

**“Impact of Environmental Regulations on Natural Gas Drilling and Rural Job Creation:  
The Case of New York State.”**

Testimony by  
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to  
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**Statement**

Good afternoon Mr. Chairman and members of the Rural Solutions Working Group. I am Dr. Tim Considine, Professor of Economics at the University of Wyoming. I appear here today at the request of this committee. I am not here before you to advocate a position on behalf of the University of Wyoming or any other stakeholders. My comments represent my own views and conclusions based upon my research on the economic impacts of natural gas development.

Deep beneath the rolling hills and mountains of Appalachia from West Virginia in the south, through central Pennsylvania, and into upstate New York lies a layer of shale rock known as the Marcellus. Some studies estimate that this formation contains over 489 trillion cubic feet (TCF) of natural gas, which would place the Marcellus second only to the South Pars field in Qatar and Iran. So within a couple hundred miles of the Washington-New York corridor with a significant population and demand for energy lays a super giant natural gas field of Middle East proportions. Given this close location to consumers, the value of this reserve is immense, over *two trillion dollars* at current natural gas prices, which are relatively low. As a result, investment is pouring into the Marcellus region. Development is now well underway in Pennsylvania and West Virginia. Promising Marcellus and Utica shale prospects also exist in upstate New York.

Developing shale gas is unlike conventional natural gas development. The steep production decline curve of shale gas wells in which output drops roughly 50 percent per year during the first few years of production requires continuously increasing drilling activity to expand production. As a result, the economic impacts of shale gas production are similar to other continuous production activities, such as manufacturing and services. Given the huge size of the Marcellus reserves, development activity could extend decades into the future.

Natural gas development stimulates the economy through business-to-business spending and via payments to land owners. Natural gas production involves exploration, drilling, and the construction of gas processing plants and pipelines. Each of these activities requires goods and services from many sectors of the economy, including construction, trucking, and engineering construction services that are not easily out-sourced to foreign suppliers. Natural gas companies also pay lease and royalty payments to land owners, who in turn pay taxes and spend this income on local goods and services. In a recent report, I estimated these economic impacts for the Marcellus using regional economic impact models developed by the Minnesota IMPLAN Group, Inc.<sup>1</sup>

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<sup>1</sup> The analysis presented here is based upon Considine (2010) “The Economic Impact of the Marcellus Shale: Implications for New York, Pennsylvania, and West Virginia.” July, American Petroleum Institute.

The Marcellus industry in West Virginia and Pennsylvania expanded considerably during 2009 with approximately 1,121 wells drilled and output of dry natural gas and petroleum liquids exceeding 600 million cubic feet of gas equivalents. Total contribution to gross regional product for these two states increased by \$4.8 billion as a result of Marcellus production activities.<sup>2</sup> This increase in economic activity is distributed across a broad swath of the economy, and generated 57,357 jobs and \$1.7 billion in local, state, and federal tax collections in 2009.

The gains in gross regional product are broad based, which dispels the notion that natural gas production contributes benefits to only a select few sectors or individuals. My study also projected Marcellus gas development and economic impacts out to the year 2020. Under a medium development scenario, the Marcellus in Pennsylvania and West Virginia alone could lead to the creation of an additional 165,000 jobs. If development proceeded at a faster pace, the employment gains in these two states would exceed 250,000 by the year 2020.

In stark contrast with their neighbors to the south, residents in upstate New York are not directly benefiting from Marcellus development. New York environmental regulations that limit the use of water in hydro fracturing amount to a de facto moratorium on the development of the Marcellus and other shale gas resources in New York State. These policies impose costs on the New York State economy that are equal to the foregone value added, jobs, and tax revenues from Marcellus development.

To estimate these lost opportunities, I devised two scenarios for developing Marcellus gas in the counties just north of the Pennsylvania state line and west of the New York City watershed. The first scenario envisions Marcellus drilling beginning in 2011 and reaching 340 wells in 2020. The second scenario has drilling increasing to 502 wells by 2020. Both scenarios are quite conservative because in 2009 alone, 296 wells were drilled just three years after development began in the Pennsylvania counties that border the prospective New York Marcellus.

Under the first scenario, if the moratorium remains, New York residents lose the opportunity to gain the present value equivalent of more than \$11.4 billion in economic output from 2011 to 2020. The present value of losses in state and local tax revenues is \$1.4 billion. Employment levels are between 15,000 and 18,000 below those found under development. Under the second scenario with higher potential development, the lost output opportunities increase to \$15.8 billion. Under this scenario, the drilling moratorium would be contributing to the loss of between 20,000 and 27,000 jobs and to a present value loss of \$2 billion in state and local tax revenue between 2011 and 2020.

In conclusion, my analysis indicates that the drilling moratorium imposes a very significant cost on the New York state economy. Using conservative assumptions on possible development without the moratorium, the present value of losses from the drilling moratorium range from \$11.4 to \$15.8 billion – a very high opportunity cost to New Yorkers. Since shale gas development will likely take place over decades, a permanent drilling moratorium would entail even greater efficiency losses. A more rational approach to balancing costs and benefits could improve overall social wellbeing. The implications of this analysis for national policy are clear. Policies that prohibit or severely limit the use of hydro fracturing in natural gas drilling reduce economic output, employment, and tax revenues with disproportionate impacts on rural communities. Thank you for your invitation to speak. I now welcome any questions you may have.

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<sup>2</sup> Gross regional product is valued added or the regional version of gross domestic product.

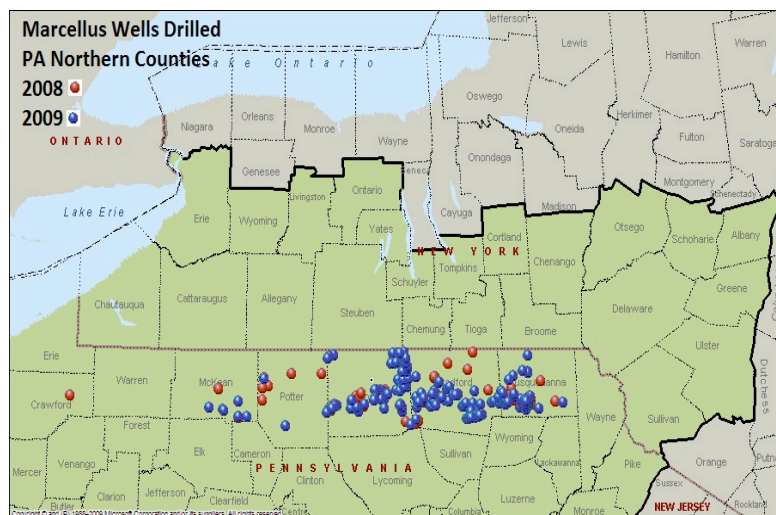
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## Technical Appendix: Economic Impacts of New York State Regulations on Hydro Fracturing

This technical document briefly provides some technical background information for the estimates presented in the above statement.<sup>3</sup> The regulatory policies limiting the use of hydro fracturing impose a cost on the New York State economy that are equal to foregone value added, jobs, and tax revenues from Marcellus development.<sup>4</sup> This appendix quantifies possible development paths for the Marcellus in New York and estimates the opportunity costs of current policies under two development scenarios.

If restrictions on drilling are removed, commercial development of the Marcellus in New York State is a distinct possibility. In this event, the key question for assessing the economic impacts of such a development concerns the level of drilling activity that could take place. Evidence of substantial drilling activity in northern Pennsylvania suggests a similar level of activity just north in New York.

During 2008, 52 Marcellus wells were drilled in the following five northern counties of Pennsylvania: McKean, Potter, Tioga, Bradford, and Susquehanna. The number of Marcellus wells drilled in the same five counties during 2009 was 296. A map of this dramatic expansion of activity and its proximity to New York is displayed below in Figure 1. The New York counties due north of this northern Pennsylvania Marcellus zone include from west to east Allegheny, Steuben, Chemung, Tioga, and Broome counties. Steuben and Chemung counties are accustomed to natural gas development with the production from a much deeper resource called the Trenton Black River formation. Citizens and their leaders in these counties are well aware of the benefits that natural gas development can bring to their communities.



**Figure 1: Northern Pennsylvania Marcellus Drilling and New York State**

<sup>3</sup> The analysis presented here is based upon Considine (2010) "The Economic Impact of the Marcellus Shale: Implications for New York, Pennsylvania, and West Virginia." July, <http://www.api.org/policy/exploration/hydraulicfracturing/upload/API%20Economic%20Impacts%20Marcellus%20Shale.pdf>

<sup>4</sup> Value added is equal to wages and payments to owners of capital and is also known as gross domestic product.

While the activity in northern Pennsylvania may be a harbinger of rapid development in New York, the Marcellus gets increasingly closer to the surface as one moves north into upstate New York. As a result, a common opinion among gas drilling companies is that if Marcellus development does occur in New York, it is likely to be concentrated in the southern half of the border counties mentioned above. In part for this geological constraint and other factors, the New York Department of Environmental Protection argues that if Marcellus development occurs, the maximum number of wells drilled in any one year in New York would be 500 wells.

The reluctance of some companies to drill Marcellus wells in Delaware county, which contains the watershed for New York City, is another constraint. Chesapeake Energy announced earlier this year that they would not drill in this area. Similar concerns may explain why there is no Marcellus drilling in Wayne county Pennsylvania, which is the Delaware River watershed. These developments suggest that if Marcellus development would occur in New York, it would most likely be restricted to the upper tier of New York State west of Broome County.

In addition to the Marcellus, the Utica Shale is another promising natural gas resource for New York. In Pennsylvania, the Utica formation is below the Marcellus, however, the Utica Shale is not as deep in New York as it is in Pennsylvania. This suggests that the Utica Shale could be commercially attractive north of the New York Marcellus. On the other hand, there is no evidence that the New York Utica Shale is productive. Range Resources completed and tested a horizontal Utica well in western New York but the results are confidential. The only comment from Range is that they plan to drill additional Utica wells. Hence, prospects for the Utica Shale in New York are promising but there is simply no evidence of commercial prospects to justify inclusion in the scenarios developed below.

Accordingly, this study assumes that if horizontal drilling with hydro fracturing is allowed in New York, the Marcellus Shale will be the first shale formation to be developed. The assumed trajectory of future drilling appears below in Table 1, which is the medium development scenario. In the first year, 42 wells would

**Table 1: Potential Marcellus Activity in New York under Medium Development Scenario, 2011-2020**

	Millions of Current dollars		
	2011	2015	2020
Total Spending	172.6	1,899.9	2,209.9
Lease & Bonus	66.6	502.2	502.2
Exploration	5.9	68.9	73.8
Drilling & Completion	78.2	918.5	984.0
Pipeline & Processing	19.1	224.5	240.5
Royalties	0.0	152.3	373.5
Other	2.9	33.5	35.9
	Assumed Number of Wells*		
Horizontal	14	304	330
Vertical	28	9	10
Total	42	314	340
	Gas equivalents million cubic feet per day		
Production	0.1	487.6	952.1

\*Author assumptions.

be drilled, ramping up to 314 wells four years later in 2015 while leveling off at 340 wells in 2020. The share of horizontal drilling is based upon the observed ratio in northern Pennsylvania. As a result, total spending under this scenario would begin at \$172.6 million, increase 10 fold to \$1.9 billion by 2015, and reach \$2.2 billion in 2020 (see Table 1).

The lost economic benefits of New York’s restrictions on drilling, or the economic impacts associated with the above spending are presented in the following tables. Total gross output in New York would increase \$3 billion in 2015 if Marcellus development would be allowed. Value added impacts displayed in Table 2 are \$1.7 billion. The impacts include direct, indirect, and induced effects from Marcellus industry spending. The direct impacts arise from actual local spending by gas producing companies. The indirect impacts include the supply-chain impacts while the induced impacts originate from households spending income earned from direct and indirect spending.

These impacts are a sample from one year. Assuming a 3 percent discount rate, the accumulated gains in valued added from 2011 to 2020 amounts to over \$11.4 billion. Employment would increase by more than 15,000 in 2015 (see Table 3). Finally, local and state tax revenues would increase more than \$214 million in 2010 dollars.

The impacts of Marcellus industry spending for 2011, 2015, and 2020 are displayed in Tables 4 thru Table 6 for valued added, employment, and tax revenues. The level of Marcellus industry activity and spending and the corresponding impacts on value added, employment, and tax revenues under the high development scenario are displayed in Tables 7 thru Table 10.

**Table 2: Impacts on Value Added in New York by Sector under Medium Development Scenario during 2015**

Sector	Millions of 2010 dollars			
	Direct	Indirect	Induced	Total
Ag, Forestry, Fish & Hunting	1.4	1.1	0.8	3.3
Mining	226.7	4.5	1.2	232.3
Utilities	12.0	13.6	12.5	38.1
Construction	157.0	3.7	2.7	163.4
Manufacturing	9.4	24.7	10.8	44.8
Wholesale Trade	138.1	28.2	22.7	189.1
Retail trade	55.2	3.8	48.4	107.4
Transportation & Warehousing	20.5	15.6	7.5	43.6
Information	7.6	27.0	19.3	53.9
Finance & Insurance	14.9	58.5	63.5	136.9
Real estate & rental	68.1	49.5	106.4	224.0
Professional- scientific & tech services	42.3	84.7	23.1	150.1
Management of companies	0.0	21.5	4.4	25.9
Administrative & waste services	6.9	27.1	11.5	45.5
Educational services	21.6	0.4	10.1	32.1
Health & social services	44.4	0.6	67.0	112.1
Arts- entertainment & recreation	4.8	2.2	6.1	13.1
Hotel & food services	13.0	5.5	16.5	35.0
Other services	12.8	6.4	16.6	35.8
Government & Misc.	5.2	6.8	6.3	18.4
<b>Total</b>	<b>862.0</b>	<b>385.3</b>	<b>457.5</b>	<b>1,704.8</b>

**Table 3: Employment Impacts in New York under Medium Development Scenario during 2015**

Sector	Number of Jobs			
	Direct	Indirect	Induced	Total
Ag, Forestry, Fish & Hunting	33	33	22	88
Mining	1,232	14	2	1,248
Utilities	32	22	19	73
Construction	2,154	49	37	2,239
Manufacturing	61	182	70	313
Wholesale Trade	925	189	152	1,266
Retail trade	887	63	836	1,786
Transportation & Warehousing	266	202	97	566
Information	34	107	85	226
Finance & Insurance	57	215	267	540
Real estate & rental	154	227	213	593
Professional- scientific & tech services	271	730	182	1,183
Management of companies	0	100	21	120
Administrative & waste services	125	463	198	786
Educational services	445	9	236	691
Health & social services	701	6	1,051	1,758
Arts- entertainment & recreation	110	41	130	281
Hotel & food services	323	138	429	890
Other services	319	106	410	835
Government & Misc.	67	95	82	244
<b>Total</b>	<b>8,196</b>	<b>2,992</b>	<b>4,540</b>	<b>15,727</b>

**Table 4: Impacts on Value Added in New York by Sector under Medium Development Scenario 2011-2020**

Sector	<i>Millions of 2010 dollars</i>		
	2011	2015	2020
Ag, Forestry, Fish & Hunting	0.3	3.3	3.8
Mining	19.8	232.3	249.2
Utilities	3.5	38.1	44.8
Construction	14.0	163.4	175.7
Manufacturing	4.0	44.8	51.1
Wholesale Trade	16.4	189.1	207.0
Retail trade	9.9	107.4	125.9
Transportation & Warehousing	3.9	43.6	48.9
Information	4.9	53.9	62.9
Finance & Insurance	12.5	136.9	158.6
Real estate & rental	21.0	224.0	268.3
Professional- scientific & tech services	13.2	150.1	166.5
Management of companies	2.3	25.9	28.8
Administrative & waste services	4.1	45.5	51.6
Educational services	3.1	32.1	40.6
Health & social services	10.6	112.1	135.3
Arts- entertainment & recreation	1.2	13.1	15.7
Hotel & food services	3.3	35.0	42.1
Other services	3.4	35.8	42.9
Government & Misc.	1.7	18.4	21.6
<b>Total</b>	<b>153.0</b>	<b>1,704.8</b>	<b>1,941.2</b>

**Table 5: Employment Impacts in New York by Sector under Medium Development Scenario 2011-2020**

Sector	Number of Jobs		
	2011	2015	2020
Ag, Forestry, Fish & Hunting	8	88	101
Mining	106	1,248	1,338
Utilities	7	73	85
Construction	191	2,239	2,408
Manufacturing	28	313	354
Wholesale Trade	110	1,266	1,386
Retail trade	165	1,786	2,101
Transportation & Warehousing	50	566	633
Information	21	226	264
Finance & Insurance	49	540	627
Real estate & rental	55	593	710
Professional- scientific & tech services	104	1,183	1,312
Management of companies	11	120	134
Administrative & waste services	70	786	892
Educational services	67	691	867
Health & social services	166	1,758	2,119
Arts- entertainment & recreation	26	281	338
Hotel & food services	84	890	1,069
Other services	79	835	1,004
Government & Misc.	22	244	285
<b>Total</b>	<b>1,419</b>	<b>15,727</b>	<b>18,027</b>

**Table 6: Potential Tax Impacts in New York by Sector under Medium Development Scenario 2011-2020**

	Millions of 2010 dollars			Millions of 2010 dollars			
	2011	2015	2020	2011	2015	2020	
State and Local taxes				Federal Taxes			
Dividends	1.9	21.5	24.6	S.S. Employee Contribution	4.8	53.6	60.8
S.S. Employee Contribution	0.1	0.6	0.7	S.S. Employer Contribution	4.2	47.3	53.7
S.S. Employer Contribution	0.2	2.5	2.9	Excise Taxes	0.6	6.9	7.9
Sales Tax	4.6	50.6	58.3	Custom Duty	0.3	3.2	3.7
Property Tax	5.6	62.3	71.7	Fed NonTaxes	0.5	5.3	6.1
Motor Vehicle Lic	0.1	0.6	0.7	Corporate Profits Tax	2.4	26.8	30.6
Other Taxes	0.9	10.2	11.7	Personal Income Tax	8.6	96.2	109.1
S/L NonTaxes	0.2	1.7	2.0	Total Federal Tax	21.4	239.3	271.9
Corporate Profits Tax	1.4	15.0	17.2				
Income Tax	3.6	40.3	45.7				
NonTaxes (Fines- Fees	0.7	7.4	8.4				
Motor Vehicle License	0.1	0.7	0.8				
Property Taxes	0.1	0.6	0.7				
Other Tax (Fish/Hunt)	0.0	0.2	0.2				
<b>Total State and Local Tax</b>	<b>19.3</b>	<b>214.3</b>	<b>245.5</b>				

**Table 7: Potential Marcellus Activity in New York under High Development Scenario, 2011-2020**

	Millions of Current dollars		
	2011	2015	2020
Total Spending	215.8	2,522.7	3,325.9
Lease & Bonus	83.2	650.1	650.1
Exploration	7.3	89.2	109.1
Drilling & Completion	97.7	1,189.1	1,453.7
Pipeline & Processing	23.9	290.6	355.3
Royalties	0.0	260.3	704.6
Other	3.6	43.4	53.0
	Assumed Number of Wells*		
Horizontal	17	394	487
Vertical	35	12	15
Total	52	406	502
	Gas equivalents million cubic feet per day		
Production	0.1	853.3	1,838.6

\*Author assumptions.

**Table 8: Impacts on Value Added in New York by Sector under High Development Scenario 2011-2020**

Sector	Millions of 2010 dollars		
	2011	2015	2020
Ag, Forestry, Fish & Hunting	0.3	4.4	5.6
Mining	21.3	300.9	368.3
Utilities	4.0	50.9	67.7
Construction	15.0	211.8	259.9
Manufacturing	4.5	59.2	76.7
Wholesale Trade	17.9	246.4	307.4
Retail trade	11.3	143.1	189.9
Transportation & Warehousing	4.3	57.2	72.9
Information	5.6	71.7	94.8
Finance & Insurance	14.2	181.8	238.8
Real estate & rental	24.3	300.6	406.7
Professional- scientific & tech services	14.5	196.4	248.0
Management of companies	2.5	34.0	43.0
Administrative & waste services	4.6	60.0	77.3
Educational services	3.8	43.9	62.1
Health & social services	12.3	150.8	205.4
Arts- entertainment & recreation	1.4	17.6	23.8
Hotel & food services	3.8	47.0	63.8
Other services	3.9	48.0	65.0
Government & Misc.	1.9	24.5	32.6
Total	171.4	2,250.1	2,909.7



**Table 9: Employment Impacts in New York by Sector under High Development Scenario 2011-2020**

Sector	Number of Jobs		
	2011	2015	2020
Ag, Forestry, Fish & Hunting	9	116	151
Mining	114	1,616	1,977
Utilities	8	97	128
Construction	206	2,902	3,560
Manufacturing	31	412	530
Wholesale Trade	120	1,650	2,059
Retail trade	189	2,383	3,173
Transportation & Warehousing	55	743	946
Information	24	301	398
Finance & Insurance	56	717	944
Real estate & rental	64	796	1,075
Professional- scientific & tech services	114	1,549	1,955
Management of companies	12	158	200
Administrative & waste services	79	1,036	1,335
Educational services	80	941	1,326
Health & social services	193	2,365	3,216
Arts- entertainment & recreation	31	378	513
Hotel & food services	97	1,196	1,622
Other services	91	1,122	1,523
Government & Misc.	26	325	430
<b>Total</b>	<b>1,598</b>	<b>20,803</b>	<b>27,060</b>

**Table 10: Tax Impacts in New York by Sector under High Development Scenario 2011-2020**

	Millions of 2010 dollars			Millions of 2010 dollars			
	2011	2015	2020	2011	2015	2020	
State and Local taxes				Federal Taxes			
Dividends	2.2	28.5	37.0	S.S. Employee Contribution	5.4	70.7	91.1
S.S. Employee Contribution	0.1	0.8	1.0	S.S. Employer Contribution	4.7	62.3	80.4
S.S. Employer Contribution	0.3	3.3	4.3	Excise Taxes	4.7	62.3	80.4
Sales Tax	5.2	67.1	87.6	Custom Duty	0.7	9.1	11.9
Property Tax	6.4	82.5	107.7	Fed NonTaxes	0.3	4.2	5.6
Motor Vehicle Lic	0.1	0.8	1.0	Corporate Profits Tax	0.5	7.0	9.2
Other Taxes	0.0	0.0	0.0	Personal Income Tax	2.7	35.4	45.9
S/L NonTaxes	1.0	13.5	17.6	Total Federal Tax	9.6	126.8	163.4
Corporate Profits Tax	0.2	2.3	3.0				
Income Tax	4.0	53.1	68.4				
NonTaxes (Fines- Fees	0.7	9.8	12.6				
Motor Vehicle License	0.1	0.9	1.2				
Property Taxes	0.1	0.8	1.1				
Other Tax (Fish/Hunt)	0.0	0.2	0.3				
<b>Total State and Local Tax</b>	<b>21.8</b>	<b>283.4</b>	<b>368.6</b>				