Preliminary Report for Broome County Legislators

POTENTIAL ECONOMIC AND FISCAL IMPACTS FROM NATURAL GAS PRODUCTION IN BROOME COUNTY, NEW YORK

Prepared for Broome County, New York

By

Bernard L. Weinstein, Ph.D. and
Terry L. Clower, Ph.D.*

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*Professors of Applied Economics, University of North Texas, Denton, TX. Views expressed are the authors' alone and do not necessarily reflect those of the university, its officers, or regents.

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INTRODUCTION

The Marcellus Shale in the Appalachian area of the eastern United States is fast becoming the hottest natural gas drilling play in the nation. Indeed, some industry experts believe production in the Marcellus Shale could eventually outstrip that of the Barnett Shale in north central Texas, currently the largest producer of natural gas in the continental US. This is not an unreasonable assumption, considering that the Marcellus formation is 65 million acres in size compared to a mere 3 million for the Barnett.

Covering most of western Pennsylvania, virtually all of West Virginia, and parts of eastern Ohio and southern New York, the Marcellus Shale is estimated to contain between 168 and 516 trillion cubic feet of natural gas. According to a recent estimate by Penn State University, potential production from the 31-million-acre core area of the Marcellus region could meet the entire nation's gas needs for at least 14 years.[1] Ten to 20 percent of this natural resource lies within New York's borders, mainly along the southern tier of the state. At present, most gas production in all geological formations is occurring in the westernmost region of the southern tier, with Chautauqua, Cattaraugus, Allegany and Erie Counties accounting for almost 70 percent of the state's 14,000 operating oil and gas wells. But over the past two years, exploratory drilling has occurred in every county of southern New York, including Broome County.

Like most investments, development of a natural gas field can create substantial economic and fiscal benefits for a community. Exploration, drilling, production, servicing, pipeline development and operations, royalty payments, and other direct expenditures bring new income and employment to the region. These expenditures, in turn, generate "spillover" effects including:

[1] Quotation from Penn State University geoscientist Terry Engelder, *www.pressconnects.com,* November 4, 2008.

- outlays by gas and oilfield service companies
- rising demand for professional services such as attorneys, accounts, and engineers
- higher restaurant, hotel and retail revenues along with attendant sales tax receipts
- residential development and other real estate activity as a result of new employment and income in the community

On several occasions in the past five years, the authors of this report have looked at the benefits to north central Texas that have attended investment and production in the Barnett Shale. We have documented substantial increases in population, employment, income and local tax revenues in communities that have encouraged natural gas production in the Barnett Shale region.[2] A more recent study by the Perryman Group finds that even in a recessionary economy, drilling and production in the Barnett Shale are contributing significantly to local income and tax revenues while limiting job losses in the region.[3] In March 2009, more than 10,000 wells were operating in the Barnett field, supplying more than five percent of the nation's natural gas supplies.

As has been the case in most parts of New York State's southern tier, Broome County has recorded negative economic growth in recent years and, according to the County Executive, is currently suffering from a fiscal crisis.[4] The county's population in 2008 was almost three percent less than in 2000, while both the State of New York and the United States posted gains (see Table 1). Since 2000, the Binghamton MSA has seen a 4.3 percent drop in employment, while both New York State and the US have recorded increases—even allowing for the

[2] *The Economic and Fiscal Impacts of Devon Energy in Denton, Tarrant, and Wise Counties (2004),*www.unt.edu/cedr/devonenergy.pdf and *The Economic and Fiscal Impacts of Devon Energy Corporation in the Barnett Shale of North Texas: An Update (2006),* www.unt.edu/cedr/devonenergy2006.pdf.
[3] The Perryman Group, *An Enduring Resource: Contribution of the Barnett Shale to the Economy of Fort Worth and the Surrounding Area, March 2009,* www.barnettshaleexpo.com/docs/2009_eco_report.pdf.
[4] Quotation from Broome County Executive Barbara Fiala, *Binghamton University Pipe Dream,* March 6, 2009.

significant job losses since the current recession began (see Table 2). Development of the Marcellus Shale may offer opportunities to create new employment opportunities while diversifying the economic base of Broome County.

Table 1

Population Change 2000 - 2008

	2000	2008	% Change 2000 - 2008
Broome County	200,536	195,018	-2.8%
New York	18,976,457	19,490,297	2.7%
United States	281,421,906	304,059,724	8.0%

Source: U.S. Census

Table 2

Employment Change 2000 - 2009

	2000	2009	% Change 2000 - 2009
Binghamton, NY MSA	118,800	113,700	-4.3%
New York	8,562,500	8,699,400	1.6%
United States	130,781,000	134,333,000	2.7%

Source: U.S. BLS
**Note: Seasonally adjusted January numbers used*

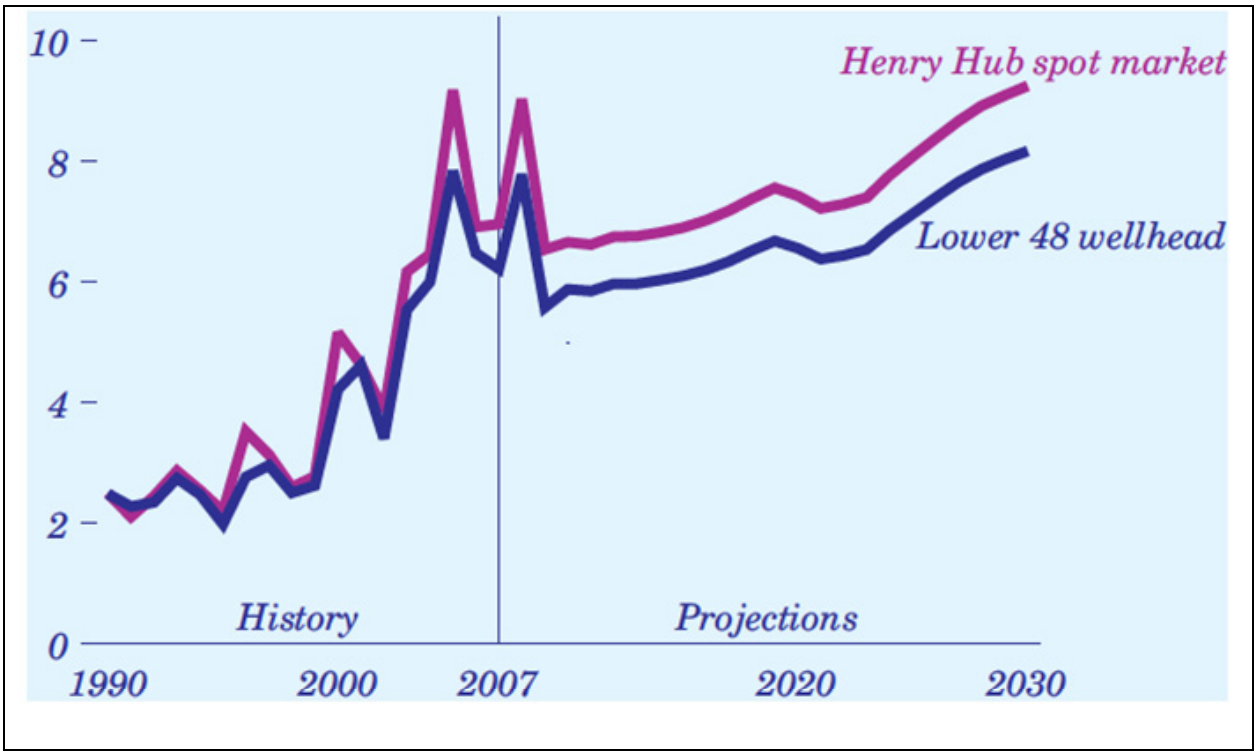
In what follows, we posit several scenarios for natural gas development in Broome County. We then look at the potential economic and fiscal benefits to area residents as well as Broome County itself from site development and drilling activities, as well as the recurring impacts from ongoing operations, should these scenarios be realized. Finally, we discuss in general terms how growth of the energy industry can help diversify the economy of New York State and provide long-term job prospects to slow-growing communities in the southern tier, such as Broome County and the City of Binghamton.

POTENTIAL GROSS RECEIPTS FROM NATURAL GAS PRODUCTION IN BROOME COUNTY

Like other commodities, natural gas prices vary over time. In fact, over the past several years, the wellhead prices of natural gas have swung wildly. In the summer of 2008 prices were approaching $15 per MCF (thousand cubic feet), but by the spring of 2009 prices were below $5.00 (see Figure 1).[5]

Figure 1

Past and Projected Prices for Natural Gas



Source: Energy Information Agency, U.S. Department of Energy.

As a rule of thumb, when prices drop below $5 per MCF, most new drilling ceases in the Barnett Shale. But the "drill/no drill" price may be closer to $3.00 in the core of the Marcellus Shale because gas deposits are nearer the surface and drilling costs are lower. What's more,

[5] One thousand cubic feet is roughly equivalent to one million Btus.

because the Millennium Pipeline passes through Broome County, local producers will receive a "premium" when delivering gas to the New York City Gate.

In order to calculate the potential economic and fiscal impacts of shale development, we first need to estimate the maximum number of wells than can be drilled in Broome County. Drilling companies divide fields into 640-acre "sections." Chesapeake Energy, currently the largest producer in the Marcellus Shale, drills six wells per section. If we divide Broome County into 716 sections (458,000 acres/640 acres), and we posit six wells per section, that calculation suggests the Marcellus Shale in Broome County could hypothetically support 4,296 natural gas wells. Since drilling is not likely to occur in downtown Binghamton or the town squares of other communities in Broome County, we will use a maximum well count of 4,000.[6]

In 2008, Chesapeake Energy estimated that one of its wells in the Marcellus Shale could be expected to produce about 2.11 billion cubic feet (BCF) over its 10-year economic life (see Figure 2).[7] But the more recent experience of the Cabot Oil & Gas Corporation in the Marcellus Shale suggests output could easily be 10 percent higher.[8] In terms of price assumptions, we have used the most recent projections from the Energy Information Agency of the U.S. Department of Commerce. As indicated in Table 3, prices should be sufficiently high in the years ahead to support rising gas production in Broome County. What's more, demand should remain strong as natural gas become the preferred fuel for electric power generation, home heating and industrial uses in the northeastern United States. New York State, in particular, is expected to record substantial increases in gas demand over the next several decades.[9]

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[6] It should be kept in mind, however, that with new horizontal drilling methods, production can occur in densely populated or developed areas with minimal economic or environmental disruption.

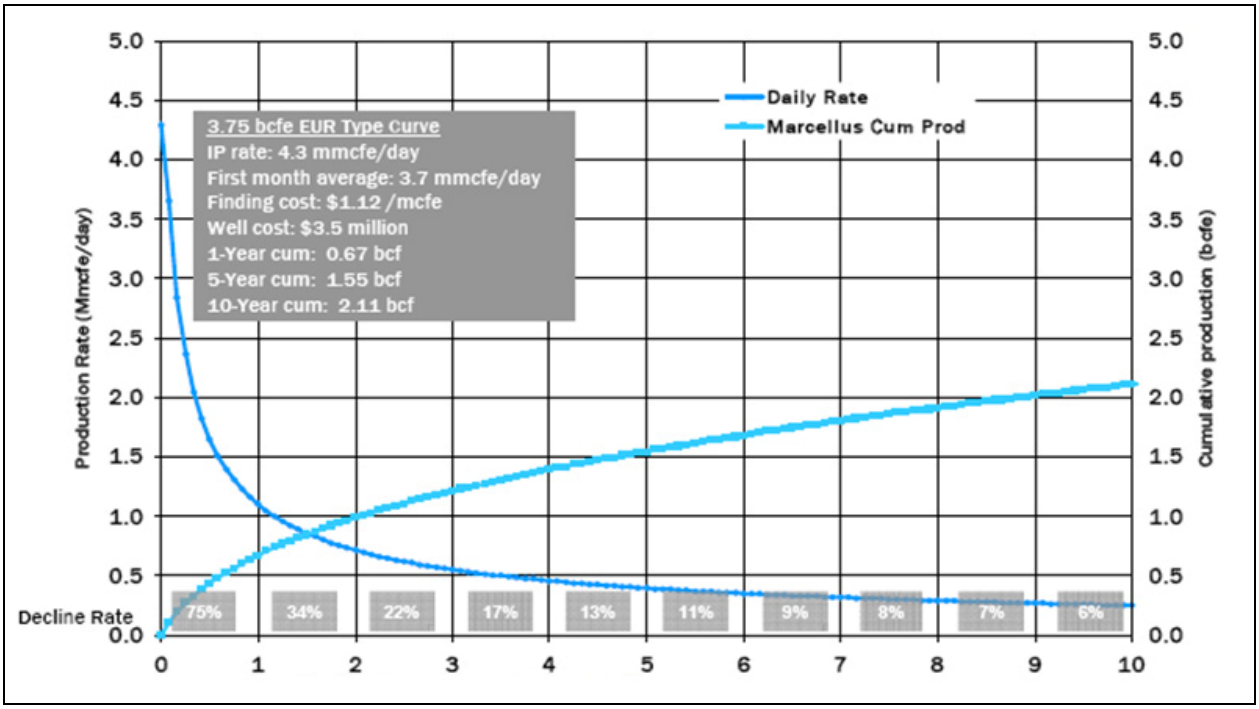
[7] This should be regarded as a conservative estimate since fracturing and re-fracturing of the formation may produce additional commercial quantities of gas.

[8] *Cabot Oil & Gas Update, April 2009.*

[9] First draft of New York Energy Report, *http://www.nysenergyplan.com/*

Figure 2

Marcellus Shale Horizontal Well Production Profile



Source: Chesapeake Energy, Nov. 2008

Though gas wells can produce for 20 to 30 years, the bulk of their output occurs in the first ten years. In Table 4, using the wellhead price projections from the Energy Information Agency and the yield curve from Figure 2 (plus 10 percent), we calculate the total revenue for a hypothetical gas well in Broome County. Assuming well completion in 2009 and production commencing in 2010, we estimate gross revenues at about $9.3 million per well during the first ten years of production. The net present value of this revenue stream, using a discount rate of 3.2 percent, would be about $8.3 million.

As discussed above, Broome County can probably support 4,000 gas wells. If, theoretically, they were all completed this year and began producing in 2010, the total revenue stream over ten years would be about $37.2 billion. But since well development will obviously be a staged process, the revenue impact is perhaps better expressed as $3.72 billion per year.

These revenues will generate significant new income and employment benefits for businesses and residents of Broome County (see discussion below).[10]

Table 3

Projected Prices for Natural Gas

Year	Wellhead Price	HH Spot Price
2010	$5.88	$6.66
2011	5.85	6.62
2012	5.97	6.75
2013	5.97	6.76
2014	6.03	6.82
2015	6.10	6.90
2016	6.20	7.02
2017	6.34	7.18
2018	6.52	7.38
2019	6.68	7.56
2020	6.56	7.43
2021	6.38	7.22
2022	6.44	7.29
2023	6.54	7.40
2024	6.86	7.77
2025	7.13	8.08
2026	7.40	8.38
2027	7.66	8.67
2028	7.87	8.92
2029	8.03	9.09
2030	8.17	9.25

HH = Henry Hub
Source: Energy Information Agency

[10] Gross revenues are calculated before deducting operating expenses. Net revenues will obviously be less.

Table 4

Total Revenue from a Hypothetical Gas Well in Broome County, New York

Year	Production in MMCF	Wellhead Price	Total Revenue
2010	737,000	$5.88	$4,333,560.00
2011	184,250	$5.85	$1,077,862.50
2012	121,605	$5.97	$725,981.85
2013	94,852	$5.97	$566,266.44
2014	78,727	$6.03	$474,723.81
2015	68,493	$6.10	$417,807.30
2016	60,959	$6.20	$377,945.80
2017	55,472	$6.34	$351,692.48
2018	51,034	$6.52	$332,741.68
2019	47,462	$6.68	$317,046.16
2020	44,614	$6.56	$292,667.84
		Total	$9,268,295.86

Source: EIA, Chesapeake Energy

THE ECONOMIC AND FISCAL IMPACTS FROM DRILLING 2000 AND 4000 GAS WELLS IN BROOME COUNTY, NEW YORK

Chesapeake Energy has estimated the cost of completing a well in the Marcellus Shale at $3.5 million. We consider two development scenarios: The first assumes that 2,000 total wells will be drilled in Broome County and the second assumes a total of 4,000 completed wells. In constant dollars, that equates to total drilling costs (expenditures) of $7 billion and $14 billion to build out the gas fields in Broome County over some period of time for the two scenarios, respectively. Expenditures at this level will have huge economic and fiscal impacts on the County.

In order to calculate these impacts, we have utilized the IMPLAN input-output model developed by the Minnesota IMPLAN Group. Input-output models track how spending flows

through a regional, state, or national economy. The estimates include direct, indirect, and induced impacts. Direct impacts are the result of drillers procuring goods and services in the local community. For example, a given drilling company will purchase a range of goods and services ranging from equipment and tools to office supplies from local vendors. These vendors, in turn, purchase goods and services to support their local operations. For example, the firm providing office supplies hires employees, utilizes inventory-counting services, and engages other professional service providers such as accountants—activity that is captured as indirect impacts. Induced impacts track the economic and fiscal effects of employees of the driller and its vendors spending a portion of their earnings in the local economy for goods and services.

Each of these impacts is adjusted to account only for purchases from local entities. For example, to the best of our knowledge there are no manufacturers of drill bits located in Broome County; therefore, purchases of drill bits have little impact on the local economy. Still, when added together, the sum of all the activity from direct, indirect, and induced impacts is greater than the local proportion of drilling firm spending. This is known as the "multiplier effect." The fiscal impacts estimated in this analysis include indirect business taxes such as state and local sales and use taxes, property taxes, and government revenue from permit fees and licenses.

Assuming that 2,000 wells will be developed in Broome County, drilling expenditures will total $7 billion generating $7.6 billion in local economic activity (see Table 5). This level of economic activity will support over 8,100 person-years of employment.[11] If the drilling activity is evenly spaced over a ten year period, spending at this level would support 810 (8,100/10) new jobs lasting 10 years. These 8,100 person-years of employment will pay almost $400 million in

[11] A person-year of employment equates to one job lasting one calendar year.

salaries, wages, and benefits for an average of almost $49,000 per job.[12] In addition, drilling activity will create more than $605 million in property income in the form of rents, royalties, dividends, and corporate profits. Finally, gas well drilling activity in Broome County will produce $42.7 million in state and local tax revenues from property taxes, sales and use taxes, and fees for permits and licenses. About $20.5 million of these tax revenues will go to Broome County taxing entities.

If the number of developed gas wells in Broome County reaches 4,000, the impacts effectively double. Drilling expenditures will total $14 billion and total local economic activity will rise to $15.3 billion. Labor income from salaries, wages and benefits will increase by almost $793 million from the creation of over 16,000 person-years of employment (see Table 5). Property income related to gas well drilling activities will rise by $1.2 billion and tax revenues will increase by $44 million and $41 million during the period of drilling activity for state and local taxing entities, respectively.

Table 5

Economic and Fiscal Impacts of Gas Well Drilling Activities
In Broome County, New York Over 10 Years

Description	Impact 2,000 Wells	Impact 4,000 Wells
Total Spending	$ 7,000,000,000	$ 14,000,000,000
Total Economic Activity	$ 7,648,652,000	$ 15,297,304,000
Total Wages, Salaries, Benefits (labor income)	$ 396,436,000	$ 792,872,000
Total Employment (person years)	8,136	16,272
Total Property Income*	$ 605,676,000	$ 1,211,352,000
State Taxes+	$ 22,240,000	$ 44,480,000
Local Taxes+	$ 20,528,000	$ 41,056,000

** Includes royalties, rents, dividends, and corporate profits. + Includes sales, excise, property taxes, fees, and licenses.*

[12] This is the average of all jobs created, including those from indirect and induced spending. Annual earnings for roughnecks and tool-pushers on drilling rigs can be substantially higher.

THE RECURRING ECONOMIC AND FISCAL IMPACTS FROM NATURAL GAS PRODUCTION IN BROOME COUNTY, NEW YORK

The value of gas production in Broome County over a ten-year period, using our 2,000 and 4,000 well scenarios and previously noted well productivity estimates, should range between about $18 billion and $37 billion (in constant dollars), or between $1.8 billion and $3.7 billion per year. Assuming 2,000 total wells, gas production in Broome County will generate $2 billion in local economic activity in an average year over a ten-year period. However, this estimate of economic activity is likely to be conservative due to modeling assumptions regarding the amount of business that will stay in Broome County.

Based on Broome County's current industrial structure, the IMPLAN model assumes that about 15 percent of the spending associated with natural gas production activities will stay in the local economy. However, as the local gas industry matures, equipment and service providers may well locate facilities in Broome County. In addition, local entrepreneurs will create new businesses to support gas production activities and/or provide support services to royalty holders. Therefore, our impact estimates represent a lower-bound of potential economic activity that will occur in Broome County.

This new economic activity will increase county labor income by $157 million and support almost 2,200 jobs each year (see Table 6). Due largely to gas production royalty payments, annual county property income in the form of rents, royalties, dividends, and corporate profits will increase by $119 million. All of this activity and income will generate about $26 million in state and local tax revenues, with $12.6 million of this amount going to Broome County taxing jurisdictions in an average year.

If 4,000 total wells are developed in Broom County, total economic activity rises to $4.1 billion per year, which will support 4,380 jobs paying in excess of $313 million in salaries, wages, and benefits. Property income impacts from rents, royalties, dividends and corporate profits will increase to $239 million per year. County level tax entities will receive an estimated $25 million in new annual revenues and state tax revenues will increase by $27 million.

Table 6

Economic and Fiscal Impacts of Gas Production Activities
In Broome County, New York
Average Annual Impact Over a 10-Year Period

Description	Impact 2,000 Wells	Impact 4,000 Wells
Total Spending	$ 1,853,785,000	$ 3,707,570,000
Total Economic Activity	$ 2,060,198,000	$ 4,120,397,000
Total Wages, Salaries, Benefits (labor income)	$ 156,758,000	$ 313,516,000
Total Employment (person years)	2,190	4,380
Total Property Income*	$ 119,622,000	$ 238,640,000
State Taxes+	$ 13,622,000	$ 27,244,000
Local Taxes+	$ 12,574,000	$ 25,149,000

** Includes royalties, rents, dividends, and corporate profits. + Includes sales, excise, property taxes, fees, and licenses.*

OTHER POTENTIAL FISCAL AND ECONOMIC BENEFITS OF GAS PRODUCTION IN BROOME COUNTY, NEW YORK

In the discussion above, we used the IMPLAN model to estimate the indirect state and local taxes that would be generated by natural gas production in Broome County. At the same time, Broome County and its local jurisdictions should gain some direct lease and property tax revenue from gas drilling and operations.

The County and the Town of Maine have already posted an RFP for the leasing of a portion of 6,000 publicly-owned acres for natural gas and oil extraction. Though it's impossible to predict the size of bonus payments, or the royalty percentage, for gas leases in Broome County, the experience of Dallas-Fort Worth International Airport may be instructive. Chesapeake Energy made a bonus payment of $180 million for exclusive drilling rights on the 18,000 acres of airport property—i.e., $10,000 per acre. In addition, DFW Airport receives a 25 percent royalty on the value of natural gas produced by wells located on airport property. In fiscal 2008, these revenues exceeded $28 million.

Presumably, all gas wells located on private property will be subject to ad valorem real property taxes imposed by Broome County as well as its city, towns, villages and school districts. Here again, there is no way to make an accurate projection of new property tax valuations and revenues for Broome County and its local governments that will result from natural gas development. But the growth of oil and gas property values in the Barnett Shale of North Texas may hint at the potential for Broome County.

Between 2000 and 2005, oil and gas property values (mainly gas) escalated dramatically in the 10 core counties of the Barnett Shale (see Table 7). The percentage increases ranged from 60 to 218,000! More importantly, the taxable value of O&G properties jumped from about $341 million to $5.9 billion as drilling and production ramped up during this period. Local school districts in the Barnett Shale have been the primary beneficiaries of rising O&G valuations (see Table 8). In the case of the Decatur School District, oil and gas account for more than one-third of all property in the tax base.

Table 7

Oil and Gas Property Values

County	2000	2005	% Change 2000-2005
Denton	$48,200,100	$2,748,406,110	5,602%
Tarrant	$1,226,703	$741,825,050	60,373%
Wise	$196,502,840	$1,991,325,370	913%
Johnson	$66,932	$145,666,190	217,533%
Parker	$29,004,240	$135,907,200	369%
Palo Pinto	$51,693,210	$124,568,510	141%
Erath	$9,549,790	$15,326,210	60%
Hood	$4,534,040	$7,540,760	66%
Hill	$27,175	$11,360	-58%
Total	$340,805,030	$5,910,576,760	1,634%

Source: Texas Comptroller of Public Accounts

Table 8

Oil, Gas, and Minerals in School District Tax Base
2005

County	Total	OGM	% OGM
Denton ISD (Denton Co.)	$7,280,054,652	$37,189,184	0.5108%
Northwest ISD (Denton Co.)	$7,456,681,553	$1,704,160,200	22.8541%
Bridgeport ISD (Wise Co.)	$955,564,830	$77,215,860	8.0807%
Decatur ISD (Wise Co.)	$1,355,073,370	$476,976,620	35.1993%

Source: Texas Comptroller of Public Accounts

The City of Binghamton, as the largest city along the southern tier of New York State, could possibly become the administrative center for drilling companies and their suppliers operating in the New York section of the Marcellus Shale. In late May 2009, Chesapeake Energy announced it was looking for property in Bradford County, Pennsylvania for a housing development to provide lodging for about 180 workers. The project will include a laundry,

recreation facilities, and a cafeteria and will create about 30 jobs.[13] This is but one example of the types of ancillary development that can occur in conjunction with new natural gas production.

CONCLUSION

The Marcellus Shale is currently one of the busiest natural gas drilling plays in the nation. Not only is the shale formation huge in size, it is also deep, thick, high in organic carbon context, and over-pressured in certain regions with high gas content (see Figure 3). In addition, it benefits from a pricing premium relative to most gas producing regions due to its proximity to the Northeastern markets. A decade from now, production could well outstrip that of the Barnett Shale in north Texas, currently the number one gas field in the continental United States.

Because Broome County is fortunately located at the epicenter of the Marcellus Shale geological formation, the potential economic and fiscal benefits from natural gas drilling and production are sizeable. As discussed above, over a 10-year period the economic impact of drilling alone could exceed $15 billion, supporting more than 16,000 person-years of employment and generating salaries and wages of $792 million. State and local tax coffers would receive $85 million of new revenues.

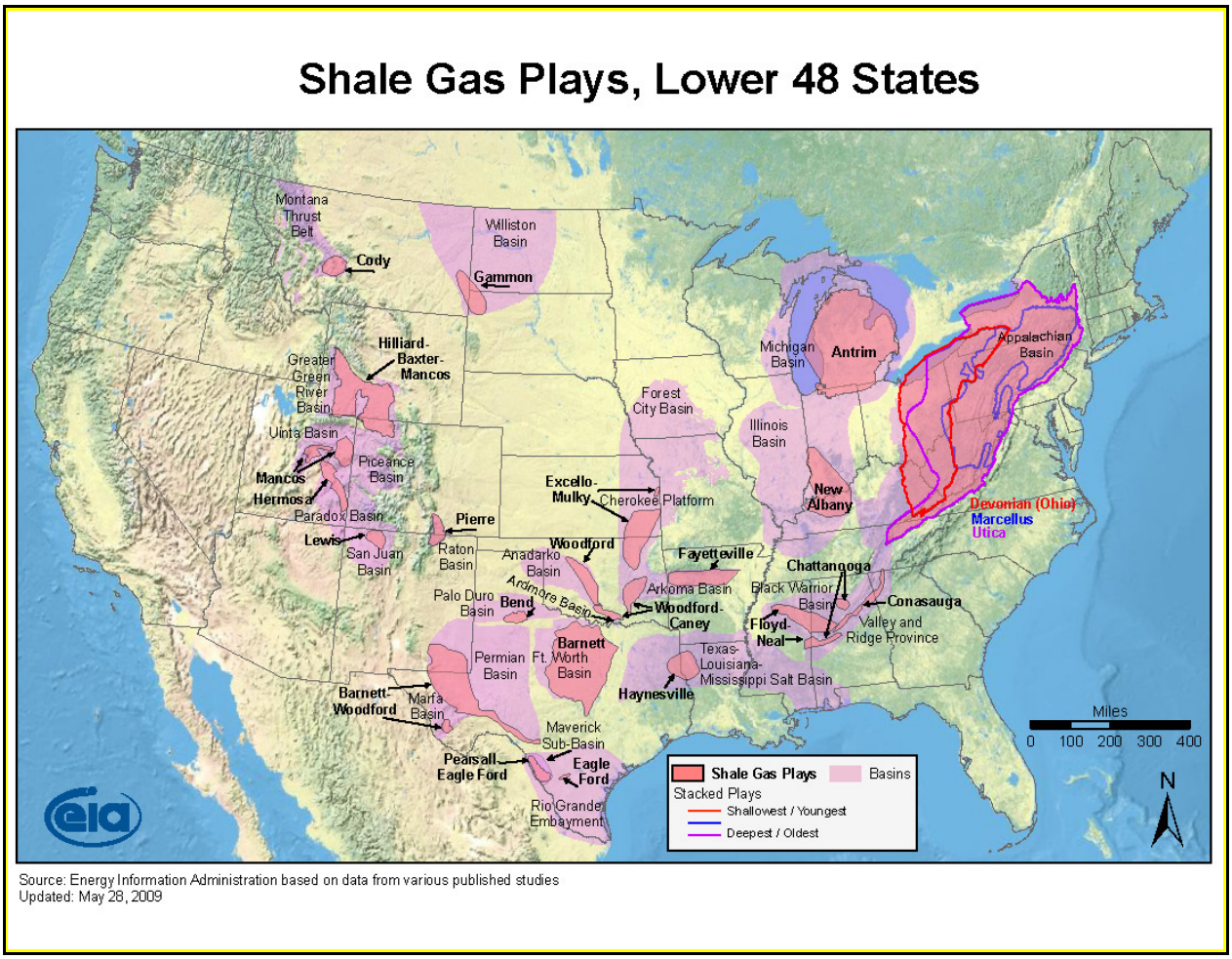
Ongoing production from completed wells will also contribute significantly to the Broome County economy. Our model predicts as much as $4.1 billion in new economic activity per year over a 10-year period supporting over 4,000 jobs and $314 million in salaries and wages. State and local tax receipts could be boosted by $52 million per year, with slightly less than half accruing to Broome County taxing jurisdictions. Local revenues will also be enhanced by bonus payments and royalties from wells located on county-owned property as well as new ad

[13] *Sayre Morning Times,* May 28, 2009.

valorem taxes on wells located on private property. Finally, should Broome County and the City of Binghamton evolve into an administrative center for the natural gas industry in New York State, ancillary development can be anticipated with attendant income, employment and fiscal benefits to the region.

Of course, all of these economic and fiscal benefit calculations are predicated on the assumption that the State of New York creates and maintains a supportive regulatory and tax climate toward the natural gas drilling and production industry. Policymakers must keep in mind that New York is competing with many other states in the Marcellus Shale for investment in this infant industry. Excessive regulatory or fiscal burdens could significantly limit New York's prospects. In particular, the state should avoid the temptation to levy a severance tax on natural gas production as this would only serve to drive the industry to Pennsylvania or another state.

Figure 3



Source: Energy Information Administration based on data from various published studies
Updated: May 28, 2009