# Section 5 – Potential economic impacts

***Note to the reader:*** *Subsections A through F of Section 5 were prepared by the N.C. Department of Commerce. Subsections G through N of Section 5 were prepared by the N.C. Department of Environment and Natural Resources.*

## A. Introduction

The purpose of this section is to provide an estimate of economic impacts on the North Carolina economy related to new gas drilling activities, specifically directional drilling of gas wells in the Sanford sub-basin of the Deep River Triassic Basin. The economic impact analysis focuses on drilling activities and does not take site preparation, leasing of land, hydraulic fracturing, or extraction, production or transmission of gas into consideration. While a review of the natural gas industry was conducted in order to potentially model these impacts, uncertainty about data quality did not permit further analysis. Data quality issues resulted primarily from a lack of survey-based, real-world industry cost and supply chain relationship data. This survey approach would be necessary due to the absence of well-defined data in the matrix that underlies the modeling tool. Follow-on analysis with better data is recommended.

This analysis is not intended to indicate a position by the North Carolina Department of Commerce (Commerce) for or against the drilling, extraction, production or any other activities related to natural gas development in the state.[317] Results are estimates and are derived from inputs provided by the North Carolina Department of Environment and Natural Resources (N.C. DENR) and, in some cases, based on forecasts or hypotheses. While economic modeling can provide some information about how an economy will react under different conditions, future economic performance is not entirely predictable. Economic modeling should be used in conjunction with other forms of analysis to estimate overall project merits and drawbacks. Caution must be exercised in interpreting these results; the economic impact estimates in this analysis are based strictly upon assumptions.

Commerce uses IMPLAN software for economic impact modeling.[318] The following table summarizes data and assumptions used in developing the economic impact model for this report.

[317] The natural gas industry includes other "midstream" economic activities such as extraction, processing, distribution and retail sales. These activities are not analyzed in this report, nor were economic analyses of these activities required by the study legislation.

[318] IMPLAN allows researchers to develop local level input-output models to estimate the economic impacts associated with marginal changes in the economy, such as "shocks" of new production or output. The framework and methodological basis for the IMPLAN model is derived from the U.S. Dept. of Commerce's Benchmark Input-Output Accounts. The IMPLAN model is widely used by local, state and federal government agencies as well as private industry and universities. Minnesota IMPLAN Group Inc. or MIG Inc. was founded in 1993 by Scott Lindall and Doug Olson as an outgrowth of their work at the University of Minnesota starting in 1984. This developmental work closely involved the U.S. Forest Service's Land Management Planning Unit in Fort Collins, and Dr. Wilbur Maki at the University of Minnesota. For more information please visit www.IMPLAN.com.

**Table 5-1. Model Assumptions**

| | |
|---|---|
| Project Location / Economic Impact Area | North Carolina |
| IMPLAN Sector | 28 - Drilling Oil and Gas Wells |
| Time Period for Drilling Activities | 2013-2019 |
| Estimated Cost of Drilling a Single Well | $3,000,000 |
| Total Estimated Wells Drilled | 368 |
| Local Purchase Percent | Using model default values, 36% of drilling expenditures are expected to be spent in the local economy |

In addition to the model described below, a literature review of studies published both by the natural gas industry as well as by academic economists was conducted to better understand potential outcomes for North Carolina. Overall, these studies show that a large infusion of economic activity from shale gas drilling will increase the incomes of some individuals and communities and will add jobs. However, without reliable expenditure inputs based on primary research, it remains uncertain how much wealth, income or benefits from long-term employment would accrue to Lee, Chatham and surrounding counties.[319] Some literature questions whether static input-output models (like IMPLAN) overestimate potential economic impacts and suggests dynamic models like REMI are more suitable alternatives.[320] Although this economic impact analysis only considers impacts and jobs associated with new drilling activities, readers should not discount the potential for additional economic impacts associated with other natural gas activities such as site preparation, leasing of land, production, extraction or transmission. Data and modeling tool limitations are the primary reasons these analyses were not included here. Lease payments, for example, were not modeled due to lack of reasonable data including the volume and amount of potential payments.[321]

[319] Primary research through firm surveys would provide a better baseline from which to forecast. At this time, the oil and gas extraction industry is underdeveloped in North Carolina and surveying would likely yield inadequate sample results. Surveying would have been impossible to conduct given the time constraints on this analysis.

[320] Regional Economic Models Inc., or REMI, primarily differs from IMPLAN in that it is a dynamic model. Changes in the economy are measured by their marginal, not average, impact on the environment. This reasoning is intuitive because the relationships and impacts of economic changes are not linear. REMI is able to account for a wide variety of factors that are absent in IMPLAN. This includes demographic information, substitution between different resources, trade impacts and changes in productivity. More information is available online at www.remi.com

[321] For example, a study by the America's Natural Gas Alliance notes lease payments range from "as little as $150 per acre to as high as $5,000 per acre…without specific data, such a wide range poses a significant problem in approximating the aggregate lease payments made for a specific year." (Source: http://www.anga.us/media/195472/utsa%20eagle%20ford.pdf)

The following analysis considers the economic impacts of new drilling activities in the Sanford sub-basin on the North Carolina economy. The Sanford sub-basin is approximately 59,000 acres of the 785,000 acres of the Triassic Basins in North Carolina (this does not include the Pekin formation because of its lack of potential to produce hydrocarbons). Table 5-2 summarizes annual figures for the total number and estimated cost of wells drilled. The number of wells and the drilling ramp-up estimates were provided by the North Carolina Geological Survey. Estimates for the average cost to drill a single well were confirmed by industry experts consulted by Commerce including the American Natural Gas Alliance. However, costs can vary from well to well. In total, 368 wells are assumed to be drilled over seven years.

**Table 5-2. Potential Well Field**

| Sanford Sub-basin Shale Play: Estimated Number of Wells | | | | |
|---|---|---|---|---|
| | *Annual Ramp Up* | *Cummulative Total* | *Annual Cost of Drilling* | |
| *Year 1* | 7 | 7 | $ | 21,000,000 |
| *Year 2* | 32 | 39 | $ | 96,000,000 |
| *Year 3* | 45 | 84 | $ | 135,000,000 |
| *Year 4* | 63 | 147 | $ | 189,000,000 |
| *Year 5* | 88 | 235 | $ | 264,000,000 |
| *Year 6* | 123 | 358 | $ | 369,000,000 |
| *Year 7* | 10 | 368 | $ | 30,000,000 |
| *These estimates were forecasted by N.C. DENR based on the estimated acreage of the Sanford sub-basin and using an estimated well spacing of one well per 160 acres.* | | | | |

### *Limits to economic input-output models*

IMPLAN models are customized to reflect existing economic relationships within a local economy. Thus, given that the state currently has no shale gas hydraulic fracturing, extraction or production activities, baseline data in IMPLAN is limited. Until the industry is more developed, and economic and multiplier relationships are better represented in the data, model outputs will not be robust.

## B. Economic impacts

The model estimates that 36 percent of drilling investments will be spent locally with North Carolina vendors. Since North Carolina does not presently have a developed fossil fuel extraction industry, the majority of inputs for drilling operations are not expected to be supplied by existing North Carolina companies. This means there are likely to be substantial economic “leakages” as dollars are spent outside the North Carolina economy on purchases for operations. For instance, the drilling and hydraulic fracturing of wells for the purpose of extracting shale gas requires specialized equipment. Several aspects of this process could be contracted to specialized companies.

Impacts are presented as statewide impacts. Monetary figures are presented in 2012 dollars. IMPLAN software measures employment in job-years.

**Key Economic Impact Definitions**

Direct Impacts: The known or predicted change in the economy that is being studied. In this analysis the direct impacts are the changes associated with drilling activities.

Indirect Impact: Secondary impact caused to industries in the supply chain of the direct impact. In this case, indirect impacts would result from industries supplying resources and materials to drilling activities.

Induced Impact: Direct and indirect employment (and increases in labor income) creates additional household spending on goods and services.

Employment: The number of full-time and part-time jobs; measured by place of employment. Employees, sole proprietors and active partners are included, but unpaid family workers and volunteers are not.

Job-Years: IMPLAN measures employment impacts in job-years with each unit of employment equivalent to one job for one year. This is important when IMPLAN is used to measure non-permanent operations. For example, IMPLAN does not distinguish between 10 units of employment employed over five years, and 50 workers employed in one year. Therefore, one worker may account for multiple units of employment if that person is employed over multiple years.

Output: Output includes the cost of production or the cost of goods sold plus value added (employee compensation, proprietor income, indirect business taxes and other property income).

Value Added: is a measure of the contribution of each private industry and of government to a region's gross domestic product. It is defined as an industry's gross output (which consists of sales or receipts and other operating income, commodity taxes, and inventory change) minus its intermediate inputs (which consist of energy, raw materials, semi-finished goods, and services that are purchased from domestic industries or from foreign sources).

## *Employment*

The IMPLAN model estimates drilling activities in the Sanford sub-basin would sustain an average of 387 jobs per annum over the seven-year time period. This figure includes all direct, indirect and induced jobs and is an annual average calculated from the total effects in Table 5-3. An alternative way to express this is that drilling activities would result in approximately 2,710 "job-years"[322] over the seven-year period modeled. The true annual job counts will vary by year, depending on the level of drilling activity; these detailed impacts are shown below in Table 5-3. Using the well drilling ramp-up estimated by the North Carolina Geological Survey, there will be differing numbers of wells drilled in any given year and, consequently, varying

[322] IMPLAN measures employment impacts in job-years with each unit of employment equivalent to one job for one year. An individual worker may account for multiple units of employment if that person is employed over multiple years. So, for example, 2,710 cumulative jobs could mean 2,710 jobs each lasting one year or 271 jobs each lasting 10 years, or other potential combinations of jobs and years equaling 2,710 total job-year units over the time period.

levels of employment associated with drilling. In the peak well year, drilling activities are estimated to sustain 858 jobs over a one-year period. In Year 1, the year with the lowest level of drilling expenditures, the IMPLAN model estimates that 59 jobs will be either created or partially supported by these expenditures.

It is important to recognize that the jobs associated with these projects are not permanent and continuous jobs, but rather temporary jobs. When the drilling expenditures cease, or the maximum number of wells have been drilled, all employment demands created by the gas resource associated with drilling will end. Table 5-4 details the top 10 industry sectors most affected by the new drilling activities. The Drilling Oil and Gas Wells sector is most impacted, with nearly 1,800 job-years, 65 percent of the total, estimated to be added.

**Table 5-3. Annual Employment Impacts**

| Annual Employment Impacts (Job Years) | | | | |
|---|---|---|---|---|
| Year | Direct Effect | Indirect Effect | Induced Effect | Total Effect |
| 2013 | 39 | 6 | 15 | 59 |
| 2014 | 169 | 28 | 64 | 261 |
| 2015 | 229 | 38 | 87 | 353 |
| 2016 | 308 | 51 | 117 | 475 |
| 2017 | 413 | 68 | 157 | 638 |
| 2018 | 555 | 92 | 210 | 858 |
| 2019 | 44 | 7 | 17 | 68 |
| Cummulative | 1,760 | 290 | 670 | 2,710 |

Source: MIG IMPLAN 3.0; model created February 2012. Cumulative employment impacts rounded to the nearest tenth.

**Table 5-4. Top 10 Industry Sectors Impacted**

| Top Ten Industry Sectors Impacted from, Ranked by Employment | | |
|---|---|---|
| Sector | Description | Total Employment (Job Years) |
| 28 | Drilling oil and gas wells | 1,757 |
| 413 | Food services and drinking places | 82 |
| 360 | Real estate establishments | 55 |
| 319 | Wholesale trade businesses | 45 |
| 394 | Offices of physicians, dentists, and other health practitioners | 35 |
| 369 | Architectural, engineering, and related services | 33 |
| 397 | Private hospitals | 30 |
| 367 | Legal services | 29 |
| 335 | Transport by truck | 27 |
| 398 | Nursing and residential care facilities | 26 |

Source: MIG IMPLAN 3.0; model created February 2012. Employment impacts rounded to the nearest whole number.

### *Financial impact to the state's economy*

Each year, as long as the drilling activities continue to occur, the state's economy will experience positive economic benefits. Table 5-5 describes the estimated annual impacts on the state's gross domestic product.

**Table 5-5. Annual Economic Impacts**

| Value Added (GDP) | | | | |
|---|---|---|---|---|
| Year | Direct Effect | Indirect Effect | Induced Effect | Total Effect |
| 2013 | $ 4,833,000 | $ 562,000 | $ 1,026,000 | $ 6,421,000 |
| 2014 | $ 21,236,000 | $ 2,468,000 | $ 4,508,000 | $ 28,212,000 |
| 2015 | $ 28,703,000 | $ 3,336,000 | $ 6,093,000 | $ 38,131,000 |
| 2016 | $ 38,623,000 | $ 4,489,000 | $ 8,198,000 | $ 51,310,000 |
| 2017 | $ 51,853,700 | $ 6,027,000 | $ 11,007,000 | $ 68,888,000 |
| 2018 | $ 69,662,000 | $ 8,097,000 | $ 14,787,000 | $ 92,546,000 |
| 2019 | $ 5,551,000 | $ 645,000 | $ 1,178,000 | $ 7,374,000 |
| Cummulative | $ 220,461,700 | $ 25,624,000 | $ 46,797,000 | $ 292,882,000 |

Source: MIG IMPLAN 3.0; model created February 2012. All monetary impacts presented in 2012 dollars and rounded to the nearest thousand.

Cumulative impacts of the drilling activities are reported and expected to occur over the time period 2013-2019. Upon exhaustion of all drilling activities in the state, it is estimated the economy will have increased output by $453 million. Output represents the level of all economic activity from production and is typically larger than value added impacts, which measure the direct change in North Carolina's gross domestic product (GDP). Anticipated drilling activities are estimated to positively affect the state's GDP by $292 million by year 2019. Value-added is considered a standard benchmark in measuring economic impacts on the state.

## C. Timing of the realization of economic benefits

One indicator of the likelihood that North Carolina's basin will be developed in the near-term would be for this resource to appear in shale play lists from leading energy research firms. IHS Global Insight, in a December 2011 study for the American Natural Gas Alliance, considered 21 geographically diverse shale plays around the country.[323] Six prominent plays are expected to account for more than 90 percent of U.S. shale capacity by 2035. North Carolina was not on this list and, at this time, does not appear on U.S. Geological Survey maps of North American shale plays.

In addition, the fossil fuel industry is highly agglomerated, meaning that suppliers cluster in the same geographic region as the extraction activities. Due to North Carolina's lack of infrastructure, including suppliers, the state's natural gas resource may be less attractive to investors and thus there is more uncertainty in the potential for the state to reap employment benefits from supplier firms. Construction of the infrastructure necessary for shale gas

[323] HIS Global Insight, Inc. "The Economic and Employment Contributions of Shale Gas in the United States." December 2011. Web http://anga.us/media/235626/shale-gas-economic-impact-dec-2011.pdf

extraction could raise the break-even cost of drilling in North Carolina relative to other existing plays, while gas from these other plays is likely to be available for years at low prices.[324]

However, changes in future demand for natural gas from utility, industrial, and transportation sectors will affect future pricing. Future prices will also be affected by changes in policy that, for example, increase exports. These factors could impact the viability of North Carolina's resource for development. Pricing forecasts, such as analyses from the U.S. Energy Information Agency,[325] reflect the best available knowledge about market trends as of the time the forecast is made. To the extent that dynamics could change or are not captured in current models, price forecast analyses should not, in Commerce's view, become the sole basis for policy decisions.

## D. Other issues

### *Agriculture, wineries and the local food industry*

As shown in the model, natural gas development is expected to create benefits, as equipment, materials and supplies are purchased by the natural gas industry and workers spend their wages in the local economy. Landowners could realize benefits from lease royalties and payments.

Research from other states indicates that there are also potential costs to local agricultural activities. Natural gas extraction is an equipment-intensive heavy industry. It has been associated with disruption of farmland and viticulture with round-the-clock operations, noise, lights, wastewater pits and significant truck traffic on remote roads, according to studies from Cornell University.[326]

Lee and Chatham Counties have significant agriculture activities present. According to National Agriculture Statistics Service 2007 data reported by the North Carolina Department of Agriculture and Consumer Services Agricultural Statistics Division, Chatham County has 1,089 farms and Lee County has 272 farms.[327] The market value of farm products sold in 2007 was an estimated $171.7 million in Chatham County and $31.5 million in Lee County.[328] In Chatham County, 23.9 percent of land is farmland, and in Lee County, 22.2 percent of land is farmland.[329] Additionally, according to 2012 County tax office data, 209,258 acres are enrolled in the present

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[324] Jeff Ventura, President, Range Resources, presentation at Goldman-Sachs Global Energy conference, January 10, 2012, Web. www.slideshare.net/plsderrick/range-2012-goldman-sachs-global-energy-conference-presentation

[325] http://www.eia.gov/forecasts/aeo/er/pdf/0383er%282012%29.pdf

[326] Community and Regional Development Institute at Cornell University. "The Economic Consequences of Marcellus Shale Gas Extraction: Key Issues" Issues 14 September 2011 Web. http://assembly.state.ny.us/member_files/125/20110915/index.pdf

[327] Source: NASS http://ncagr.gov/stats/codata/chatham.pdf; http://ncagr.gov/stats/codata/lee.pdf

[328] Source: www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/North_Carolina/cp37037.pdf; www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/North_Carolina/cp37105.pdf

[329] Source: http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/North_Carolina/st37_2_008_008.pdf

use value (PUV) program in Chatham County and 20,268 acres are enrolled in the PUV program in Lee County.[330]

## *Travel and tourism*

Travel and tourism are important parts of the present and future economy of North Carolina and the Piedmont region. Visitor spending encompasses a wide group of activities including the food and beverage industry, lodging, retail and service stations, transportation and recreation. North Carolina ranks as the sixth most visited state in the United States and enjoys $1.5 billion in visitor spending annually. North Carolina's natural scenic beauty, picturesque small towns and rural vistas are hallmarks for the brand identity the State markets to visitors.

In 2010 (the most recent data available from the Department of Commerce Travel Economic Impact Model), direct visitor spending[331] in Lee, Chatham and Moore counties was an estimated $60.0 million, $25.0 million and $342 million respectively.[332] Approximately 0.6 percent of Lee County residents and 0.2 percent of Chatham County residents were employed in the Tourism industry in 2010.[333]

Based on the economic impact analysis shown here, monetary impacts (value added) from drilling could exceed tourism-related spending in a given year. Individual gas wells and drilling activity, while disruptive at a local scale, may not impact the region's tourism industry directly. Some would argue that tourism-related businesses are locally owned and operated, making these businesses important to the long-term economic development trajectory for a region. The same is also true of local agriculture businesses. Some researchers have argued that the employment impact from gas drilling, comparatively, will be relatively short-term and the majority of economic benefits will not accrue to local tourism businesses. [334]

## *Residential issues*

Some analysts report that elsewhere in the country, a natural gas and oil development boom has caused the demand for available housing stock to outpace supply due to imported labor (workers with specialized skills in drilling and hydraulic fracturing). North Carolina, with

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[330] Source: Lee and Chatham County tax offices. Present-use value is the value of land in its current use as agricultural land, horticultural land, or forestland based solely on its ability to produce income and assuming an average level of management. Property that qualifies for present-use value classification is assessed at its present-use value rather than its market value. Present-use value is usually much less than market value and qualifying tracts are assessed at this lower value.

[331] The North Carolina Commerce Department defines travel as activities, including business and leisure, associated with all overnight and day trips to places 50 miles or more, one way, from the traveler's origin and any overnight trips away from home in paid accommodations.

[332] N.C. Department of Commerce. Travel Economic Impact Model Web. http://www.nccommerce.com/tourism/research/economic-impact/teim

[333] BLS data downloaded from the North Carolina Department of Commerce Access NC website, http://accessnc.commerce.state.nc.us/EDIS/page1.html

[334] Rumbach, Andrew. "Natural Gas Drilling In the Marcellus Shale: Potential Impacts On the Tourism Economy of the Southern Tier." Web. http://www.stcplanning.org/usr/Program_Areas/Energy/Naturalgas_Resources/STC_RumbachMarcellusTourismFinal.pdf

potentially few workers trained in the fossil fuel extraction industry, would likely require companies to bring in work crews from elsewhere.[335] Some researchers have found that the uptick in housing demand from this industry is associated with increases in housing prices.[336]

North Carolina residents have expressed concern at public forums about the impacts of increased housing prices on retirees. About 13 percent of Lee County residents, 22 percent of Moore County residents and 17 percent of Chatham County residents are over 65 years old.[337] More than 70 percent of residents in Lee and Chatham counties own their homes. Rental unit vacancy rates in these two counties are relatively low,[338] which is an indicator of a limited rental housing supply. If significant gas development occurs, a shortage of affordable housing is possible. Because many retirees are on fixed incomes, increased housing prices may raise property tax rates and crowd out this population. Anecdotal observations also suggest that retirees may not wish to live in an industrialized landscape.

## E. Potential impacts to North Carolina energy consumers from developing the shale play

North Carolina customers should continue to benefit in the short-term from historically low natural gas prices nationwide, regardless of development of the potential supply in North Carolina. The New York Times reported Dec. 15, 2011 that Piedmont Natural Gas, a residential service provider in North Carolina, South Carolina and Tennessee, has filed to lower its customer rates eight times since 2008. As a result, Piedmont's average residential customer in North Carolina and South Carolina will pay approximately $175 less in wholesale natural gas costs in the 2011-12 winter compared with 2008-09 and, collectively, residential customers in North Carolina and South Carolina will save approximately $125 million compared to that prior period.[339]

The low-cost benefits North Carolina customers enjoy in the future will likely occur as a result of macroeconomic factors, such as the current domestic oversupply, that contributed to the

[335] Jacquet, Jeffrey. "Energy Boomtowns & Natural Gas: implications for Marcellus Shale Local Governments & Rural Communities." Northeast Regional Center for Rural Development, Penn. State University, Paper No. 43. 1/2009. http://nercrd.psu.edu/publications/rdppapers/rdp43.pdf

[336] Williamson, Jonathan and Bonita Kolb. "Marcellus Natural Gas Development's Effect on Housing in Pennsylvania." Center for the Study of Community and the Economy, Sep. 31, 2011. Web. http://www.phfa.org/forms/housing_study/2011/marcellus_report.pdf

[337] Source: American Community Survey, 2006-2010

[338] American Community Survey 2006-2010 data downloaded from the North Carolina Department of Commerce Access NC website, http://accessnc.commerce.state.nc.us/EDIS/page1.html

[339] *The New York Times*. "Piedmont Natural Gas Files to Further Reduce Customer Rates in North Carolina and South Carolina," Dec. 15, 2012. Web 27 Feb 2012. http://markets.on.nytimes.com/research/stocks/news/press_release.asp?docTag=201112150948PR_NEWS_USPRX____CL23460&feedID=600&press_symbol=231886

current suppression of prices. The development of the North Carolina shale play will not, in itself, dictate the price North Carolina customers pay for natural gas services. [340]

## F. Fiscal impacts to local government

The arrival of a natural gas industry to central North Carolina will increase the need for services from local governments including infrastructure, emergency, school and police and criminal justice services. Elected officials have testified to the Pennsylvania Association of Township Supervisors that dramatic increases in heavy truck traffic have impacted the sense of place of rural communities, forced residents to combat increased traffic and caused local governments to face higher cost burdens from road maintenance.[341] However, North Carolina's Deep River Basin is significantly more populated than the regions that have reported negative impacts to local governments; the region has relatively higher industrial activity and the North Carolina well field is estimated to be much smaller. [342] Bradford County, Pa., currently has 1,994 Marcellus wells permitted, as of February 2012.[343] In contrast, the North Carolina Geological Survey currently estimates a maximum field of 368 wells in North Carolina's Sanford sub-basin.

Research studies on whether crime rates increase disproportionately in energy boomtowns are mixed. Recent findings from the Justice Center for Research at Pennsylvania State University observe that there has been a "more variable pattern" of calls to state police and arrest statistics in the Marcellus region; the report stresses, however, that given an abbreviated observation period, trends are "difficult to detect."[344] More information on the potential impacts of oil and gas extraction and production on crime can be found in Section 6.

Some regions have reported that an influx of well-paid oil and gas workers has caused problems in drilling communities, but it is difficult to predict whether these problems will occur in North

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[340] We note that some, notably Vik Rao of the Research Triangle Energy Consortium at RTI (http://rtec-rtp.org/2012/02/17/can-nc-profit-from-shale-gas-without-producing-it/), suggest that North Carolina may be able to profit from the shale boom without producing any natural gas locally. In a February 2012 blog post, Rao argues that if natural gas prices stay low most shale gas production will be in the regions, like the Marcellus, that have higher amounts of the more-profitable natural gas liquids (NGL). The NGL's can easily be processed into raw materials for many useful fabrics and plastics. Alternatively, nitrogen fertilizers use methane as the feed stock, so "cheap natural gas equates to cheap fertilizer," Rao says. North Carolina may be able to import cheap natural gas and liquids from neighboring states and turn attention to incentivizing manufacturing value-added products that use gas and liquids as inputs.

[341] Herr, Elam. "Impact of Natural Gas Drilling on Infrastructure." Presentation for Pennsylvania State Association of Township Supervisors, June 8, 2011. Web http://files.dep.state.pa.us/PublicParticipation/MarcellusShaleAdvisoryCommission/MarcellusShaleAdvisoryPortalFiles/Workgroups/June_8_Elam_Herr.pdf

[342] Pad construction would involve heavy equipment including bulldozers and excavators. According to the New York Department of Environmental Conservation, well pads average 3.5 acres in size, with additional land required for surface water impoundments and equipment staging areas.

[343] See www.MarcellusGas.org for permit activity.

[344] Kowalski, Lindsay and Gary Zajac. "A Preliminary Examination of Marcellus Shale Drilling Activity and Crime Trends in Pennsylvania" Justice Center for Research at The Pennsylvania State University. January 9, 2012 Web. http://www.justicecenter.psu.edu/wp-content/uploads/2012/01/Marcellus-Shale-Drilling-and-Crime-Trends-in-Pennsylvania.pdf.

Carolina. This economic impact analysis shows that the majority of workers will be employed in the drilling sector of the economy. According to IMPLAN 2010 data, North Carolina has fewer than 200 workers in the Drilling Oil and Gas Sector at present. Since North Carolina does not have a substantial workforce in the Drilling Oil and Gas Sector, and the national drilling workforce has been shown to be transitory, the state can expect many of the drilling crews to come from other parts of the country if shale gas development proceeds.

## G. Additional state resources needed to provide regulatory oversight

The emergence of the shale gas industry in North Carolina will require additional capacity within the Department of Environment of Natural Resources (DENR) and/or another regulatory agency to develop and enforce a "cradle to grave" regulatory program. DENR has delegated authority for implementing and enforcing many different federal laws that govern aspects of shale gas development - the Clean Water Act, the Clean Air Act, the Safe Drinking Water Act etc. The stay may also need to add additional environmental standards to fill gaps in existing state and federal laws. Multiple divisions within DENR and other agencies would be involved in this regulatory framework due to the current division of jurisdiction over different aspects of the industry.

Specific shale gas regulatory activities undertaken by other states include:

- Issuing permits for drilling oil/gas wells
- Setting requirements for proper locations, well designs and construction of wells
- Inspection of drilling activity
- Development of controls and procedures to prevent accidental discharges
- Creation of design standards for on-site pits/lagoons to store drill cutting and flowback water
- Oversight of proper closure of on-site waste pits/lagoons after drilling completion
- Setting and enforcing standards for drill-cutting management and sediments left on-site
- Responding to citizen questions/concerns about safety of drinking water from private wells
- Customer service support for companies and individuals wishing to learn more about permitting processes and drilling regulations
- Production and dissemination of information and educational products to make the public aware of regulatory, landowner rights, public notices and other issues
- Regulation of the wastewater disposal and transportation activities

If North Carolina chooses to develop an oil and gas regulatory program, state government staff will undertake all of these types of activities. Drilling activities also will increase the need for staff to evaluate and monitor potential impacts to local plant and animal habitats and health and groundwater quality. As North Carolina has no active oil and gas production, DENR has no full-time staff members working on oil and natural gas permitting and regulation. The recent STRONGER report for North Carolina suggests that, at least initially, the department should focus resources on development and adoption of rules, technical criteria, administrative procedures, staff training, permitting processes and incorporation of industry considerations into state emergency response plans. These measures are needed to ensure that state

environmental staff, the industry and the public are aware of regulatory expectations and permitting processes. These activities could influence workloads for administration, legal and rulemaking staff and numerous individuals in several DENR divisions.

Once preliminary tasks are finished, ongoing program activities in the Division of Waste Management, Division of Land Resources, Division of Water Quality, Division of Water Resources and Office of Conservation Planning and Community Affairs would continue to impact staff workloads. There may be additional effects to other divisions and agencies that we are unable to anticipate at this time. This additional staffing would be located in the department's main administrative office in Raleigh and in the regional office(s) closest to the drilling fields. The amount of staff needed to successfully implement the program and provide industry support will depend on the number of permit applications that need to be processed and the number of inspections the agency is required to perform.

Recent budget cuts have reduced the number of field inspectors in the Division of Land Resources. The water, air and waste programs have also lost staff positions due to the economic downturn and resulting loss of tax and permit revenue. These offices cannot handle the additional workload associated with natural gas exploration and development with the current staff level. While the state's environmental programs are strong, existing programs were not developed in anticipation of regulating oil and gas exploration and production activities. Development of a comprehensive permit review process, inspection program and emergency response plans will be critical to guard against potential negative environmental impacts and this program development will take time and resources beyond those necessary for existing program operations.

While it is premature to estimate what the development of a regulatory program would cost to develop and maintain, state agencies will need enough resources to comprehensively oversee and implement environment and natural resource protections against potential adverse industry impacts. This would include appropriate measurement of environmental baselines before gas extraction, monitoring water and air quality during drilling, and ensuring measures taken to close wells properly.

Arkansas, a state with oil, natural gas and shale gas industries, employs seven full-time positions for inspection and monitoring activities of its shale gas program. This includes four dedicated full-time inspectors, one supervisor and two enforcement administrators. Twelve additional positions in the Arkansas Department of Environmental Quality that have some job responsibilities relating to the shale gas industry.[345] According to the department's database, staff conducted 1,392 inspections on facilities involved in the Fayetteville Shale Gas industry. Each inspector performed about 200 inspections in 2011. In addition, the agency issued at least 815 permits for different drilling and support activities.[346]

[345] Personal communication with Doug Szenher, Public Outreach and Assistance Division, Arkansas Department of Environmental Quality February 24, 2012.

[346] Arkansas Department of Environmental Quality. Complaints and Inspections Database. Accessed 2/25/2012. http://www.adeq.state.ar.us/home/pdssql/complaints_inspections.asp.

A companion agency, the Arkansas Oil and Gas Commission, employs an additional 39 people to support all three energy industries. The Commission administers and enforces state and federal laws dealing with the regulatory oversight of the oil, natural gas and brine production industries in Arkansas. The Commission's regulatory programs include administration of the U.S. EPA Underground Injection Control Program for operation of underground injection disposal wells, the U.S. Department of Transportation (USDOT) Pipeline Safety Program for natural gas gathering lines and Arkansas Abandoned and Orphaned Well Plugging Program used to plug abandoned and orphaned oil and gas wells. Commission staff members have job titles such as general counsel, regulatory counsel, geologists, permitting specialists and administrative functions such as fiscal officer, GIS analyst, IT support and webmaster. A random sample of permit reports indicates that this agency issued around 23 permits each week during 2011. This is about 1,200 for the year.[347]

Pennsylvania, another state with an established gas and oil program, employs approximately 200 people in the Department of Environmental Protection to work with the gas and oil industries.[348] In 2011, 88 inspectors performed 24,194 inspections of oil and gas facilities. This is an average of 275 inspections per inspector each year. The agency processed 5,728 gas and oil related permits. Approximately 60 percent of the permits and 40 percent of the inspections occurred in the Marcellus Shale gas region.[349]

These figures serve as initial indicators for the number of additional staff that may be required in North Carolina to support an active oil and gas exploration and extraction industry. The number of staff needed to implement North Carolina's regulatory program would be dependent on the specific permit review and inspection requirements and level of industry activity. We are unable to create a more precise estimate for needed resources and staff at this time without knowing more about the specific permit and compliance requirements that will apply to the industry.

## H. Comparison of existing bonding requirements to those in other states

Oil and gas producing states generally require oil and gas operators to provide a bond to the regulatory agency before beginning certain drilling operations. The U.S. Department of Interior's Bureau of Land Management imposes similar bonding requirements on oil and gas drillers operating on federal lands. These bonds are intended to ensure the operator properly reclaims the site after drilling; if the operator does not (or cannot), the bond provides the agency with funds to perform reclamation.

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[347] State of Arkansas Oil and Gas Commission. Weekly Permit and Completions Reports for 2011. Accessed February 28, 2012. http://www.aogc.state.ar.us/permitreport.htm

[348] Personal communication with Eugene W. Pine, P.G., Environmental Program Manager, Pennsylvania Department of Environmental Protection February 29, 2012.

[349] State of Pennsylvania Oil and Gas Permits and Compliance Reports/Databases for 2011. Accessed February 29, 2012. http://www.portal.state.pa.us/portal/server.pt/community/oil_and_gas_reports/20297

A 2010 Government Accounting Office (GAO) survey compiled data on expenditures by the federal Bureau of Land Management (BLM) to plug orphaned wells on BLM lands and compared bonding requirements across states.[350] The survey found that over a 21-year period, BLM spent about $3.8 million to reclaim 295 orphaned wells, or an average of about $12,900 per well. The GAO report states that "the amount spent per reclamation project varied greatly, from a high of $582,829 for a single well in Wyoming in fiscal year 2008 to a low of $300 for 3 wells in Wyoming in fiscal year 1994." The BLM also estimated the costs of wells it has yet to reclaim at approximately $1.7 million for 102 orphaned wells, an average of roughly $16,700 per well.

The GAO survey compared bonding requirements of the BLM with 12 western states. These states offer both a single well bond that covers one well and a blanket bond that covers either multiple wells or all wells of a single operator in a state. The amount of the bond required may vary based the number of wells the operator has orphaned or the well depth. A summary of bonding requirements found in the survey is presented in Table 5-6. For some states, regulators may increase or decrease the amount of the bond based on various factors. For instance, Alaska has a minimum single well bond of $100,000 unless the operator demonstrates that the cost of well abandonment and location clearance will be less than $100,000.

[350] U.S. General Accounting Office. *Oil and Gas Bonds: Bonding Requirements and BLM Expenditures to Reclaim Orphaned Wells,* GAO-10-245. Washington, DC: General Accounting Office, 2010. Retrieved April 16, 2011 from http://www.gao.gov/assets/310/300218.pdf.

**Table 5-6. Summary of State Oil and Gas Well Bonding Requirements**[351, 352, 353, 354]

| State | Single Well Bond | Blanket Bond |
|---|---|---|
| Alaska* | ≥$100,000 | ≥$200,000 |
| Arizona* | $10,000 (≤10,000 ft)<br>$20,000 (>10,000 ft) | $25,000 (up to 10 wells)<br>$50,000 (11-50 wells)<br>$250,000 (>50 wells) |
| California* | $15,000 (<5,000 ft)<br>$20,000 (5,000-10,000 ft)<br>$30,000 (≥10,000 ft) | Either $1 million<br>**OR**<br>$100,000 (up to 50 wells)<br>$250,000 (>50 orphaned wells),<br>+<br>1) annual fee for each idle well, or<br>2) escrow account of $5,000 per idle well, or<br>3) $5,000 bond per idle well, or<br>4) file a management and elimination plan |
| Colorado* | $10,000 (<3,000 ft)<br>$20,000 (>3,000 ft) | $60,000 (up to 100 wells)<br>$100,000 (>100 wells)<br>Additional fees for "excess inactive wells" |
| Idaho* | ≥$10,000 | ≥$25,000<br>Idaho has separate requirements for wells on state and school lands. |
| Montana* | $1,500 (≤2,000 ft)<br>$5,000 (2,001-3,500 ft)<br>$10,000 (>3,500 ft) | $50,000 (Board of Oil and Gas Conservation can increase bond to $100,000 under certain circumstances or limit number of wells covered) |
| Nevada* | ≥$10,000 | ≥$50,000 |
| New Mexico* | $5,000 plus $1 per foot of well depth in some counties<br>$10,000 plus $1 per foot of well depth in all other counties | $50,000 |
| Oregon* | $10,000 (<2,000 ft)<br>$15,000 (2,000-5,000 ft)<br>$25,000 (>5,000 ft) | sum of individual bonds but not <$100,000 |

[351] 25 Pa. Code § 78.303. Retrieved March 3, 2012 from http://www.pacode.com/secure/data/025/chapter78/chap78toc.html.
[352] Tennessee Department of Environment & Conservation. "Oil and Gas Well Permit." Retrieved March 3, 2012 from http://tn.gov/environment/permits/oilgas.shtml.
[353] 16 Tex. Admin. Code § 3.78. Retrieved March 3, 2012 from http://info.sos.state.tx.us/pls/pub/readtac$ext.TacPage?sl=T&app=9&p_dir=F&p_rloc=148268&p_tloc=14949&p_ploc=1&pg=2&p_tac=&ti=16&pt=1&ch=3&rl=78.
[354] W. Va. Code § 22-10-5. Retrieved March 3, 2012 from http://www.legis.state.wv.us/wvcode/code.cfm?chap=22&art=10.

**Table 5-6, continued**

| State | Single Well Bond | Blanket Bond |
|---|---|---|
| Pennsylvania+∞ | $4,000 | For wells <6,000 feet:<br>• $4,000/well (up to 50 wells, but no bond > $35,000)<br>• $35,000 + $4,000/well (51 - 151 wells, but no bond > $60,000)<br>• $60,000 + $4,000/well (151 - 250 wells, but no bond > $100,000)<br>• $100,000 + $4,000/well (>250 wells, but no bond > $250,000)<br>For wells ≥6,000 feet:<br>• $10,000/well (up to 25 wells, but no bond > $140,000)<br>• $140,000 + $10,000/well (26 - 50 wells, but no bond > $290,000)<br>• $290,000 + $10,000/well (51 - 151 wells, but no bond > $430,000)<br>• $430,000 + $10,000/well (>150 wells, but no bond > $600,000) |
| Tennessee+ | $2,000 | $10,000 for up to 10 wells |
| Texas+ | $2 per foot of total well depth for each well | $25,000 (1-10 wells)<br>$50,000 (11 to 99 wells)<br>$250,000 (100 or more wells) |
| Utah* | ≥$1,500 (<1,000 ft)<br>≥$15,000 (1,001-3,000ft)<br>$30,000 (3,001-10,000ft)<br>≥$60,000 (>10,000 ft) | ≥$15,000 (<1,000 ft)<br>≥$120,000 (>1,000 ft) |
| Washington* | ≥$50,000 for most wells | ≥$250,000 |
| West Virginia+ | $5,000 | $50,000 |
| Wyoming* | ≥$10,000 (<2,000 ft)<br>≥$20,000 (>2,000 ft) | ≥$75,000 |

∞ Legislation enacted in Pennsylvania in February 2012 raised bond fees from $2,500 for a single well and $25,000 for a blanket bod covering all of an operator's wells in the state. These requirements will be effective in early April 2012.
* Data from the GAO survey.
+ Data from individual state's codes or websites, as shown in footnotes.

Alaska also has a Statewide Miscellaneous Land Use Bond. This $100,000 bond is usually carried by applicants for geophysical exploration permits.

North Carolina Session Law 2011-276 revised the amount of the bond required for an oil and gas drilling permit to $5,000 plus $1 per linear foot. Under North Carolina's law, the bond only covers proper closure and abandonment of the well. The bond does not cover the costs of restoring the surface of the site to pre-existing conditions or remediation of contamination caused by the drilling operation. Currently in North Carolina, site reclamation is addressed only through lease agreements; North Carolina's oil and gas regulations do not require a site reclamation bond to address contamination or other environmental impacts. Permanent damage to the site represents a loss not only to the property owner, but also a loss to the public in the form of contaminated groundwater and surface water, increased runoff, erosion and sedimentation, and other environmental damage.

# I. Comparison of existing severance taxes to severance taxes or royalty payments in other oil and gas states

Under the North Carolina Oil and Gas Conservation Act, adopted in 1945, the state can assess on "each barrel of oil produced and saved a tax not to exceed five mills on each barrel." The tax revenue can only be used to pay the costs of administering the law. The same act also levies a tax on natural gas. The Department is authorized to assess "against each 1000 cubic feet of gas produced and saved from a gas well a tax not to exceed one-half mill on each 1000 cubic feet of gas."[355] This is 5/100 of a cent, $.0005 per 1,000 cubic feet of gas. These revenues are also to be used solely to pay the costs of administering the law.[356]

Like North Carolina, a handful of states assess a severance tax as a flat rate per unit of measure. Most states base the severance tax on the gross value (the amount of gas produced multiplied by the average price paid for that gas). However, the way in which states calculate "value" varies. Some states deduct certain items from the gross value or gross proceeds, such as production costs, ad valorem taxes or royalties paid. Texas offers a reduced tax rate of 0.0% to 7.4% of the market value of gas for high cost wells for 120 days or until the cumulative value of the tax reduction equals 50 percent of the drilling and completion costs for the well,[357] "depending on how the well's drilling and completion costs compare to the median cost of all High-Cost gas wells (previous State fiscal year)."[358] In Montana, producers may deduct from the calculation of the severance tax payment any natural gas produced that is used in the operation of the well. As a result, the severance tax of each state is not directly comparable to that of other states, because it is not the "effective rate" that a gas operator must pay.

Despite these variations, North Carolina has one of the lowest severance taxes in the nation. In fact, with the exception of those states that do not assess any severance tax, North Carolina's tax rate was the lowest of all states for which severance taxes were identified as part of this study. Maryland, New York and Pennsylvania do not assess severance taxes on the production of natural gas, however, Pennsylvania recently enacted a law imposing an "impact fee" on natural gas production, and New York assesses a "property type production tax" on the amount of natural gas produced.

Severance tax and corporate income tax rates are shown for 21 states in Table 5-7. Because of the variety of deductions available and differences in the ways in which states calculate the value of natural gas sold, these rates are not directly comparable; however, this table provides an idea of how these tax rates relate to one another.

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[355] N.C.G.S. § 113-387. Retrieved March 3, 2012 from http://www.ncleg.net/gascripts/statutes/statutelookup.pl?statute=113.
[356] Ibid.
[357] 16 Tex. Admin. Code § 3.101. Retrieved March 3, 2012 from http://info.sos.state.tx.us/pls/pub/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=16&pt=1&ch=3&rl=101.
[358] Texas Comptroller of Public Accounts. "Natural Gas Production Tax." *Texas Taxes.* Retrieved March 3, 2012 from http://www.window.state.tx.us/taxinfo/nat_gas/.

## Table 5-7. Severance and Corporate Income Tax Rates for Various Natural Gas-Producing States[359]

| State | Severance Tax Rate | Estimated Tax Paid on 1,000 mcf at $2.44 per MMBtu | Estimated Primary Severance Tax Burden* | Dedicated Severance Tax Revenues | Corporate Income Tax Rate |
|---|---|---|---|---|---|
| Alaska | 25% | $625.25 | 25.00% | None | 10 rates for increasing income (1 - 9.4%) |
| Montana | 12.16% | $304.12 | 12.16% | Counties, local governments, conservation, reclamation, remediation, schools | 6.75% of taxable income |
| Alabama | 2.00% + privilege tax (3.65% to 8%) | $250.10 | 10.00% | None | 6.5% of taxable income |
| Kansas | 8.00% | $200.08 | 8.00% | Local governments | 4.00% |
| Texas | 7.50% | $187.58 | 7.50% | Schools | 0.5% of the taxable margin |
| West Virginia | 5.00% + $0.047 per mcf | $130.05 | 7.08% | Local governments, conservation, reclamation, remediation, Medicaid | 7.5% of taxable income |
| Oklahoma | 1.00% - 7.00% | $175.07 | 7.00% | Local governments, conservation, reclamation, remediation, schools | 6% of taxable income |
| Louisiana | $0.164/mcf | $164.00 | 6.56% | Local governments, conservation, reclamation, remediation | 5 rates for increasing income (4% to 8%) |
| Wyoming | 6.00% | $150.06 | 6.00% | Local governments, conservation, reclamation, remediation, water development | None |
| North Dakota | $0.1476/mcf | $147.60 | 5.90% | Local governments, schools, water development | 3 rates for increasing income (1.7% to 5.2%) |
| Arkansas | 1.25% - 5.00% | $125.05 | 5.00% | Roads | 6 rates for increasing income (1% to 6.5%) |
| Colorado | 2.00% - 5.00% | $125.05 | 5.00% | Local governments, conservation, reclamation, remediation, schools, water development | 4.63% of taxable income |
| Utah | 3.00% or 5.00% | $125.05 | 5.00% | Schools | 5% of taxable income |
| Kentucky | 4.50% | $112.55 | 4.50% | Local governments | 3 rates for increasing income (4% to 6%) |
| New Mexico | 3.75% | $93.79 | 3.75% | Local governments, conservation, reclamation, remediation | 3 rates for increasing income (4.8% to 7.6%) |
| Tennessee | 3.00% | $75.03 | 3.00% | Local governments | 6.5% of net earnings |
| Ohio | $0.025/mcf + $.005/mcf assessment | $30.00 | 1.20% | Conservation, reclamation, remediation | Commercial activities tax, $150 minimum |
| North Carolina | $0.0005/mcf | $0.50 | 0.02% | Administrative costs related to oil and gas management | 6.9% of taxable income |
| Maryland | 0 | $0.00 | 0.00% | N/A | 8.25% of taxable income |
| New York | 0 | $0.00 | 0.00% | N/A | 6.5% of taxable income |
| Pennsylvania | None; impact fee = $50,000 per well in 2012 | $0.00 | 0.00% | N/A | 9.9% of taxable income |

*For those states that charge a flat rate per mcf, the estimated primary severance tax burden was calculated by dividing the severance tax rate by the Henry Hub price for natural gas on Feb. 29, 2012 ($2.50 per mcf, or $2.44 per MMBtu).

[359] This table was compiled using two primary sources: Marshall University's *Taxation of Natural Gas: A Comparative Analysis,* and the Allegheny Conference on Community Development's *Benchmarking Pennsylvania: A Summary of Severance Taxes on the Natural Gas Industry* (retrieved March 4, 2012 from http://www.alleghenyconference.org/PEL/PDFs/NaturalGasSeveranceTax021009.pdf). Where these two sources differed, the website of that state's revenue department was consulted. Corporate income tax information was collected primarily from the following source: Federation of Tax Administrators. "Range of State Corporate Income Tax Rates (For tax year 2012 – as of January 1, 2012)." February 2012. Retrieved March 4, 2012 from http://www.taxadmin.org/fta/rate/corp_inc.pdf.

## J. Use of special assessments

In addition to severance taxes, a variety of other taxes, fees and assessments may affect the oil and gas industry in any given state. These include corporate income taxes, real property taxes, personal property taxes, sales and use taxes, impact fees and permit fees. A few of these are discussed below, but this should not be considered an exhaustive list of all of the taxes and fees assessed at the state and local levels in all states.

### *Corporate income taxes*

Although Pennsylvania had no severance tax or impact fee on natural gas extraction until February 2012, the corporate income tax in Pennsylvania, at 9.9 percent of taxable income, was the highest corporate income tax of the 21 states examined. Wyoming is the only state that does not charge a corporate income tax. Corporate income tax rates also vary; however, corporate income taxes may not be as important a consideration as severance taxes, "as most gas operating companies are organized as exempt entities."[360] The way in which states determine taxable income varies. In nine states, the corporate income tax applies to a percentage of taxable income. Other states use tiered rates, depending on the level of income. In lieu of a corporate income tax, Texas levies a franchise tax of 0.5 percent of the taxable margin.

### *Pennsylvania's impact fee*

On Feb. 8, 2012, Pennsylvania enacted legislation (House Bill No. 1950) that places an impact fee on each well drilling for natural gas in the Marcellus Shale. The fee will fluctuate from year to year based on current natural gas prices and the Consumer Price Index. In 2012, drillers will pay $50,000 per well (or $10,000 for vertical wells). The fee will be collected and administered by the Pennsylvania Public Utilities Commission, but a county may receive a share of the revenue if the county passes an ordinance enacting the fee by mid-April 2012. If a county fails to act, the municipalities within the county can pass a resolution in support of the impact fee. If more than half of a county's municipalities do so within 60 days, the county's fee will be enacted. The fee will also go into effect if municipalities representing more than 50 percent of the county's total population pass the resolution. In areas where the fee is in effect, 60 percent of the revenue would be split between the county and municipalities where the well is located, and the remainder would be divided among various state agencies. In addition, the bill "authorizes the annual transfer of millions of dollars from the Oil and Gas Lease Fund to the Environmental Stewardship Fund and Hazardous Sites Cleanup Fund."[361] Pennsylvania impact fee bill authors estimate the fee will generate about $180 million in 2012.

### *New York's property tax on natural gas*

New York is unique in the way it taxes natural gas production. In the 1990s, New York's Office of Real Property Tax Services (ORPTS) was authorized by law "to impose an annual charge on oil

[360] Marshall University Center for Business and Economic Research. *Taxation of Natural Gas: A Comparative Analysis*. 2011. Retrieved March 3, 2012 from http://www.marshall.edu/cber/research/NaturalGasFinal.pdf.
[361] StateImpact. "What the New Impact Fee Law Means for Pennsylvania." 2012. Retrieved March 4, 2012 from http://stateimpact.npr.org/pennsylvania/tag/impact-fee/.

and gas producers to pay costs incurred in the administration of the oil and gas program."[362] ORPTS develops economic profiles, using data submitted by oil and gas producing companies, the New York State Department of Environmental Conservation and a consulting geologist. Staff analyzes the data and "determines unit of production values for each economic profile. Assessors use the unit of production values to calculate assessed values for oil and gas properties."[363] The process involves an income approach to valuation of oil and gas wells that includes production decline rates and income/expense escalation rates, gross income and operating expenses, remaining economic life of property, real property taxes, net income, depreciation, depletion, income and other taxes, capital investment, royalty interest not retained, rate of return and calculation of the present worth of net income.

### *Real property taxes*

A study by Marshall University's Center for Business and Economic Research examined the property valuation of natural gas property in 19 natural gas-producing states, finding that only two of the states (Alabama and Wyoming) do not levy a real property tax on natural gas. For the states that do assess a real property tax on natural gas, seven of them provide guidance to counties on how to value natural gas real property. Three allow local governments to determine the valuation methods and rates to be used as well as whether to tax natural gas real property.

### *Sales and use taxes*

In the study performed by Marshall University, 17 states assessed sales and use taxes on natural gas. Alaska and Ohio do not. These taxes range from 1.5 percent (Mississippi) to 8.6875 percent (New Mexico). Five states allow local governments to levy a local sales and use tax in addition to the state's tax.

### *Other fees and taxes*

Arkansas levies both a severance tax (ranging from 1.5 to 5 percent of the market value of gas) and a charge not to exceed 10 mills per thousand cubic feet of gas "to pay the expenses and other costs in connection with the administration" of the law laying out the activities of the Oil and Gas Commission.[364] The duties of the Arkansas Oil and Gas Commission include collecting data; performing inspections; examining properties, leases, papers, books and records; examining, checking, testing and gauging oil and gas wells, tanks, refineries and means of transportation; holding hearings; recordkeeping; enforcement activities; and making rules.[365]

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[362] The New York State Department of Taxation and Finance. "Overview Manual for Valuation and Assessment of Oil and Gas Producing Property in New York State." 2012. Retrieved March 4, 2012 from http://www.tax.ny.gov/research/property/valuation/oilgas/overview.htm.

[363] The New York State Department of Taxation and Finance. "Overview Manual for Valuation and Assessment of Oil and Gas Producing Property in New York State." 2012. Retrieved March 4, 2012 from http://www.tax.ny.gov/research/property/valuation/oilgas/overview.htm.

[364] Ark. Code § 15-71-107. Retrieved March 5, 2012 from http://law.justia.com/codes/arkansas/2010/title-15/subtitle-6/chapter-71/15-71-107/.

[365] Ark. Code § 15-71-110. Retrieved March 5, 2012 from http://law.justia.com/codes/arkansas/2010/title-15/subtitle-6/chapter-71/15-71-110/.

Utah levies a conservation tax of 0.2 percent on the value at the well of natural gas produced, saved and sold or transported from the place where it is produced. These fees are deposited into the Utah Oil and Gas Conservation Account, which is dedicated to the administration of the fund, the plugging and reclamation of abandoned oil and gas wells, and education programs addressing issues of the mineral and petroleum resources and industries.[366] Wyoming also has a conservation tax on the fair market cash value of all natural gas produced, sold and transported within the state. The Wyoming Oil and Gas Commission can adjust the rate as necessary, and the most recent rate is 0.04 percent.[367]

Colorado levies an environmental tax of 1.7 mills per $1 of the market value of natural gas at the wellhead, regardless of whether the gas was produced, saved, sold or transported from the field where it was produced. This funding supports the Colorado Oil and Gas Conservation and Environmental Response Fund. A portion of Colorado's severance tax may also support this fund[368] as well as any appropriations by the General Assembly, grants, etc. The fund was created to

> "(I) Investigate, prevent, monitor, or mitigate conditions that threaten to cause, or that actually cause, a significant adverse environmental impact on any air, water, soil or biological resource;
>
> (II) Gather background or baseline data on any air, water, soil, or biological resource that the commission determines may be so impacted by the conduct of oil and gas operations; and
>
> (III) Investigate alleged violations of any provision of this article, any rule, or order of the commission, or any permit where the alleged violation threatens to cause or actually causes a significant adverse environmental impact."[369]

Louisiana imposes an oilfield site restoration fee at a rate of $0.003 per thousand cubic feet of natural gas. This fee is increased for stripper and incapable wells to reflect the proportion of the reduced severance tax that would be collected.[370] Similarly, Texas levies an Oilfield Cleanup Fee on Gas of $0.0007 per thousand cubic feet of gas. The revenue is used in various conservation efforts, including controlling and cleaning up oil and gas waste, plugging abandoned wells, and conducting environmental site assessments.[371] Texas also levies a condensate production tax, at 4.6 percent the market value of gas in Texas.[372]

Mississippi levies drilling, permit and ownership transfer fees to fund its Oil and Gas Conservation Fund. The permit fee is $600 and the ownership transfer fee is $100. An

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[366] Marshall University, December 7, 2011.
[367] Marshall University, December 7, 2011.
[368] Marshall University, December 7, 2011.
[369] Colo. Rev. Stat. § 34-60-124. Retrieved March 5, 2012 from http://cogcc.state.co.us/RR_Docs_new/rules/AppendixV.pdf.
[370] Marshall University, December 7, 2011.
[371] Marshall University, December 7, 2011.
[372] Texas Comptroller of Public Accounts. "Natural Gas Production Tax." *Texas Taxes.* Retrieved March 3, 2012 from http://www.window.state.tx.us/taxinfo/nat_gas/.

additional $100 annual tax on non-plugged natural gas wells funds Mississippi's Emergency Plugging fund.[373]

New Mexico has an Oil and Gas Conservation Tax, and an Oil and Gas Emergency School Tax. The Oil and Gas Conservation Tax is 0.19 percent of the taxable value of products sold. The Oil and Gas Emergency School tax is a privilege tax on the business of every person severing oil and other liquid hydrocarbons, carbon dioxide, helium and natural gas, and is based on the products' taxable value. For natural gas, this tax is four percent of the taxable value.

Proposed legislation in New York would establish a natural gas production contamination damage recovery and remediation fund. The fund would be charged as a surcharge on permit fees and could be used by the New York Department of Environmental Conservation "to pay for cleanup and decontamination costs incurred in any response to contamination due to natural gas production after funds from bonds established for this purpose are fully expended."[374]

Tennessee's oil and gas reclamation fund is supported by fees from violations of oil and gas extraction standards. The funds are used to perform reclamation work for lands and waters damaged by surface and subsurface exploration and extraction.[375]

## K. Estimate of revenue generated by severance taxes or royalties at levels comparable to other oil and gas states

Since many states use the value of natural gas sold as the basis for severance taxes but calculate the value of natural gas differently, direct comparison of the revenue generated by these taxes is difficult. Table 5-8 shows examples of what some states collected in severance taxes in 2009.

[373] Marshall University, December 7, 2011.
[374] DiNapoli, Thomas, New York State Comptroller. Memorandum. OSC #20. Retrieved March 5, 2012 from http://www.osc.state.ny.us/legislation/2011-12/oscb20memo.pdf.
[375] Marshall University, December 7, 2011.

**Table 5-8. Severance Tax Collections per Million Cubic Feet for 2009[376]**

| State | Severance Taxes Collected | Production (MMcf) | Taxes Collected per MMcf |
|---|---|---|---|
| Alaska | $77,141,000.00* | 397,077 | $194.27 |
| Louisiana | $282,430,592.09† | 3,332,956 | $84.74 |
| North Dakota | $9,811,808.26 | 59,369 | $165.27 |
| Ohio | $2,069,704.00† | 88,824 | $23.30 |
| Oklahoma | $707,296,658.00† | 1,857,777 | $380.72 |
| Tennessee | $1,252,875.55† | 5,478 | $228.71 |
| Texas | $1,407,739,109.00 | 7,284,520 | $193.25 |
| West Virginia | $75,948,588.59 | 264,436 | $287.21 |

† Fiscal Year 2009

* Calendar Year 2008

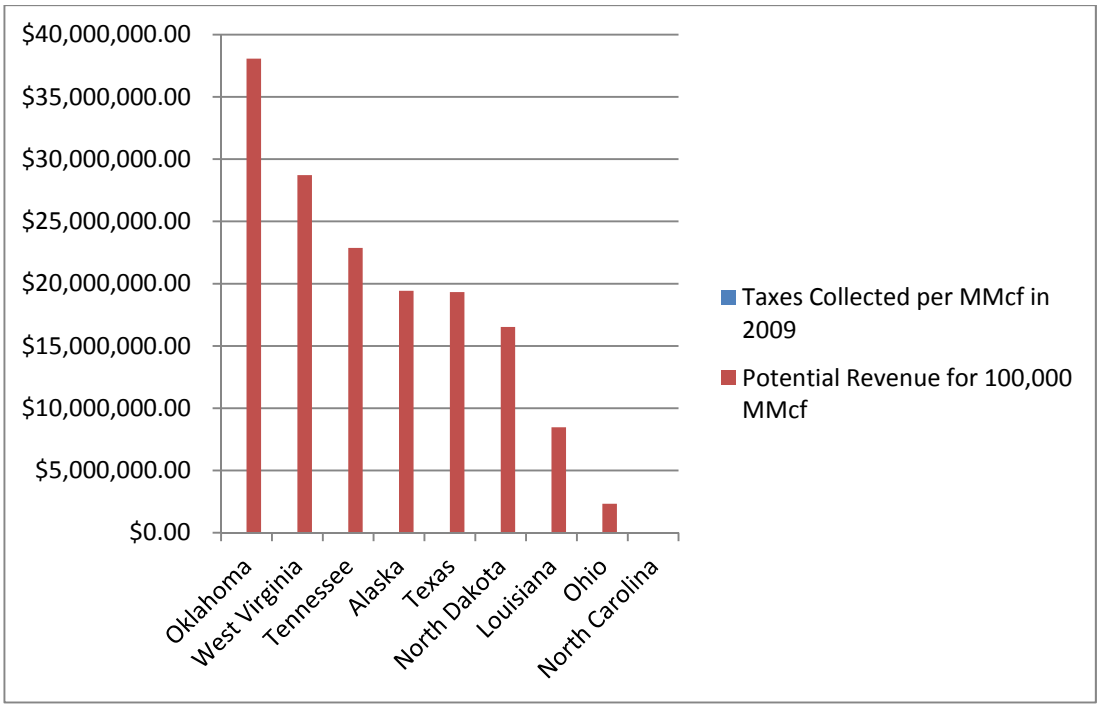
For the sake of comparison, Table 5-9 shows a hypothetical example of what North Carolina would collect if the Triassic Basins produced natural gas using the amount of taxes collected per MMcf found by the Marshall University study and shown in Table 5-8 above. A graphical representation of this estimate is shown in Figure 5-1.

**Table 5-9. Estimated Revenues Based on Other States' Tax Collections**

| State Severance Tax Collection | Taxes Collected per MMcf in 2009 | Potential Revenue for 100,000 MMcf | Potential Revenue for 1,000 MMcf |
|---|---|---|---|
| Oklahoma | $380.72 | $38,072,000 | $380,720 |
| West Virginia | $287.21 | $28,721,000 | $287,210 |
| Tennessee | $228.71 | $22,871,000 | $228,710 |
| Alaska | $194.27 | $19,427,000 | $194,270 |
| Texas | $193.25 | $19,325,000 | $193,250 |
| North Dakota | $165.27 | $16,526,821 | $165,268 |
| Louisiana | $84.74 | $8,474,000 | $84,740 |
| Ohio | $23.30 | $2,330,000 | $23,300 |
| North Carolina | N/A (existing severance tax rate used in calculation) | $50,000 | $500 |

[376] Marshall University Center for Business and Economic Research. "Taxation of Natural Gas: A Comparative Analysis, Severance Tax Review." December 13, 2011. Retrieved March 5, 2012 from http://www.marshall.edu/cber/research/SeveranceTaxReviewFinal.pdf.

**Figure 5-1. Estimated Revenues Using Other States' Tax Collections**




## L. Fees for permitting oil and gas exploration and production activities

### *Well permitting fees in North Carolina and other states*

State fees for permits to drill an oil or gas well range from $0 to more than $3,000. The U.S. Bureau of Land Management charges a $6,500 fee to drill on federal land. That fee has been effective since 2009 (the previous fee was $4,000), and the money generated "constitutes a reimbursement to the U.S. Treasury for the estimated cost of processing new APDs".[377] Of the states researched for this report, Colorado, Maryland and New Mexico do not charge any fee. (Colorado statutes authorize the Oil and Gas Conservation Commission to charge a permit fee of up to $200,[378] but according to the Oil and Gas Conservation Commission's website, the current fee is $0.[379]) Wyoming charges a minimal $50. Louisiana, New York, Pennsylvania and Texas charge fees at a range of rates based on the depth of the wells to be drilled. Ohio charges

[377] Gorey, Tom. "BLM Will Collect $6,500 Processing Fee for Each New Oil and Gas Drilling Permit Application." November 4, 2009. U.S. Department of the Interior Bureau of Land Management. Retrieved March 5, 2012 from http://www.blm.gov/wo/st/en/info/newsroom/2009/november/NR_11_04_2009.html.
[378] Colorado Revised Statutes § 34-60-160(1)(f). Retrieved March 9, 2012 from http://www.michie.com/colorado/lpext.dll?f=templates&fn=main-h.htm&cp=.
[379] Colorado Oil and Gas Conservation Commission. "Fee Structure." Retrieved March 9, 2012 from http://cogcc.state.co.us/ (selected Rules from menu on lefthand side of page, then choose "Appendix III - Fee Structure").

a range of fees based on the population size of the town in which the well is drilled. Permit fees for a number of states are shown in Table 5-10 on the next page. [380]

[380] Alabama permit fee found at http://www.ogb.state.al.us/documents/forms/pdf/ogb01.pdf; Alaska permit fee found at http://dog.dnr.alaska.gov/Permitting/Documents/Application_Checklist_201111.pdf; Arkansas permit fee found at: http://www.aogc.state.ar.us/OnlineData/Forms/Rules%20and%20Regulations.pdf; BLM permit fee found at http://www.blm.gov/wo/st/en/info/newsroom/2009/november/NR_11_04_2009.html; Colorado permit fee found at http://cogcc.state.co.us/; Kentucky permit fee found at http://oilandgas.ky.gov/Documents/Oil%20and%20Gas%20Operators%20Manual.pdf; Louisiana permit fees found at http://dnr.louisiana.gov/assets/OC/exec_div/SWO_29_R_10_11_FEE_SCHEDULE.pdf; Maryland permit requirements found at http://www.dsd.state.md.us/comar/getfile.aspx?file=26.19.01.06.htm; Mississippi permit fee found at http://www.ogb.state.ms.us/docs/MSOGB_Rulebook_20111214.pdf; New Mexico permit fees obtained through personal communication with David Brooks, March 5, 2012; New York permit fee found at http://law.onecle.com/new-york/environmental-conservation/ENV023-1903_23-1903.html; Ohio permit fees found at http://codes.ohio.gov/orc/1509; Oklahoma permit fees found at http://www.okc.gov/pw/oilgas/pdf/DrillPermitForm.pdf; Pennsylvania fees found at http://www.pacode.com/secure/data/025/chapter78/chap78toc.html#78.19.; Tennessee permit fees found at http://tn.gov/environment/permits/oilgas.shtml; Texas permit fees found at http://info.sos.state.tx.us/pls/pub/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=16&pt=1&ch=3&rl=78; West Virginia fees found at http://www.legis.state.wv.us/wvcode/ChapterEntire.cfm?chap=22&art=6&section=2#06; and Wyoming fee found at http://wogcc.state.wy.us/downloads/HOW2FileAPD.pdf.

**Table 5-10. Permit Fees for Drilling Natural Gas Wells in Selected States**

| State or Federal Agency | Permit Fee |
|---|---|
| Alabama | $300 |
| Alaska | $250 |
| Arkansas | $300 |
| Bureau of Land Management | $6,500 |
| Colorado | $0 |
| Kentucky | $350 |
| Louisiana | $126 (0-3,000 feet for 6 months)<br>$631 (3,001-10,000 feet for 6 months)<br>$1,264 (≥10,001 feet for 6 months)<br>$252 (0-3,000 feet for 1 year)<br>$1,262 (3,001-10,000 feet for 1 year)<br>$2,528 (≥10,001 feet for 1 year) |
| Maryland | $0 |
| Mississippi | $600 |
| New Mexico | $0 |
| New York | $190 - $3,800 or more |
| North Carolina | $3,000 |
| Ohio | $500<br>(if well is in a township of 5,000-10,000 residents)<br>$750<br>(if well is in a township of 10,000 - 15,000 residents)<br>$1,000<br>(if well is in a township with ≥15,000 residents or a<br>**for all permits,** an additional $5,000 if the permit requires mandatory pooling |
| Oklahoma | $2,200 + $550 processing fee |
| Pennsylvania | $900 to $3,000 or more, depending on depth<br>(horizontal wells and wells drilled in Marcellus Shale) |
| Tennessee | $500 |
| Texas | $200 (wells ≤2,000' deep)<br>$225 (wells 2,000 - 4,000')<br>$250 (wells 4,000 - 9,000')<br>$300 (wells >9,000') |
| West Virginia | $650 |
| Wyoming | $50 |

## *Well abandonment fees and other well fees in North Carolina and other states*

North Carolina charges oil and gas operators a well abandonment fee in addition to the well drilling fee. Under current North Carolina law, an owner who intends to abandon a well must give DENR notice of the abandonment and pay a fee of $450.

Few other states appear to have a well abandonment fee. Tennessee has a temporary well abandonment fee of $100 per well per year. This fee is for "wells that are not producing but have not been plugged and closed out. The fee is due each year until the well is plugged."[381]

Arkansas requires all permit holders of liquid hydrocarbon wells and any Class II disposal or Class II enhanced recovery wells to pay annual fees as financial insurance. The amounts of the annual fees are shown in Table 5-11 below.

**Table 5-11. Annual Fees for Well Permit Holders in Arkansas[382]**

| Number of Wells | Amount of Fee |
|---|---|
| 1-5 permits or wells | $100/well |
| 6-15 permits or wells | $750/operator |
| 16-50 permits or wells | $1,250/operator |
| 51-150 permits or wells | $2,000/operator |
| 151-300 permits or wells | $3,000/operator |
| 301 or more permits or wells | $4,000/operator |

Louisiana also charges an annual fee, but this fee is based on the production of each well, as shown in Table 5-12 below.

**Table 5-12. Annual Production Fees for Wells in Louisiana[383]**

| Tier | Annual Production (Barrel Oil Equivalent) | Fee per Well |
|---|---|---|
| Tier 1 | 0 | $18 |
| Tier 2 | 1 - 5,000 | $98 |
| Tier 3 | 5,001 - 15,000 | $284 |
| Tier 4 | 15,001 - 30,000 | $467 |
| Tier 5 | 30,0001 - 60,000 | $742 |
| Tier 6 | 60,001 - 110,000 | $1,027 |
| Tier 7 | 110,001 - 9,999,999 | $1,217 |

[381] Tennessee Department of Environment & Conservation. "Permits." Retrieved March 9, 2012 from http://tn.gov/environment/permits/oilgas.shtml.

[382] Arkansas Oil and Gas Commission. *Arkansas Oil and Gas Commission General Rules and Regulations as of February 17, 2012*. 2012. Retrieved March 9, 2012 from http://www.aogc.state.ar.us/OnlineData/Forms/Rules%20and%20Regulations.pdf.

[383] Louisiana Office of Conservation. *Statewide Order No. 29-R-10/11*. November 19, 2010. Retrieved March 9, 2012 from http://dnr.louisiana.gov/assets/OC/exec_div/SWO_29_R_10_11_FEE_SCHEDULE.pdf.

In Maryland, operators of wells that have been permitted and drilled but not plugged and reported as plugged must pay an annual fee of $100 to the Emergency Plugging Fund of the Mississippi State Oil & Gas Board.[384]

### *Other environmental permitting fees in North Carolina*

Anyone who intends to disturb land in North Carolina is required to apply for and obtain an erosion and sedimentation control plan from the N.C. Division of Land Resources (with the exception of some agricultural activities and those required to obtain a permit under the Mining Act of 1971). This requirement would apply to oil and gas operations as well. For applications for erosion and sedimentation control plans, the N.C. Division of Land Resources charges an application fee of $65 per acre of disturbed land. Additional environmental permitting requirements would vary depending on the specifics of each project.

## M. Recommendations for funding state regulatory oversight

### *Appropriate level of severance taxes or royalty payments*

North Carolina's current severance tax rate is lower than that of any other state that charges a severance tax. Further study is needed to determine an appropriate severance tax rate.

### *Recommendations for new or modified permit fees*

Permit fees are collected once and intended to pay for the cost of reviewing applications for permission to drill. However, for an oil and gas program to effectively oversee oil and gas drilling sites, inspections must be conducted at various stages throughout the process, such as cementing and casing of the well, drilling the well and hydraulic fracturing. Inspections must also occur yearly or at some other regular interval. Ensuring oversight of drilling activity is critical to the protection of public health, groundwater resources, surface water resources and land resources. Severance taxes can be a volatile revenue source, increasing or decreasing based on the natural gas market. However, the need to inspect oil and gas sites exists whether or not the market is booming. Since program costs are annual and ongoing, DENR recommends that the General Assembly should authorize an annual fee to recover the costs of inspections and data collection, rather than depending on severance tax revenue to pay for this set of program costs.

## N. Other recommended uses for oil and gas revenue

In other oil- and gas-producing states, revenues from oil and gas fees and taxes are used to support conservation initiatives, local governments impacted by the industry and for reclamation and remediation of lands impacted by oil and gas drilling. For instance, Colorado's severance tax revenue is divided between the Department of Natural Resources (DNR) and the Department of Local Affairs (DOLA). DNR's share of the revenue is used to provide "loans for

[384] Mississippi Oil and Gas Board. *State Oil and Gas Board Statutes, Rules of Procedure, Statewide Rules and Regulations*. November 16, 2011. Retrieved March 9, 2012 from http://www.ogb.state.ms.us/docs/MSOGB_Rulebook_20111214.pdf.

state water projects administered by the Colorado Conservation Board,"[385] regulatory functions, species conservation, water efficiency grants and low-income energy assistance. The regulatory functions supported include the Oil and Gas Conservation Commission, the Colorado Geological Survey, the Division of Minerals and Geology and the Water Conservation Board. DOLA's share of the severance tax is distributed to local governments in two ways. Seventy percent of the revenue is used for loans and grants to local governments that are "socially or economically impacted by the mineral extraction industry." The remaining 30 percent is distributed directly to local governments based on the proportion of the mineral industry in each county.[386]

DENR recommends that severance taxes and program fees collected should fund:

1) the administration of the oil and gas program;
2) conservation initiatives, including land and water conservation and the improvement of water and wastewater infrastructure;
3) reclamation and remediation of lands adversely impacted by oil and gas exploration and production; and
4) costs incurred by local governments for infrastructure and public services as a result of industry activity.

Further study is needed to determine the distribution amounts for each of these needs.

[385] Colorado Legislative Council Staff. "Mineral Taxes." December 2010. Retrieved March 10, 2012 from http://www.colorado.gov/cs/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1251672450913&ssbinary=true.
[386] Ibid.