WV	Double Weighted Sales	6.50	6.50

[1] Tax rate is reduced to 6.9% in tax years beginning after 2014.
[2] Public Utility Excise Tax imposed on gross receipts (4.75%) for most entities. Sales to other public utilities for resale and receipts derived entirely from interstate business are exempt.
[3] Double weighted sales for an investment of $200 million or more.
[4] Franchise Margin Tax is 0.975% for most entities.

Other Taxes and Fees

Certain states levy tangible personal property taxes on natural gas machinery and equipment. Severance taxes in North Dakota and Oklahoma are levied in lieu of personal property taxes. Exemptions for certain types of machinery and equipment (e.g., offshore rigs and storage tanks) vary by state. Ohio and Pennsylvania do not levy a personal property tax. (See Table 3.4.)

All comparison states levy state-level sales and use taxes. Some states grant broad exemptions for goods and services used for natural resource extraction. Certain states have more specific exemptions for natural gas development and drilling. All comparison states, with the exception of Michigan, authorize some form of local sales and use tax. Pennsylvania authorizes an additional levy of 1.0 percent for Allegheny County and 2.0 percent for Philadelphia.

Permits to drill a natural gas well are usually issued by a state regulatory authority. Fees associated with drilling permits can be a function of well depth and type. All drilling permit fees in Table 3.4 apply, but are not limited, to horizontal, unconventional wells.

Bonds are financial assurance for the costs of plugging wells and reclaiming well sites once production has ceased. Bonds can be collected on a per well basis or as blanket bonds for multiple wells. In some states, financial statements detailing assets are accepted in lieu of bonds. All bonds in Table 3.4 apply, but are not limited, to horizontal, unconventional wells.

[65] Independent producers may immediately deduct 100 percent of these IDCs on their federal income tax return.

Table 3.4
All Other Taxes and Fees by State

State	Personal Property: Gas Machinery & Equipment	State Sales & Use Tax Rate	Presence of Local Sales and Use Taxes	Permit per Well	Bond per Well
PA	**Exempt** - Tangible personal property is not subject to tax.	**6%** - Goods and services used in extraction are exempt.	**Yes** - 2% in Philadelphia, 1% in Allegheny County.	**$5,000**	**$10,000** - $140,000-$600,000 blanket bond for multiple wells based on the number of wells.
AR	**Taxable** - Personal property valued by assessor at usual selling price of similar property at time of listing.	**6.5%** - Certain goods to construct gas rigs are exempt.	**Yes** - Up to 3% for counties and up to 3.5% for cities.	**$300**	**$3,000 - $25,000**- $100,000 blanket bond for multiple wells.
CO	**Taxable** – No specific statutory provisions concerning the taxation of gas machinery and equipment.	**2.9%** - Fuel used in gas production and exploration is exempt.	**Yes** - No statutory limit.	**$0**	**$10,000 - $20,000** - Based on depth, $20,000-$100,000 blanket bond for multiple wells.
LA	**Taxable** - Certain drilling rigs may be exempt if approved by a parish.	**4%** - Various exemptions exist for goods and services used in the production of gas.	**Yes** - Up to 6% for counties and up to 5.99% for cities.	**$252 - $2,528** - Based on depth.	**$1 - $3 per foot** - $25,000-$250,000 blanket bond for multiple wells.
MI	**Taxable** - Certain tanks housed and used on residential and agricultural property are exempt.	**6%** - Sales of goods to extractive operators are exempt.	**No**	**$300**	**$10,000-$30,000** - Based on depth, $100,000-$250,000 blanket bond for multiple wells based on depth.
ND	**Exempt** - Gross production tax in lieu of ad valorem tax on gas machinery and equipment.	**5%** - Certain goods used to recover, compress, process, gather or refine gas are exempt.	**Yes** - Up to 3%.	**$100**	**$50,000 - $100,000** blanket bond for up to 6 wells.

Table 3.4
All Other Taxes and Fees by State

State	Personal Property: Gas Machinery & Equipment	State Sales & Use Tax Rate	Presence of Local Sales and Use Taxes	Permit per Well	Bond per Well
OH	**Exempt** - Certain equipment may be taxed as real property; however, tangible personal property tax phased out between 2005 and 2009.	**5.75%** - Goods used in the mining of natural resources are exempt.	**Yes** - Up to 1.5% for counties and transit districts.	**$500 - $1,000** - Based on area and population, additional $250 to expedite and $5,000 for mandatory pooling.	**$5,000 - $15,000** blanket bond for multiple wells, financial statements for certain operators may be accepted in lieu of bond.
OK	**Exempt** - Gross production tax on gas in lieu of personal property tax.	**4.5%** - Goods and services used in the production of gas are taxable.	**Yes** - Up to 2% for counties and special taxing jurisdictions.	**$175**	**$25,000** - Financial statements for certain operators may be accepted in lieu of bond.
TX	**Taxable** - Income-producing personal property is taxable, certain offshore gas rigs and equipment is exempt.	**6.25%** - Goods and services used in initial production, or increasing production, of gas are exempt.	**Yes** - Up to 2%.	**$500 - $750** - Based on depth. Includes 150% surcharge, additional $500 for exceptions to Statewide Rules and $375 to expedite.	**$2 per foot** - $25,000-$250,000 blanket bond for multiple wells.
VA	**Taxable** - Subject to local taxation as tangible personal property.	**4.3%** - Goods used in drilling, extraction and processing of gas and well reclamation are exempt.	**Yes** - Up to 1%.	**$650**	**$10,000** - Plus $2,000 per acre of land, maximum $100,000 blanket bond for multiple wells.
WV	**Taxable** - Unless fixed to structures and taxed as real property.	**6%** - Goods and services used in the production of natural resources are exempt.	**Yes** - Up to 1% for municipalities and excise tax up to 6% for special districts.	**$10,150**	**$50,000** - $250,000 blanket bond for multiple wells.

Source: Tax information from Wolters Kluwer CCH, fee and bond information from environmental/oil and gas regulatory departments of selected states.

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Section 4: Summary

This report computes effective tax rates of state and local levies on the production of shale gas in Pennsylvania and ten comparison states. The computations use a market value tax base to facilitate comparisons across the states. For the purpose of this analysis, the Pennsylvania impact fee is treated as a levy on production. Table 4.1 summarizes the effective tax rates by production level and price scenario. The state and local components are listed separately.

Table 4.1
Effective Tax Rates by State, Production Level and Price Scenario

	Low Production					
	Low Price			High Price		
State	State	Local	Total	State	Local	Total
Pennsylvania	1.6%	n.a.	1.6%	1.3%	n.a.	1.3%
Arkansas	3.2	1.0%	4.2	3.2	0.9%	4.1
Colorado[1]	4.5	1.1	5.6	4.6	1.0	5.6
Louisiana	2.6	n.a.	2.6	2.4	n.a.	2.4
Michigan	5.9	n.a.	5.9	5.9	n.a.	5.9
North Dakota	2.5	n.a.	2.5	2.3	n.a.	2.3
Ohio	0.8	1.0	1.8	0.6	0.8	1.4
Oklahoma	3.9	n.a.	3.9	3.9	n.a.	3.9
Texas	3.7	0.9	4.6	3.7	0.9	4.6
Virginia	n.a.	3.0	3.0	n.a.	3.0	3.0
West Virginia	5.8	1.4	7.2	5.7	1.5	7.2

	High Production					
	Low Price			High Price		
State	State	Local	Total	State	Local	Total
Pennsylvania	0.8%	n.a.	0.8%	0.6%	n.a.	0.6%
Arkansas	3.3	1.0%	4.3	3.6	0.9%	4.5
Colorado[1]	4.8	0.9	5.7	4.8	0.9	5.7
Louisiana	3.2	n.a.	3.2	3.3	n.a.	3.3
Michigan	5.9	n.a.	5.9	5.9	n.a.	5.9
North Dakota	2.5	n.a.	2.5	2.3	n.a.	2.3
Ohio	0.8	1.0	1.8	0.6	0.8	1.4
Oklahoma	3.9	n.a.	3.9	3.9	n.a.	3.9
Texas	3.7	0.9	4.6	3.7	0.9	4.6
Virginia	n.a.	3.0	3.0	n.a.	3.0	3.0
West Virginia	5.8	1.7	7.5	5.7	1.8	7.5

[1] Local effective tax rates exclude property tax liability used as a credit against state severance tax.

Methodology and Scope

Differences in tax systems complicate efforts to compare the taxes levied on natural gas extractors across states. In order to overcome some of those differences, the analysis uses a standard metric, the effective tax rate, to compare severance and certain local taxes levied on unconventional gas production.

The effective tax rate is computed under four scenarios based on two production levels and two gas price levels, which are held constant across the comparison states. The production levels are designed to provide a reasonable range for the estimated ultimate recovery (EUR) of a Pennsylvania Marcellus shale well that begins production in 2014. The price levels are based on the Energy Information Administration (EIA) Henry Hub spot price forecast. Severance taxes are modeled for each state under the different scenarios using the rates, exemptions and incentives applicable to the state. The effective tax rate is equal to the net present value of the severance and certain local tax liabilities divided by the net present value of the market value of gas produced under each scenario.

In addition to state severance taxes and related fees, the analysis addresses other state and local taxes that are related to natural gas production.

- Local taxes imposed on the value of natural gas reserves or annual gas sales are estimated separately and included in the total effective tax rate for each state.
- Corporate income, personal income, personal property and sales taxes are discussed. However, data do not exist to quantify those taxes adequately and they are not included in the effective tax rate computations.

The following caveats are important for proper interpretation and utilization of the analysis:

- The effective tax rates for each scenario are based on the net present value of both severance and certain local tax liabilities and market value of production from a single well over a 30 year horizon. They are neither annual rates, nor averages across all wells.
- The volume of gas that can be extracted from a single Pennsylvania Marcellus shale well has increased significantly in recent years. The production levels in this analysis establish an appropriate range for a new well, but they may not be representative of a legacy well.
- While the analysis is conducive to a comparison of state severance tax policies, it cannot be used to estimate the aggregate amount of tax revenues that would be generated by a particular policy because it does not project the number of new wells or the production from new or legacy wells.

Effective Tax Rates

The analysis finds that Pennsylvania has the lowest total effective tax rate (includes state severance and certain local taxes) among the comparison states under each of the four scenarios. If one considers only state severance taxes, then Pennsylvania's effective tax rate is second lowest in the low production scenario, and it is tied for lowest in the high production scenario.

The effective tax rate of the Pennsylvania impact fee displays an inverse relationship to the price of gas and the volume of production. The rate decreases when either price or volume increases because the impact fee is assessed on a fixed schedule based on the length of time since the well spud date. The fee does not vary based on price or production except in very limited circumstances, and then with only modest adjustments.

In contrast to Pennsylvania, other states levy severance taxes based on market value or volume of gas extracted. The effective tax rate for a value-based tax generally is unaffected by production and price assumptions.[66] The effective tax rate for a volume-based tax (Arkansas, Louisiana and Ohio) will vary based on price, but it is unaffected by production assumptions.

Table 4.2 displays the differences in the total effective tax rates (includes state severance and certain local taxes) among the states. The final column displays the variation between the lowest and highest effective tax rate for each state. Pennsylvania has the highest variation in rates across the four scenarios in this study. In contrast, seven states have an effective tax rate that displays little or no response to price or production assumptions.

Table 4.2
State Variations in Total Effective Tax Rates
By Production Level and Price Scenario

	Low Production		High Production		Variation in Effective Rate
	Low Price	High Price	Low Price	High Price	
Pennsylvania	1.6%	1.3%	0.8%	0.6%	1.0%
Arkansas	4.2	4.1	4.3	4.5	0.4
Colorado	5.6	5.6	5.7	5.7	0.1
Louisiana	2.6	2.4	3.2	3.3	0.9
Michigan	5.9	5.9	5.9	5.9	-
North Dakota	2.5	2.3	2.5	2.3	0.2
Ohio	1.8	1.4	1.8	1.4	0.4
Oklahoma	3.9	3.9	3.9	3.9	-
Texas	4.6	4.6	4.6	4.6	-
Virginia	3.0	3.0	3.0	3.0	-
West Virginia	7.2	7.2	7.5	7.5	0.3

[66] However, certain exemptions and production incentives may cause the effective tax rate to vary in states that levy severance taxes based on market value.

Income and Other Taxes

Taxes on corporate income, personal income, sales and tangible personal property differ significantly across states. These taxes are not easily quantified using available public data. Furthermore, dissimilarities in the tax base, administration and compliance costs among the states dilute the value of comparisons based on statutory tax rates.

In particular, two apportionment issues cloud comparisons of state income tax systems:

- The statutory corporate income tax rate may be a poor indicator of the corporate tax burden in a particular state because the net income of a multistate corporation is apportioned by statutory formula across the states in which the firm operates. States use many different rules to determine and apportion the tax base; therefore, the net income apportioned to a state may be very different than the profits generated by activities in that state.
- Corporate partners or members of a pass through entity must report their share of profit from the pass through entity on their corporate tax return. The net income is then apportioned to each state in which the corporation operates, according to the rules and formula applicable to each state. Therefore, profits derived from a pass through entity's activities in a state may not correspond to its net income ultimately apportioned to the state.

APPENDIX A

Appendix A provides further detail regarding state tax bases, production incentives and effective tax rate computations. Production incentives that affect tax liability and have been modeled are labeled accordingly. Production incentives that have minor or no impact on tax liability have not been modeled and are labeled accordingly.

Pennsylvania

Tax Rate and Base

The Pennsylvania impact fee is levied at tiered amounts. The fee is levied annually for 15 years, beginning with the year the well was drilled.

Pennsylvania Impact Fee Schedule for 2013

(NYMEX)	$0.00-$2.25	$2.26-$2.99	$3.00-$4.99	$5.00-$5.99	≥$6.00
Year 1	$40,000	$45,000	$50,000	$55,000	$60,000
Year 2	30,000	35,000	40,000	45,000	55,000
Year 3	25,000	30,000	30,000	40,000	50,000
Years 4-10	10,000	15,000	20,000	20,000	20,000
Years 11-15	5,000	5,000	10,000	10,000	10,000

Source: Pennsylvania Public Utility Commission, Act 13 Impact Fee.

The fee is levied on unconventional wells. The amount of the fee is determined by the age of the well, the type of well (horizontal or vertical) and the average annual price of natural gas on the New York Mercantile Exchange (NYMEX) (i.e., the Henry Hub spot price in dollars per MMB-tu). In future years the fee may be adjusted by the regional consumer price index for all urban consumers if there is year-over-year growth in the number of Pennsylvania unconventional wells drilled.[67]

Production Incentives

- **Minimum Daily Production:** (modeled) Wells producing less than 90,000 cubic feet per day are exempt after three years of mandatory impact fee payments.[68] A well that resumes production after suspension of the fee and produces less than 90,000 cubic feet per day remains exempt.[69]
- **Miscellaneous:** (not modeled) Vertical unconventional gas wells pay only 20 percent of the fee established for horizontal, unconventional gas wells.[70]

[67] 58 Pa.C.S § 2301, 2302.
[68] See Pennsylvania Bulletin at http://www.pabulletin.com/secure/data/vol42/42-21/998.html.
[69] 58 Pa.C.S. § 2302 (b.1).
[70] 58 Pa.C.S. § 2302 (f).

Tax Liability and Effective Tax Rates

The following table presents the impact fee forecast for Pennsylvania based on the four price and production scenarios described in the main body of the report.

Impact Fee ($000s) and Effective Tax Rates: Pennsylvania

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
2014	$50.0	$50.0	$50.0	$50.0
2015	40.0	40.0	40.0	40.0
2016	30.0	30.0	30.0	30.0
2017	20.0	20.0	20.0	20.0
2018	20.0	20.0	20.0	20.0
2019-2023	100.0	100.0	100.0	100.0
2024-2028	50.0	50.0	50.0	50.0
2029-2033	0.0	0.0	0.0	0.0
2034-2038	0.0	0.0	0.0	0.0
2039-2043	0.0	0.0	0.0	0.0
Total Fees	310.0	310.0	310.0	310.0
Discounted Amount	242.3	242.3	242.3	242.3
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**0.6%**	**0.8%**	**1.3%**	**1.6%**

The following table presents the alternative impact fee forecast for Pennsylvania assuming year-over-year growth in the number of unconventional wells drilled.

Impact Fee ($000s) and Effective Tax Rates: Pennsylvania Alternative

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
2014	$50.0	$50.0	$50.0	$50.0
2015	40.7	40.7	40.7	40.7
2016	30.5	30.5	30.5	30.5
2017	20.3	20.3	20.3	20.3
2018	20.4	20.4	20.4	20.4
2019-2023	101.6	101.6	101.6	101.6
2024-2028	50.8	50.8	50.8	50.8
2029-2033	0.0	0.0	0.0	0.0
2034-2038	0.0	0.0	0.0	0.0
2039-2043	0.0	0.0	0.0	0.0
Total Fees	314.3	314.3	314.3	314.3
Discounted Amount	245.6	245.6	245.6	245.6
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**0.6%**	**0.8%**	**1.3%**	**1.6%**

Arkansas

Tax Rate and Base

Arkansas levies a severance tax of 5.0 percent on the market value of natural gas produced.[71,72] In addition, the Arkansas Oil and Gas Commission levies a monthly assessment fee of $0.009 per thousand cubic feet (Mcf).[73]

Production Incentives

- **High-Cost Well:** (modeled) A high-cost gas well, defined by its presence in a shale formation or drilled at a depth of 12,500 feet, qualifies for a reduced severance tax rate of 1.5 percent for the first 36 months of production. The reduced rate may be extended for an additional 12 months, or until well payout is achieved, whichever occurs first.[74]
- **Minimum Daily Production:** (modeled) A high-cost well that produces less than 100,000 cubic feet of gas per day qualifies for a reduced rate of 1.25 percent after the initial high-cost rate expires.[75]
- **Home Use:** (not modeled) Individuals who sever natural resources for their own use and not for sale or commercial gain are exempt from severance tax.[76]
- **Production Process:** (not modeled) Natural gas returned to any formation for the production of oil or other liquid hydrocarbons that are consumed in oil and gas operations is exempt from the severance tax.[77]
- **Production Process:** (not modeled) A natural gas producer that uses an approved underground salt water disposal system qualifies for a severance tax credit equal to the cost of maintaining the disposal system.[78]
- **Miscellaneous:** (not modeled) A new discovery gas well, which is any newly completed conventional well that is capable of producing gas, is taxed at a rate of 1.5 percent for the first 24 months of production.[79]

Tax Liability and Effective Tax Rates

The following table presents the state severance tax liability forecast for Arkansas based on the four price and production scenarios described in the main body of the report.

[71] Ark. Code. Ann. §26-58-111.
[72] Ark. Code. Ann. §26-58-101. Market value of gas is defined as the producer's actual cash receipts from the sale of natural gas to the first purchaser, less the actual costs to the producer for dehydrating, treating, compressing and delivering the gas to the purchaser.
[73] Ark. Code. Ann. §15-71-107,108,110. See Rule D-14 Gas Assessment at http://www.aogc.state.ar.us/onlinedata/forms/rules%20and%20regulations.pdf.
[74] Ibid.
[75] Ark. Code. Ann. §26-58-101,108, 127, 205.
[76] Ark. Code. Ann. §26-58-108.
[77] Ark. Code. Ann. §26-58-101.
[78] Ark. Code. Ann. §26-58-205.
[79] Ark. Code. Ann. §26-58-127.

Tax Liability ($000s) and Effective Tax Rates: Arkansas				
	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
2014	$162.2	$131.7	$83.4	$67.7
2015	85.1	69.0	42.5	34.5
2016	68.3	55.3	33.6	27.2
2017	186.6	49.4	29.6	24.0
2018	179.1	142.5	86.4	68.8
2019-2023	591.4	470.1	289.8	230.3
2024-2028	352.3	281.0	176.7	140.9
2029-2033	213.0	170.4	109.3	87.5
2034-2038	114.3	91.7	17.8	14.5
2039-2043	19.7	15.9	10.6	8.6
Total Tax Liability	1,971.9	1,477.1	879.7	703.9
Discounted Amount	1,360.7	1,005.0	608.9	487.5
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**3.6%**	**3.3%**	**3.2%**	**3.2%**

Local Real Property Taxes

Local units levy real property tax on the assessed value of natural gas reserves.[80] The Assessment Coordination Department of Arkansas sets the annual price per Mcf based on the three year average price of gas in Arkansas. For tax year 2013, that amount is $3.58. Future values are projected using the growth rate from the forecast of the Henry Hub spot price. The average price is multiplied by 365 days to calculate the annual value per Mcf. The annual value per Mcf is then (1) multiplied by the working interest share of ownership (87.5 percent), (2) reduced by a 13 percent deduction allowance for production expenses and (3) multiplied by a 20 percent assessment ratio.[81] The assessment ratio reflects the current and future income potential of the natural gas reserves.

The result is referred to as the assessed value per Mcf and is multiplied by the average daily production of the well. That product is subject to the local property tax levy. The analysis applies a local levy of 46.85 mills (4.7 percent), which was the statewide average millage rate for 2013.[82]

[80] The department notes that "property taxes are based solely on the property's ability to produce future income for the life of the property based on current production as of January 1." See State of Arkansas, Assessment Coordination Department, Oil, Gas and Minerals Schedules at http://www.arkansas.gov/acd/pdfs/Minerals_Standards_2013.pdf.
[81] Ibid.
[82] See State of Arkansas, 2012 Millage Report (2013 collections) at http://www.arkansas.gov/acd/pdfs/2012-Millage-Report-2013-Collections-Final.pdf.

Colorado

Tax Rate and Base

Colorado levies a graduated severance tax on the gross annual income of the producer.[83,84] The severance tax uses the following tax rate schedule:

- Gross Income < $24,999: tax rate equals 2.0 percent
- Gross Income ≥$25,000 and <$99,999: tax equals $500 plus 3.0 percent over $24,999
- Gross Income ≥$100,000 and <$299,999: tax equals $2,750 plus 4.0 percent over $99,999
- Gross Income ≥$300,000: tax equals $10,750 plus 5.0 percent over $299,999

The Colorado Oil and Gas Commission also levies a 0.7 mill tax on the taxable value of gas to fund the agency.[85]

Production Incentives

- **Minimum Daily Production:** (modeled) Wells producing less than or equal to 90,000 cubic feet of gas per day are exempt from the severance tax.[86]
- **Property Tax Credit:** (modeled, see Local Real Property Taxes below) Producers qualify for a credit against severance tax of up to 87.5 percent of local property taxes paid on gas production in the prior year.[87]
- **Miscellaneous:** (not modeled) Local contributions paid by the producer to address impact problems associated with new natural gas operations, or to increase production at existing operations, may be eligible for an impact assistance credit against their severance tax liability.[88]

Tax Liability and Effective Tax Rates

The following table presents the state severance tax liability forecast for Colorado based on the four price and production scenarios described in the main body of the report.

[83] Colo. Rev. Stat. §39-29-105.
[84] Colo. Rev. Stat. §39-29-102(3). Gross income is the net amount realized by the taxpayer for the sale of gas, whether the sale occurs at the wellhead or after transportation, manufacturing and processing of the product.
[85] Rule 310, Colorado Oil and Gas Conservation Commission, Form 8 Mill Levy.
[86] Colo. Rev. Stat. §39-29-105(1) (b).
[87] Colo. Rev. Stat. §39-29-105.
[88] Colo. Rev. Stat. §39-29-107.5.

Tax Liability ($000s) and Effective Tax Rates: Colorado				
	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
2014	$475.8	$372.6	$242.5	$189.4
2015	244.9	190.4	120.2	93.0
2016	197.4	153.7	94.9	73.4
2017	177.7	138.7	84.1	65.2
2018	171.1	134.1	80.4	62.5
2019-2023	558.2	435.2	262.7	202.4
2024-2028	326.4	254.1	153.1	116.8
2029-2033	190.2	147.0	87.3	65.3
2034-2038	107.7	81.8	0.9	0.7
2039-2043	1.0	0.8	0.6	0.4
Total Tax Liability	2,450.5	1,908.3	1,126.8	869.3
Discounted Amount	1,849.5	1,441.9	875.3	676.7
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**4.8%**	**4.8%**	**4.6%**	**4.5%**

Local Real Property Taxes

Colorado is unique in that local units levy a severance tax on natural gas extraction, as opposed to a traditional property tax on the value of natural gas reserves. The tax base is equal to the state severance tax base from the prior calendar year multiplied by an assessment ratio of 87.5 percent. The analysis applies a levy of 48.714 mills (4.9 percent), which represents the average millage rate for three top gas producing counties in Colorado for 2012.[89]

All natural gas extractors qualify for a credit equal to 87.5 percent of property tax liability from the prior year that can be applied towards state severance tax liability. For most years of this analysis, the credit can be used to effectively offset most of the producer's state severance tax liability. However, although local levies offset most of the state severance tax liability, the analysis uses the pre-credit amount for state severance tax computations, and reduces the local amount by the portion that would have been used as a credit. This treatment does not change the total state and local tax liability or its nature (both are severance taxes). It merely identifies the levy as a state levy instead of a local levy to maintain comparability.

[89] See State of Colorado, Department of Local Affairs at http://www.colorado.gov/cs/Satellite?c=Page&childpagename=DOLA-Main%2FCBONLayout&cid=1251590389358&pagename=CBONWrapper, and Assessment of Oil and Gas Industry, Economic and Fiscal Impacts in Colorado in 2010, http://www.coga.org/pdf_studies/cu_econbenefits.pdf.

Louisiana

Tax Rate and Base

Louisiana levies a base tax rate of 7 cents per thousand cubic feet (Mcf) plus an annual rate adjustment to account for changing market conditions. The adjustment is a fraction, the numerator of which is the Henry Hub spot price in dollars per MMBtu for the 12 month period ending March 31st, and the denominator of which is the price of gas fuels delivered into pipelines in Louisiana as reported by the Natural Gas Clearing House for the 12 month period ending March 31, 1990.[90] For FY 2013-14, the tax rate is 11.8 cents per Mcf of natural gas produced.[91] Louisiana also levies an Oil Field Restoration Fee on both oil and gas production, currently at $0.003 per Mcf of natural gas produced.[92]

Production Incentives

- **Horizontal Well:** (modeled) Severance tax on a horizontally drilled well that commences production after July 31, 1994 is suspended for 24 months from the date of production or until payout of the well cost is achieved, whichever occurs first.[93]
- **Minimum Daily Production:** (modeled) A well that that is incapable of producing an average of 250,000 cubic feet per day during the entire taxable month qualifies for a reduced severance tax rate of 1.3 cents per Mcf.[94]
- **High-Cost Well:** (not modeled) Severance tax on a well drilled to a true vertical depth of 15,000 feet or more that commences production after July 31, 1994 is suspended for 24 months from the date of production or until payout of the well cost is achieved, whichever occurs first.[95]
- **Production Process:** (not modeled) Exemptions exist for gas that is consumed, flared, injected or vented during the production of gas.[96]
- **Enhanced Production:** (not modeled) A 20 percent severance tax reduction is available on one thousand cubic feet of gas incrementally produced from injecting produced water in an effort to reduce discharge and increase hydrocarbon recovery.[97]
- **Miscellaneous:** (not modeled) Contract rates exist for gas sold under written agreements prior to the mid-1970s.[98]

[90] See bulletin, State of Louisiana, Department of Revenue at http://www.revenue.louisiana.gov/forms/lawspolicies/RIB%2013-011.pdf.
[91] La. Rev. Stat. Ann. §47:633.
[92] See Oilfield Site Restoration (OSR) Program at http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=155#Funding.
[93] La. Rev. Stat. Ann. §47:633(7)(c)(iii).
[94] La. Rev. Stat. Ann. §47:633(9)(c).
[95] La. Rev. Stat. Ann. §47:633(7)(c)(iii).
[96] La. Rev. Stat. Ann. §47:633(9)(e)(i),(ii),(iii),(iv),(v),(vi),(vii).
[97] La. Rev. Stat. Ann. §47:633.5(C).
[98] La. Rev. Stat. Ann. §47:633.1(C).

Tax Liability and Effective Tax Rates

The following table presents the state severance tax liability forecast for Louisiana based on the four price and production scenarios described in the main body of the report.

Tax Liability ($000s) and Effective Tax Rates: Louisiana

	High Production		Low Production	
	High Price	**Low Price**	**High Price**	**Low Price**
2014	$6.7	$6.7	$3.5	$3.5
2015	235.6	98.6	1.9	1.9
2016	188.9	155.0	92.8	76.2
2017	168.3	138.2	81.8	67.1
2018	159.7	131.0	77.1	63.3
2019-2023	530.3	435.1	259.8	213.2
2024-2028	310.9	254.9	105.9	87.3
2029-2033	124.4	102.4	4.1	4.1
2034-2038	3.8	3.8	2.0	2.0
2039-2043	1.8	1.8	1.0	1.0
Total Tax Liability	1,730.3	1,327.5	629.8	519.4
Discounted Amount	1,272.7	959.2	467.0	384.9
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**3.3%**	**3.2%**	**2.4%**	**2.6%**

Michigan

Tax Rate and Base

Michigan levies a severance tax of 5.0 percent on the gross cash market value of natural gas produced and an additional fee, not to exceed 1.0 percent of the gross cash market value, for oil and gas conservation.[99,100] The conservation fee is calculated each year based on the state's production forecast. For calendar year 2014, the fee is 0.92 percent of gross cash market value.[101] The analysis holds the fee constant at 0.92 percent for all future years.

Production Incentives

- **Government or Tribal Entities:** (not modeled) Production attributable to the State of Michigan, the federal government or a political subdivision is exempt from the severance tax.[102]
- **Royalty and Interest**: (not modeled) Income received from the hydrocarbons produced from Devonian or Antrim shale that qualify for the nonconventional fuel credit embodied in IRC Sec. 29 and acquired through a royalty interest sold by the state is exempt.[103]

Tax Liability and Effective Tax Rates

The following table presents the state severance tax liability forecast for Michigan based on the four price and production scenarios described in the main body of the report.

Tax Liability ($000s) and Effective Tax Rates: Michigan

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
2014	$560.5	$440.0	$288.1	$226.1
2015	290.9	227.3	145.4	113.6
2016	235.5	184.4	115.7	90.6
2017	212.5	166.9	103.2	81.1
2018	204.8	161.5	98.9	78.0
2019-2023	676.7	533.0	331.6	261.2
2024-2028	405.9	321.5	203.6	161.2
2029-2033	246.9	196.5	126.7	100.9
2034-2038	150.6	120.4	79.1	63.2
2039-2043	88.3	70.8	47.5	38.0
Total Tax Liability	3,072.5	2,422.1	1,539.8	1,213.9
Discounted Amount	2,258.9	1,777.8	1,129.0	888.6
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**5.9%**	**5.9%**	**5.9%**	**5.9%**

[99] Mich. Comp. Laws §205.303.
[100] Mich. Comp. Laws §205.303(1). Gross cash market value of all production shall be computed as of the time when and at the place where the production was severed.
[101] See State of Michigan, Department of Treasury, Notice of Oil and Gas Fee Rate for 2014 at http://www.michigan.gov/documents/taxes/OilGasRate2014_443092_7.pdf.
[102] Mich. Comp. Laws §205.303.
[103] Mich. Comp. Laws §205.303.

North Dakota

Tax Rate and Base

For FY 2013-14, North Dakota levies a rate of 8.33 cents per thousand cubic feet (Mcf) of natural gas produced.[104] The rate is adjusted each fiscal year using the annual average producer price index for gas fuels, as published by the U.S. Bureau of Labor Statistics.[105]

Production Incentives

- **Production Process:** (not modeled) Natural gas that is taken directly from the wellhead or returned to the lease from a processing or treatment plant and used in the production of oil or gas is exempt from severance tax.[106]
- **Production Process:** (not modeled) Natural gas that is consumed at a well site to power an electric generator that consumes at least 75 percent of the gas from the well is exempt from severance tax.[107]
- **Government or Tribal Entities and Royalty and Interest:** (not modeled) Royalty interests in natural gas that are owned by the federal government, the state of North Dakota or a tribe are exempt from severance tax.[108]
- **Miscellaneous:** (not modeled) Natural gas extracted from a shallow gas zone, defined as a formation located no more than 5,000 feet below the surface (or lower if still above the Rierdon Formation), is exempt from severance tax during the first 24 months after well completion.[109]

Tax Liability and Effective Tax Rates

The following table presents the state severance tax liability forecast for North Dakota based on the four price and production scenarios described in the main body of the report.

[104] N.D. Cent. Code §57-51-02.2.
[105] See State of North Dakota, Office of State Tax Commissioner, Gas Tax Rate Notice at http://www.nd.gov/tax/oilgas/pubs/gasrate.pdf?20140115115335. The gas fuels price index is divided by the denominator specified in the statute (75.7) and the quotient is then multiplied by $0.04 to calculate the adjusted severance tax rate.
[106] Rule 81-09-02-16, NDAC.
[107] N.D. Cent. Code §57-51-02.5.
[108] Rule 81-09-02-15, NDAC.
[109] N.D. Cent. Code §57-51-02.4. Based on a conversation with the North Dakota State Tax Division, the vast majority of wells are between 7,000 and 12,000 feet.

Tax Liability ($000s) and Effective Tax Rates: North Dakota

	High Production		Low Production	
	High Price	**Low Price**	**High Price**	**Low Price**
2014	$193.6	$178.7	$99.5	$91.9
2015	135.6	110.9	67.8	55.4
2016	95.2	77.9	46.8	38.3
2017	83.8	68.6	40.7	33.3
2018	77.7	63.5	37.5	30.7
2019-2023	280.7	229.7	137.5	112.5
2024-2028	160.9	131.6	80.7	66.0
2029-2033	95.1	77.8	48.8	39.9
2034-2038	57.7	47.2	30.3	24.8
2039-2043	33.4	27.3	17.9	14.7
Total Tax Liability	1,213.6	1,013.2	607.5	507.5
Discounted Amount	891.9	749.2	445.3	374.3
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**2.3%**	**2.5%**	**2.3%**	**2.5%**

Ohio

Tax Rate and Base

Ohio levies a tax rate of 2.5 cents per thousand cubic feet (Mcf).[110] An additional gas regulatory cost recovery assessment of 0.5 cents per Mcf is imposed on the well owner.[111]

Production Incentives

- **Home Use:** (not modeled) Gas that is used on the land from which it is severed for improvements or for use in the homestead, and does not exceed a yearly cumulative market value of $1,000, is exempt from the severance tax.[112]

Tax Liability and Effective Tax Rates

The following table presents the state severance tax liability forecast for Ohio based on the four price and production scenarios described in the main body of the report.

Tax Liability ($000s) and Effective Tax Rates: Ohio

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
2014	$67.3	$67.3	$34.6	$34.6
2015	38.1	38.1	19.0	19.0
2016	28.7	28.7	14.1	14.1
2017	23.7	23.7	11.5	11.5
2018	20.3	20.3	9.8	9.8
2019-2023	66.5	66.5	32.6	32.6
2024-2028	31.5	31.5	15.8	15.8
2029-2033	14.9	14.9	7.6	7.6
2034-2038	7.0	7.0	3.7	3.7
2039-2043	3.3	3.3	1.8	1.8
Total Tax Liability	301.3	301.3	150.5	150.5
Discounted Amount	236.5	236.5	118.1	118.1
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**0.6%**	**0.8%**	**0.6%**	**0.8%**

Local Real Property Taxes

Local units in Ohio assess property tax on the value of natural gas reserves. The computation begins with gross price, which is equal to the unweighted average price per Mcf of gas produced from Ohio wells during the past five years. Gross revenue is equal to gross price multiplied by a factor that is equal to 1 in the first year and then declines by 13 percent per year for the next ten

[110] Ohio Rev. Code Ann. §5749.02.
[111] Ohio Rev. Code §1509.50(A). The owner may designate that the severer pay the owner's assessment on their behalf on the severance tax return. The severer may then recoup from the owner the amount of the assessment.
[112] Ohio Rev. Code Ann. §5749.03.

years. That amount is then reduced by 85 percent to account for royalty costs (15 percent), operating costs (40 percent) and capital costs (30 percent). The resultant profit per Mcf is then discounted to the present using a discount factor equal to the average rate for short-term U.S Treasuries plus 13 percent. This computation is made for the current year and the next nine years. The sum of that series yields the total net present value for a single Mcf on production. That amount is multiplied by 365 to yield an annual value and multiplied by the 35 percent assessment ratio to yield the multiplier.

Firms only need the multiplier, actual production and the tax rate to determine tax liability. The Ohio Tax Commissioner publishes the multiplier annually. Tax liability is equal to the product of the three values. The tax code grants a further 42.5 percent reduction to production in the first year.[113] The analysis uses the 2011 average millage rate of 49.6 mills for Class 2 property for the Marcellus shale counties of Belmont, Carroll, Guernsey, Harrison and Monroe.[114]

[113] See Ohio Department of Taxation Real Property Tax at http://www.tax.ohio.gov/real_property.aspx.The analysis does not assume production through secondary recovery means and therefore there is no further reduction (50 percent) in future years.

[114] See State of Ohio, Property Tax – Real Property at http://www.tax.ohio.gov/Portals/0/communications/publications/annual_reports/2012_annual_report/2012_AR_Section_2_Property_Tax-Real_Property.pdf and http://www.tax.ohio.gov/Portals/0/communications/publications/brief_summaries/2013_Brief_Summary/2013_BSOT_Section3_Property_Tax-Real.pdf.

Oklahoma

Tax Rate and Base

Oklahoma levies a severance tax of 7.0 percent on the gross market value of natural gas.[115,116] In addition, the Oklahoma Tax Commission levies an 0.095 percent excise tax for regulatory purposes on the gross market value of gas and the Oklahoma Corporation Commission levies an oil and gas production fee of $0.00015 per thousand cubic feet (Mcf) to fund certain activities.

Production Incentives

- **Horizontal Well:** (modeled) Natural gas production initiated on or after July 1, 2011, and prior to July 1, 2015 from a horizontally drilled well is subject to a reduced rate of 1.0 percent for a period of 48 months from the date of initial production.[117]
- **High-Cost Well:** (not modeled) Wells spudded between July 1, 2005 and July 1, 2014, and drilled to a depth of between 12,500 and 14,999 feet, qualify for a front-end tax credit equal to 6/7ths of the severance tax rate, resulting in a 1.0 percent tax rate for a period of 28 months from the date of the first sale. The credit is suspended when the average annual index price of gas is above $5.00 per thousand cubic feet of gas.[118]
- **High-Cost Well:** (not modeled) Wells spudded between July 1, 2011 and July 1, 2015, and drilled to a depth between 15,000 feet and 17,499 feet, qualify for a reduced severance tax rate of 4.0 percent for the first 48 months from the date of the first sale.[119]
- **High-Cost Well:** (not modeled) Wells spudded between July 1, 2011 and July 1, 2015, and drilled to a depth of 17,500 feet or greater, qualify for a reduced severance tax rate of 4.0 percent for 60 months from the date of the first sale.[120]
- **Inactive Well:** (not modeled) Producers that reestablish well production on a previously inactive well (2 years of inactivity) qualify for a tax refund equal to 6/7ths of the severance tax rate, resulting in a 1.0 percent tax rate for a period of 28 months from the date upon which production is reestablished. The refund is suspended when the average annual index price of gas exceeds $5.00 per thousand cubic feet of gas.[121]
- **Enhanced Production:** (not modeled) Surplus natural gas production due to the use of approved production enhancement techniques in the secondary gas recovery is exempt for a period of 5 years or upon the termination of the secondary recovery process, whichever occurs first.[122]
- **Enhanced Production:** (not modeled) Surplus natural gas production due to the use of ap-

[115] Okla. Stat. tit. 68, §1001.B (4)(5).
[116] Rule 710:45-9-100. A producer of natural gas may deduct the marketing costs for the gas produced when computing the gross value subject to the state's gross production tax. Marketing costs are the nonproduction costs incurred by the producer to enable the producer to transport the gas from the well to the market.
[117] Okla. Stat. tit. 68, §1001(E)(3) and (4).
[118] Okla. Stat. tit. 68, §1001 (H) (2) (a).
[119] Okla. Stat. tit. 68, § (H)(2)(d).
[120] Okla. Stat. tit. 68, § (H)(2)(e).
[121] Okla. Stat. tit. 68, § (F) (1).
[122] Okla. Stat. tit. 68, § (D)(3).

proved production enhancement techniques in the tertiary gas recovery is exempt for a period of 10 years, or until project payback, whichever occurs first.[123]

- **Miscellaneous:** (not modeled) The production of natural gas from a "new discovery well" that is spudded or re-entered before July 1, 2014 qualifies for a tax refund equal to 6/7ths of the severance tax rate, resulting in a 1.0 percent tax rate for a period of 28 months from the date of the first sale. The exemption amount cannot exceed the total cost of drilling and completing the well. A "new discovery well" is classified as a gas well drilled at least two miles from the nearest gas well producing from the same formation. The refund is suspended when the average annual index price of gas exceeds $5.00 per thousand cubic feet of gas.[124]
- **Miscellaneous:** (not modeled) Natural gas that is produced from any well that is located within the boundary of a three-dimensional seismic shoot and drilled based on the same surveying technology prior to July 1, 2014 qualifies for a tax refund equal to 6/7ths of the severance tax rate, resulting in a 1.0 percent tax rate for a period of 28 months from the date of the first sale. The refund is suspended when the average annual index price of gas exceeds $5.00 per thousand cubic feet of gas.[125]
- **Miscellaneous:** (not modeled) Natural gas leases that are operated at a net loss or a net profit which is less than severance tax remittance for the prior year qualify for a tax refund equal to 6/7ths of the severance tax rate, resulting in a 1.0 percent tax rate. The Oklahoma Tax Commission approves economically at-risk gas leases and the refund is limited to production for calendar years 2005-2013 only. The refund is suspended when the average annual index price of gas exceeds $5.00 per thousand cubic feet of gas.[126]

[123] Okla. Stat. tit. 68, §1001(D)(4).
[124] Okla. Stat. tit. 68, §1001(I) (1).
[125] Okla. Stat. tit. 68, § (J).
[126] Okla. Stat. tit. 68, §1001.3a(B).

Tax Liability and Effective Tax Rates

The following table presents the state severance tax liability forecast for Oklahoma based on the four price and production scenarios described in the main body of the report.

Tax Liability ($000s) and Effective Tax Rates: Oklahoma

	High Production		Low Production	
	High Price	**Low Price**	**High Price**	**Low Price**
2014	$104.0	$81.7	$53.5	$42.0
2015	54.0	42.2	27.0	21.1
2016	43.5	34.1	21.4	16.8
2017	39.1	30.7	19.0	14.9
2018	245.2	193.4	118.4	93.4
2019-2023	810.1	638.2	397.0	312.7
2024-2028	486.0	384.9	243.7	193.0
2029-2033	295.5	235.2	151.7	120.7
2034-2038	180.3	144.1	94.7	75.7
2039-2043	105.7	84.7	56.8	45.5
Total Tax Liability	2,363.4	1,869.3	1,183.2	935.9
Discounted Amount	1,502.8	1,186.8	747.7	590.5
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**3.9%**	**3.9%**	**3.9%**	**3.9%**

Texas

Tax Rate and Base

Texas levies a severance tax of 7.5 percent on the market value of gas produced and an Oil and Gas Field Clean-Up Regulatory Fee of $0.00067 per thousand cubic feet (Mcf).[127, 128,129]

Production Incentives

- **High-Cost Well:** (modeled) A reduced severance tax rate is available for high-cost gas wells spudded or completed after September 1, 1996. High-cost gas must be produced from the following: any gas well, if production is from a completion which is located at a depth of more than 15,000 feet; geopressured brine; occluded natural gas produced from coal seams; Devonian shale; or designated tight formations or produced as a result of production enhancement work. The reduction is computed by subtracting from the tax rate the product of the tax rate and the ratio of drilling and completion costs incurred for the well to twice the median drilling and completion costs for high-costs wells spudded or completed during the previous fiscal year. The reduction is for 120 months from the date of first production or until the tax reduction equals 50 percent of the drilling and completion costs.[130]
- **Minimum Daily Production:** (not modeled) A well that averages less than 90,000 cubic feet per day over three months qualifies for a 25 percent credit if the average taxable price of gas is more than $3.00 per Mcf but not more than $3.50; a 50 percent credit if the price is more than $2.50 but not more than $3.00 per Mcf; and a 100 percent credit if the price is not more than $2.50 per Mcf.[131]
- **Production Process:** (not modeled) Gas that was previously flared or vented for 12 months and is now marketed qualifies for an exemption from the severance tax over the life of the well.[132]
- **Inactive Well:** (not modeled) Gas produced from a well that has been inactive for three years is exempt from the gross production tax. Gas produced from a well that has been inactive for two years qualifies for a 10 year exemption.[133]
- **Enhanced Production:** (not modeled) Tax incentives exist for Texas Experimental Research and Recovery Activity (TERRA) wells and incremental production techniques. Investments of at least $5,000 must be made to generate increased production.[134]

[127] Texas Natural Resources Code - Section 91.111. Oil-Field Cleanup Fund.
[128] Tex. Tax Code Ann. §201.052.
[129] Tex. Tax Code Ann. §201.101. Market value is the value of the gas at the mouth of the well from which it is produced. This is determined by ascertaining the producer's actual marketing costs and subtracting those costs from the producer's gross cash receipts from the sale of gas.
[130] Tex. Tax Code Ann. §201.057.
[131] Tex. Tax Code Ann. §201.059. This credit is not modeled in the analysis as the average price of gas surpasses $3.50 per Mcf before production falls below 90 Mcf per day.
[132] Tex. Tax Code Ann. §201.058 (b).
[133] Tex. Tax Code Ann. §202.05(6) (7) (8).
[134] Tex. Tax Code Ann. §202.05(7) (8) (9).

- **Government or Tribal Entities and Royalty and Interest:** (not modeled) Royalty interests owned by cities, towns and villages; counties; independent school districts and common school districts; public colleges and universities; and political subdivisions of the federal government are not subject to the tax on gross production.[135]

Tax Liability and Effective Tax Rates

The following table presents the state severance tax liability forecast for Texas based on the four price and production scenarios described in the main body of the report.

Tax Liability ($000s) and Effective Tax Rates: Texas

	High Production		Low Production	
	High Price	**Low Price**	**High Price**	**Low Price**
2014	$266.6	$209.6	$137.0	$107.7
2015	138.4	108.3	69.2	54.1
2016	112.0	87.9	55.0	43.2
2017	101.0	79.5	49.1	38.6
2018	97.3	76.8	47.0	37.1
2019-2023	321.5	253.6	157.5	124.2
2024-2028	515.0	408.0	258.3	204.6
2029-2033	313.1	249.3	160.7	128.0
2034-2038	191.0	152.7	100.3	80.2
2039-2043	112.0	89.7	60.2	48.2
Total Tax Liability	2,167.9	1,715.3	1,094.4	866.0
Discounted Amount	1,411.8	1,114.8	709.0	559.9
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**3.7%**	**3.7%**	**3.7%**	**3.7%**

Local Real Property Tax

Local units in Texas levy ad valorem taxes on the market value of natural gas reserves once production commences. There are various ways to compute the market value of natural gas reserves. A common method is the income approach, or discounted cash flow. This appraisal method is used by a private firm that contracts with Tarrant County, one of the largest producers of natural gas in Texas. The income approach attempts to quantify the fair market value of reserves based on projected production, prices and expenses to operate the well.[136]

To determine the taxable base for local real property tax in each year, the analysis uses the four price and production scenarios discussed in the main body of the text. Those scenarios yield the market value of output or total sales in every year. An assumed profit margin (profits divided by sales) is then applied to annual sales. Various data sources suggest a profit margin for natural gas

[135] 34 TAC Sec. 3.14.

[136] For a detailed description of the income approach (and other issues) see the Frequently Asked Questions at the firm's website at http://www.pandai.com/faq/Mineral_FAQ_for_Website_linked.pdf.

extractors that range from 5 to 15 percent.[137] For the purpose of this computation, the analysis uses 10 percent. Given these assumptions, the local property tax base for natural gas reserves is equal to the net present value of all future income that will be received (i.e., the annual profits) from operation of the well. That stream should also approximate the fair market value of the well. To discount that income stream to the present, the analysis uses a taxpayer discount rate of 12 percent.[138]

Once the tax base is determined, the analysis then applies a weighted average millage rate (21.1 mills or 2.1 percent). The statewide average millage rate is from the Texas Comptroller of Public Accounts.[139] The application of the millage rate to the annual fair market value of reserves yields the local tax liability. Those amounts are then discounted to the present using the government's discount rate (4.5 percent), which is the same rate used to discount state severance tax liability and market values. The ratio of the net present value of local property tax to net present value of market value (sales) equals the local portion of the effective tax rate.

[137] Data from 2013 annual 10-K reports submitted to the Securities and Exchange Commission suggest a profit margin range (net income after tax divided by total revenues) of 5 to 15 percent for Range Resources, Chesapeake Energy, National Fuel and Cabot Oil and Gas for 2011-13. Moreover, corporate tax data for tax years 2007, 2008 and 2010 for the Oil and Gas Extraction sector suggest a pre-tax profit margin between 10 and 20 percent. See IRS tax data at http://www.irs.gov/uac/SOI-Tax-Stats-Corporation-Tax-Statistics.

[138] For a discussion of taxpayer discount factors used to value reserves, see the Pritchard and Abbott discussion at http://www.pandai.com/faq/Discount%20Rate.P&A%20Derivation%20of%20WACC.pdf.

[139] See Texas Comptroller of Public Accounts, Biannual Property Tax Report, Tax Years 2010 and 2011 at http://www.window.state.tx.us/taxinfo/proptax/references/survey-publications/biennial-report/2010-2011/96-1728.pdf.

Virginia

Tax Rate and Base

Virginia does not levy a state-level severance tax. However, Virginia Code authorizes county and city governments to levy a license tax. The license tax is imposed on gross receipts from natural gas production. The gross receipts are the fair market value measured when the gas is utilized or sold, with deductions allowed for transportation costs, unless produced in connection with coal mining.[140] Certain counties levy the full 3.0 percent gross license tax (1.0 percent for the county, 1.0 percent for the Gas Road Improvement Fund and 1.0 percent for the general fund of the county or city from where the gas was severed).[141,142]

Production Incentives

No production incentives exist for Virginia.

Tax Liability and Effective Tax Rates

The following table presents the local license tax liability forecast for Virginia based on the four price and production scenarios described in the main body of the report.

Tax Liability ($000s) and Effective Tax Rates: Virginia

	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
2014	$284.1	$223.0	$146.0	$114.6
2015	147.4	115.2	73.7	57.6
2016	119.3	93.5	58.6	45.9
2017	107.7	84.6	52.3	41.1
2018	103.8	81.8	50.1	39.5
2019-2023	342.9	270.1	168.0	132.3
2024-2028	205.7	162.9	103.2	81.7
2029-2033	125.1	99.6	64.2	51.1
2034-2038	76.3	61.0	40.1	32.0
2039-2043	44.8	35.9	24.1	19.3
Total Tax Liability	1,557.0	1,227.4	780.3	615.2
Discounted Amount	1,144.7	900.9	572.1	450.3
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**3.0%**	**3.0%**	**3.0%**	**3.0%**

[140] Virginia Code; 58.1-3712, 3713, 3713.4.
[141] See Buchanan County at http://ecode360.com/6548786.
[142] Buchanan, Dickinson and Wise counties report significant extraction from shale formations and all three counties levy the 3.0 percent gross license tax. The analysis uses a 3.0 percent rate for the local levy.

West Virginia

Tax Rate and Base

West Virginia levies a severance tax of 5.0 percent on the gross value of gas.[143] The state also levies a volume-based tax of 4.7 cents per thousand cubic feet (Mcf) of gas to service debt for workers' compensation payments.[144] As per current law, the analysis assumes that the volume-based levy expires at the end of calendar year 2018.

Production Incentives

- **Minimum Daily Production:** (modeled) Wells producing less than 5,000 cubic feet of gas per day are exempt from the severance tax.[145]
- **Home Use:** (not modeled) Individuals who sever natural resources for their own use, and not for sale or commercial gain, are exempt from the severance tax.[146]
- **Miscellaneous:** (not modeled) Natural gas, from a well that has not produced marketable quantities for five consecutive years, is exempt for 10 years from the date the well begins marketable production.[147] Effective July 1, 2013 the exemption attributable to any horizontally drilled well that meets the above criterion can no longer be claimed. Producers who have established entitlement to the exemption before June 20, 2013 are still eligible for the full exemption.[148]

Tax Liability and Effective Tax Rates

The following table presents the state severance tax liability forecast for West Virginia based on the four price and production scenarios described in the main body of the report.

[143] W. Va. Code §11-13A-3a. Gross value is the value of the natural gas at the wellhead immediately preceding transportation and transmission.
[144] Ibid. Based on a conversation with the West Virginia Department of Revenue, Research and Development Division, the provision sunsets after 2018. The analysis assumes that the levy is not extended.
[145] W.Va. Code Sec. 11-13A-3a.
[146] W.Va. Code Sec. 11-13A-3a.
[147] W.Va. Code Sec. 11-13A-3a.
[148] W.Va. Code Sec. 11-13A-22.

Tax Liability ($000s) and Effective Tax Rates: West Virginia				
	High Production		Low Production	
	High Price	Low Price	High Price	Low Price
2014	$578.8	$477.0	$297.5	$245.2
2015	305.3	251.6	152.6	125.7
2016	243.8	200.7	119.8	98.6
2017	216.6	178.1	105.2	86.5
2018	204.8	168.3	98.9	81.2
2019-2023	571.5	450.1	280.0	220.6
2024-2028	342.9	271.5	171.9	136.2
2029-2033	208.5	165.9	107.0	85.2
2034-2038	127.2	101.7	66.8	53.4
2039-2043	74.6	59.8	40.1	32.1
Total Tax Liability	2,874.0	2,324.6	1,439.9	1,164.7
Discounted Amount	2,159.3	1,753.0	1,079.5	876.4
Total Market Value	51,901.0	40,914.5	26,009.8	20,505.9
Discounted Amount	38,157.0	30,030.5	19,071.3	15,010.1
Effective Tax Rate	**5.7%**	**5.8%**	**5.7%**	**5.8%**

Local Real Property Taxes

Local units levy a tax on the value of natural gas reserves using a yield capitalization approach.[149] That approach utilizes two parameters published annually by the West Virginia State Tax Department: (1) the first three years of production decline rates from wells located in various counties and (2) a discount rate schedule. The department also provides spreadsheets that facilitate the use of those parameters in the computation of a discounted income stream attributable to production from the well.[150] The summation of the discounted income stream is the appraisal value, which is subject to an assessment rate of 60.0 percent. The analysis uses the production decline rates from Harrison County and applies the average statewide millage rate for Class III property (22.1 mills) for TY 2014.[151]

[149] See Oil and Gas, Valuation of Producing & Reserve Oil and Natural Gas for Ad Valorem Property Tax Purposes at http://www.wva.state.wv.us/wvtax/propertyTax/formsAndPublications.aspx.
[150] See Oil and Gas, Flush Wells Valuation Worksheets at http://www.wva.state.wv.us/wvtax/propertyTax/formsAndPublications.aspx.
[151] See 2014 Natural Resource Property Valuation Variables at http://www.wva.state.wv.us/wvtax/propertyTax/formsAndPublications.aspx.

Table A.1
Production Incentives by State

State	Modeled			Not Modeled						
	Minimum Daily Production	Horizontal Well	High-Cost Well	Production Processes	Inactive Well	Enhanced Production	Home Use	Government or Tribal Entity	Royalty & Interest	Miscellaneous
PA	X									X
AR	X		X	X			X			X
CO	X									X
LA	X	X	X	X		X				X
MI								X	X	
ND				X				X	X	X
OH							X			
OK		X	X		X	X		X		X
TX	X[1]		X	X	X	X		X	X	
VA										
WV	X						X			X

[1] A severance tax credit is available for wells that meet minimum production levels in Texas; however, this credit is not modeled in the analysis.

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APPENDIX B

Table B.1 provides tabulations of new, active wells spud by month and year. Table B.2 displays the distributions of impact fee payments for calendar years 2011 and 2012. Tables B.3 and B.4 display production data for major shale plays across the U.S.

Table B.1
Pennsylvania Spudded, Active Gas Wells

	2008	2009	2010	2011	2012	2013	2014
Jan	12	25	82	152	139	120	125
Feb	16	38	60	127	126	65	57
Mar	25	18	125	137	114	96	-
Apr	26	32	135	92	130	101	-
May	24	39	131	132	120	128	-
Jun	28	71	125	137	104	106	-
Jul	24	73	134	171	79	59	-
Aug	27	53	115	184	67	119	-
Sep	28	79	155	128	77	106	-
Oct	29	100	124	174	122	94	-
Nov	27	97	106	157	90	98	-
Dec	28	116	102	142	94	92	-
Total	**294**	**741**	**1,394**	**1,733**	**1,262**	**1,184**	**n.a.**

Source: Pennsylvania Department of Environmental Protection.
Spud data contains unconventional, horizontal and active wells for all natural gas formations. Data as of 02/28/2014.

Table B.2
Act 13 Impact Fee Distribution

Section	Description	2011	2012
2314(c)	County Conservation Districts/State Conservation Commission	2,500,000	5,000,000
2314(c.1)(1)	Fish and Boat Commission	1,000,000	1,000,000
2314(c.1)(2)	PA Public Utility Commission	1,000,000	1,000,000
2314(c.1)(3)	Department of Environmental Protection	6,000,000	6,000,000
2314(c.1)(4)	PA Emergency Management Agency	750,000	750,000
2314(c.1)(5)	Office of State Fire Commissioner	750,000	750,000
2314(c.1)(6)	Department of Transportation	1,000,000	1,000,000
2314(c.2)	Natural Gas Energy Development	10,000,000	7,500,000
2314(d)	Counties and Municipalities (and Housing Fund) Funds in excess of the Municipality Restriction in section 2314(e) are re-allocated to the Housing Affordability & Rehabilitation Enhancement Fund	108,726,000	107,683,200
2315(a.1)	Marcellus Legacy Fund	72,484,000	71,788,800

Source: Pennsylvania Public Utility Commission.

Table B.3
Average Daily Production by Shale Play (MMcf/day)[1]

	ND/MT Bakken	TX Eagle Ford	TX/LA/AR Haynesville	PA/WV/OH Marcellus	CO/WY/NE/KS Niobrara	TX/NM Permian
2007	188	1,651	3,589	1,186	3,536	4,708
2008	191	1,649	4,071	1,383	4,061	4,860
2009	221	1,705	4,425	1,457	4,874	4,785
2010	263	1,755	6,098	1,891	4,834	4,492
2011	341	2,240	8,806	3,777	4,825	3,836
2012	600	3,525	9,971	6,396	4,931	4,314
2013	862	4,811	8,579	9,849	4,501	4,645
2014	1,157	6,260	6,286	13,877	4,543	5,055

[1] All data pertain to February of relevant year.
Source: Drilling Productivity Report, EIA.

Table B.4
Year-over-Year Growth Rate in Average Daily Production by Shale Play[1]

	ND/MT Bakken	TX Eagle Ford	TX/LA/AR Haynesville	PA/WV/OH Marcellus	CO/WY/NE/KS Niobrara	TX/NM Permian
2008	1.5%	-0.1%	13.4%	16.7%	14.8%	3.2%
2009	15.5	3.4	8.7	5.3	20.0	-1.6
2010	19.4	3.0	37.8	29.8	-0.8	-6.1
2011	29.4	27.6	44.4	99.7	-0.2	-14.6
2012	76.1	57.4	13.2	69.3	2.2	12.5
2013	43.6	36.5	-14.0	54.0	-8.7	7.7
2014	34.2	30.1	-26.7	40.9	0.9	8.8

[1] All data pertain to February of relevant year.
Source: Drilling Productivity Report, EIA.