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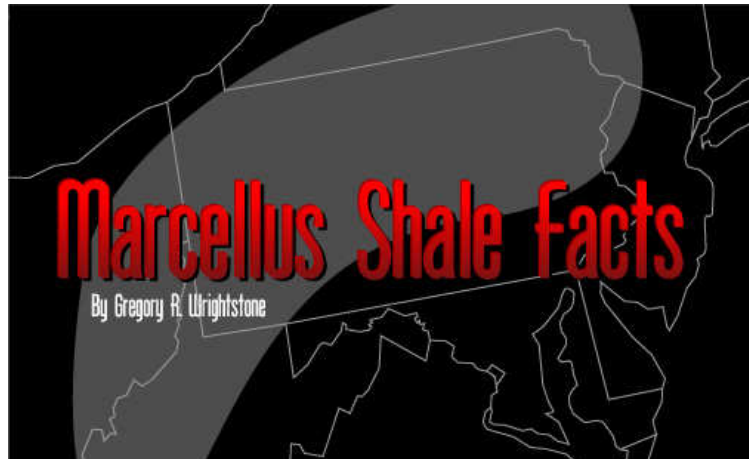
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**Marcellus Shale Facts**  
**By Gregory R. Wrightstone**  
Posted on Feb. 22, 2011



The Marcellus Shale represents a stunningly large energy reserve and an opportunity for the Commonwealth of Pennsylvania to benefit from more than 100,000 new high paying jobs, direct payments of more than a \$600 billion to land owners in the form of bonus and royalty payments, and nearly a billion dollars in additional state and local taxes. Importantly, the new jobs are primarily being created in just the parts of Pennsylvania that need them: in the economically depressed rural areas of the state.

Yet, in spite of the positive economic benefits that will accrue to the state and its citizens, strong opposition has arisen against the development of this resource. Most of the opponents support their position based on claims of existing or possible environmental catastrophe and damage to existing roads and infrastructure. Others believe that the Marcellus development should only go forward after the enactment of a new severance tax on the resource.

This white paper will serve to provide factual information concerning the Marcellus Shale

- How big is the resource?
- How long will this resource last? How long to get drilled up?
- What financial benefits can we expect for the citizens, local governments and the state?
- What effect will a severance tax have on the development?
- What negative environmental issues have been raised? What is the truth?

### How Big Is It?

Estimates for the recoverable reserves<sup>1</sup> from the Marcellus Shale are that it will produce ~489 Trillion Cubic Feet (TCF). Recent corporate press releases reported extraordinary per well recoveries in southwest PA and northern WV and may suggest that these previous estimates are likely conservative. To put the size of the resource in perspective, some facts are presented:

1. The United States consumes some 22 TCF per year – the Marcellus may provide more than 20 years of consumption for the entire country
2. The largest conventional natural gas field in North America is the Hugoton Field of Kansas with “only” 81 TCF, about 1/6 the size of the Marcellus
3. More than 450,000 wells have been drilled in the Appalachian Basin over the last 150 years and they have produced “only” 47 TCF, less than 10% of the projected production from the Marcellus

The area encompassed by the Marcellus in the subsurface comprises about 50 million acres (in grey), while the projected economic outline of the Marcellus is denoted below in red and encompasses an area of about 18 million acres.

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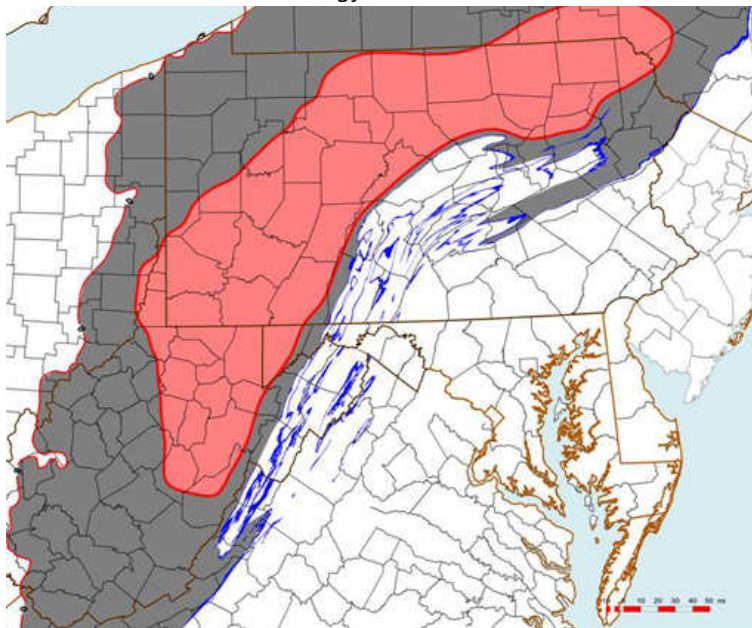
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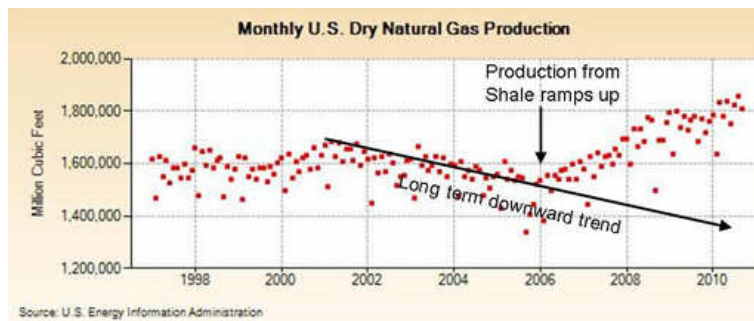
Grey: Marcellus Limits Red: Probable Current Economic Limit

Approximately 75% of the projected fairway of Marcellus production is located in Pennsylvania, meaning that a possible 13.5 million acres of the Commonwealth are located in the highly productive "core area". Using moderate assumptions of reserve size and \$5.00/MCF, the full development of the Marcellus may yield more than \$600 billion in direct royalty payments to the parties that own the oil and gas rights including citizens, communities and the Commonwealth. An additional \$54 billion in lease signing bonuses are likely to be seen in addition to the royalties paid.

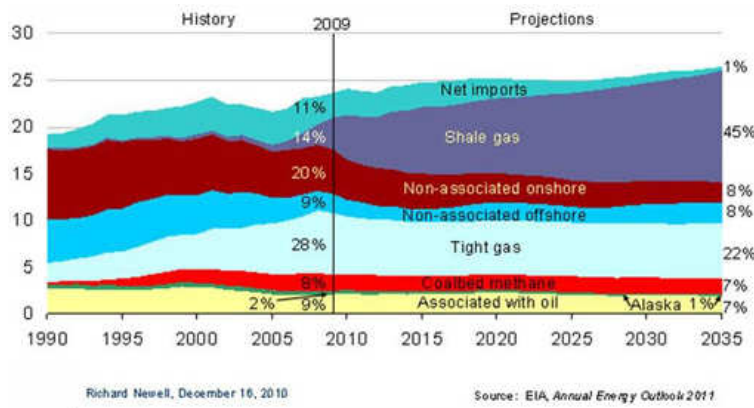
For the individual landowner, it is projected that a typical Marcellus well will yield royalties in excess of \$4 million per well drilled, or approximately \$45,000 per acre.

**Free Markets are Working**

Prior to the advent of significant production from the new Shale plays, including the Marcellus, American natural gas production was in serious decline and the predictions included dire warnings of looming shortages, steeply escalating prices and the need to import increasingly more natural gas. The rise of production from the Shale Fields, beginning in 2006, turned the tide and we are now seeing increasing production, a halt to imports and decreasing natural gas prices.



US Monthly Gas Production



US Projection - Sources of Natural Gas

The free market system is working wonderfully: vast natural gas supplies are coming on line and driving down the cost of natural gas. The chart below shows that, in the period prior to the flood of Marcellus gas into the market, gas pricing to the producer was in the \$8.00 to \$9.00/MCF range, with a peak of \$13.50/MCF in mid-2008. It is certainly likely

that, without the rise of Shale production, the market price would currently be ~\$15.00/MCF. This decreased cost of gas amounts to a projected savings of \$1,500 per year for every household in PA that uses natural gas to heat their home.

### Nymex Natural Gas Futures Contract 12-Month Forward Strip Average Prices Through 1/27/2011



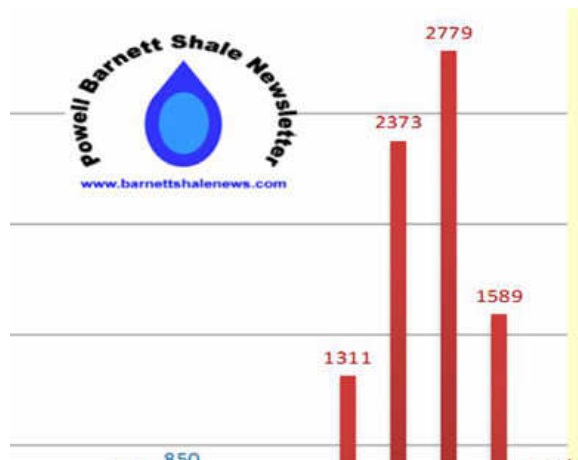
Data Source: FutureSource

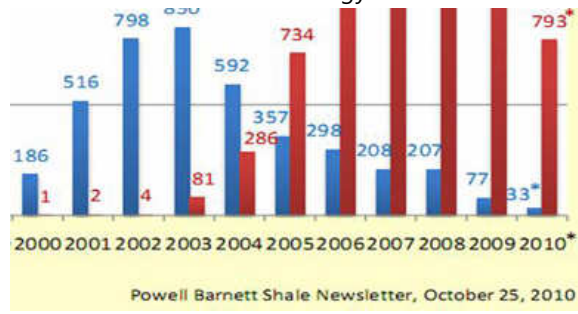
#### Natural Gas Price at Well Head

#### Pennsylvania vs. 49 Other States

Pennsylvania is in competition with all of the other natural gas producing states for the spending of limited exploration money by each company. Each company makes the decision on where and what to drill based on their projected returns on investment for each project.

Many of the other natural gas plays across the United States have seen drastic reductions in the number of wells drilled in the last two years due to the severe decline in gas pricing. Pennsylvania is the only state that is bucking the severe downward trend in the number of wells drilled for natural gas. For example, the Barnett Shale of the Fort Worth Basin was the first and "Mother" of all of the new Shale fields. The number of new wells drilled for the Barnett has fallen dramatically in response to the lower gas prices and inadequate rates of return, with drilling levels at 28% of 2008 levels:

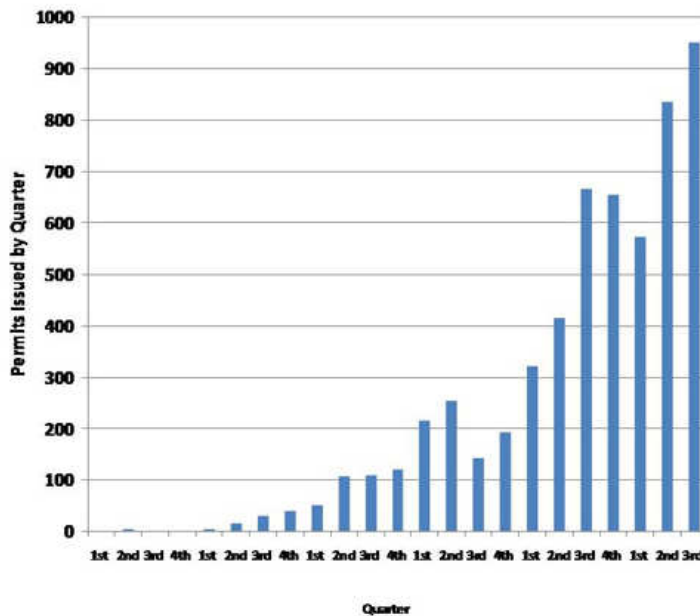




*Barnett Shale (TX) Rig Count*

Now compare that to Pennsylvania's permitted Marcellus wells by quarter and you see that the numbers of wells targeting natural gas from the Marcellus in Pennsylvania continues to explode.

**PA Marcellus Permits by Quarter**



*PA Marcellus Permits*

There is one reason and one reason only that companies are targeting the Pennsylvania Marcellus Shale and abandoning the other natural gas plays: economics. The rates of return on investment are better for the Marcellus than in the other plays.

There are several reasons that the Marcellus in Pennsylvania is so attractive for investment:

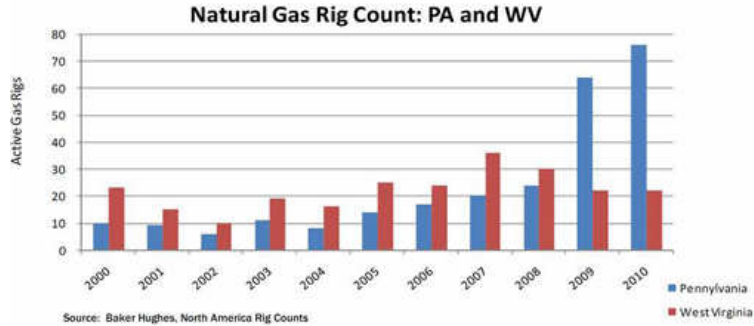
1. Excellent reservoir properties lead to high production rates
  1. High porosity
  2. High permeability
  3. High Total Organic Carbon
  4. Over-pressured

### Energy Tribune- Marcellus Shale Facts

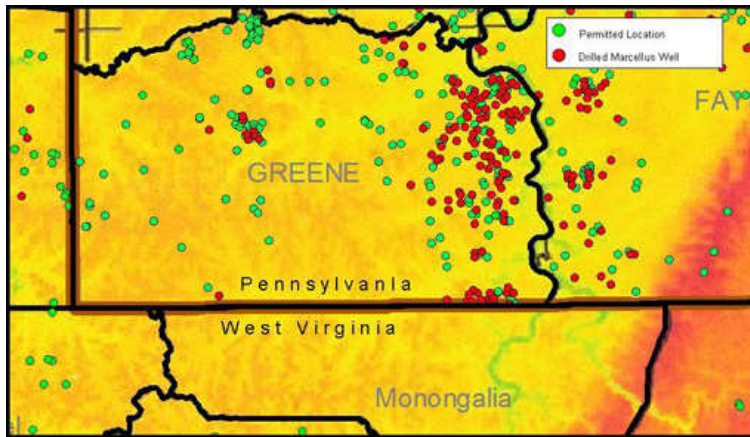
2. Proximity to east coast natural gas markets provides price premium
3. Proximity to east coast natural gas markets provides multiple pipelines with capacity
4. No severance tax yields better return on investment

One need only compare the drilling rig count and the number of permitted wells in Pennsylvania to that of the nearby counties in West Virginia, which has a severance tax. Based on detailed mapping of the important parameters that control production from the Marcellus, the southwestern counties in Pennsylvania and the adjacent counties in West Virginia should have similar reservoir qualities and production potential. Yet, drilling is booming on the north side of the Mason-Dixon line and very little drilling is occurring just to the south in West Virginia.

The only difference between the two areas is the severance tax.



Courtesy Commonwealth Foundation



Marcellus Wells as of 12/15/2010

#### Summary and Comment

The Marcellus represents an incredible opportunity to stimulate Pennsylvania's moribund economy, yield low-cost energy for our nation and provide a path toward energy independence. Decisions on the development of this resource should be based on science, data and facts. In too many cases recently, science and rational thought have been replaced by fear and hysteria fomented by a vocal minority.

The second installment of this white paper will address each of the major concerns that the opponents of Marcellus Shale development have raised concerning development of this resource.

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