

Shale Gas Development in Pennsylvania

J. Scott Roberts,

**Office of Mineral Resource
Management,**

**Pennsylvania Department
of Environmental
Protection**

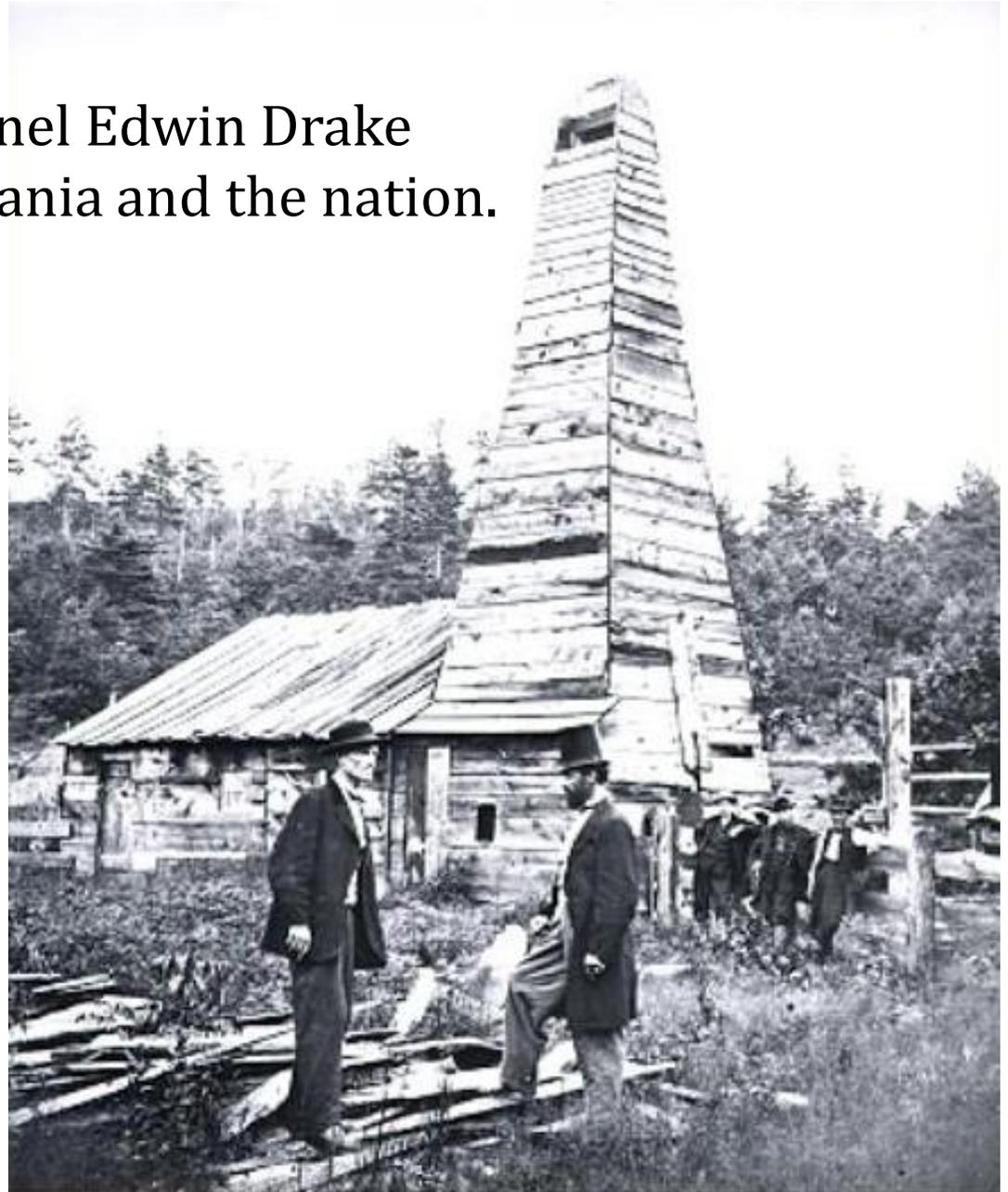
IOGCC Washington, D.C. Meeting
March 2010



Mural 'Spirit of the Light'
Rotunda, Pennsylvania State Capitol Building

On August 27th 1859 Colonel Edwin Drake forever changed Pennsylvania and the nation.

Drake's Folly was only 69.5 feet deep but its meager 25 barrels per day of crude oil soon produced jobs and economic opportunity far beyond the Oil Creek Valley.





Mineral Resources are one of the basic sources of wealth in any Civilization.

The value of the minerals themselves are multiplied by the supply chain needed for production and value is added by the use of the mineral itself.

Oil and gas drove the expansion of manufacturing of oil field equipment and transportation infrastructure.

In addition to quickly being used for heat and artificial lighting, gas became the basis for Pennsylvania's glass industry. From that time until after WWII the majority of America's glass plants were located in Pennsylvania.



With the depletion of the state's shallow oil reserves and discoveries around the world Pennsylvania exited center stage.



Discoveries of additional resources like coal bed methane, demand for niche products and proximity to large markets provided a basis for a healthy local oil and gas industry.



Pennsylvania Oil and Gas Facts

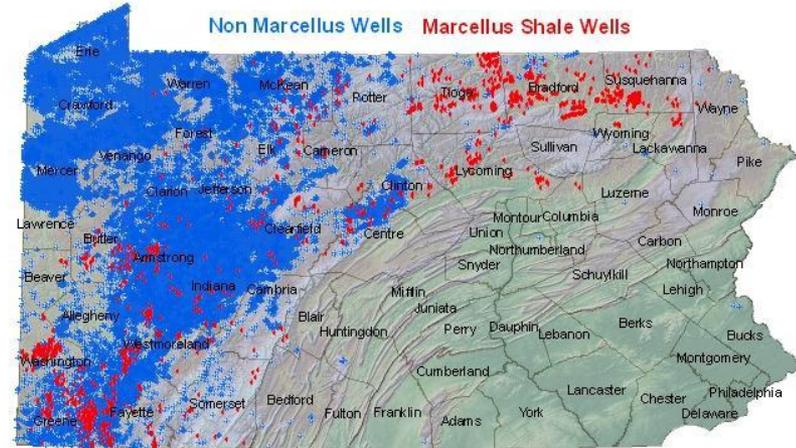
120,000 operating oil and gas wells.

7,883 well permits issued in 2008
and 6,233 in 2009.

17,864 wells drilled since 2005.

14,544 inspections of 9848 wells.

Department of Environmental Protection Bureau of Oil and Gas Management Active Oil and Gas Wells



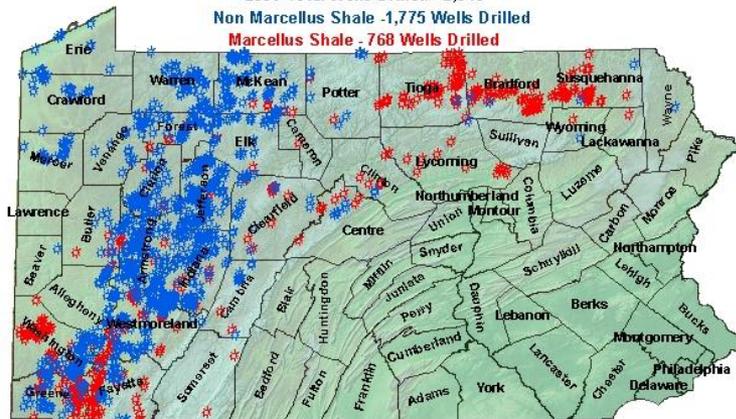
as of 11/20/2009

Department of Environmental Protection Bureau of Oil and Gas Management Wells Drilled

2009 Total Wells Drilled - 2,543

Non Marcellus Shale - 1,775 Wells Drilled

Marcellus Shale - 768 Wells Drilled



As Reported by Operators

Updated 01/25/2010

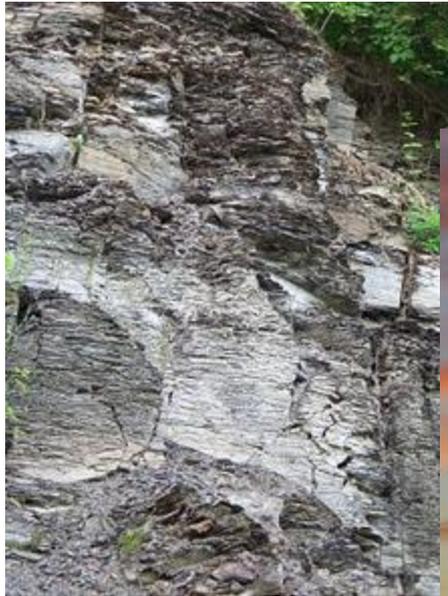
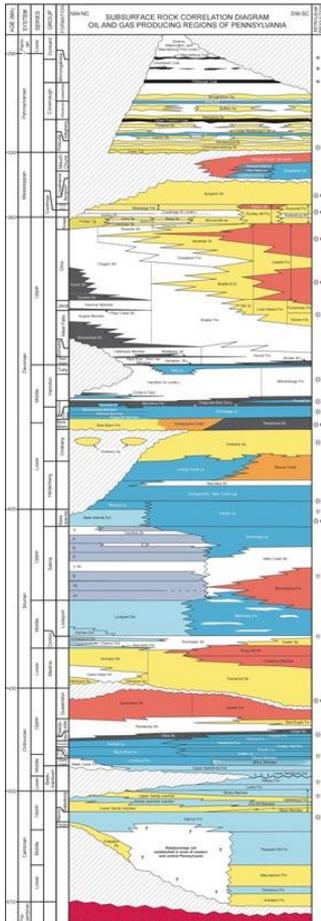
2005 – present
2,792 Marcellus permits issued.

1,108 Marcellus wells drilled.

Expect between 4,000 to 5,000
Marcellus permit applications in
2010.

Today, the petroleum industry is coming home.

The potential of the Devonian age Marcellus Shale has been recognized since wells began being drilled through it on the way down to the Oriskany Sandstone in the 1930's.



Outcrop exposure of the Marcellus Shale.



Now, using techniques pioneered in Texas' Barnett Shale, horizontal drilling and hydraulic fracturing are making that potential a reality.

Also returning are jobs and economic opportunity.

- \$4+ Billion spent on leasing.
- According to Penn State, between 30,000 and 50,000 jobs created since 2008.
- Fully booked hotel rooms -
 - In Bradford some workers have stayed so long that they are legally consider hotel 'residents' instead of 'guests'.
 - Recently one company announced
 - plans for a 140 bed housing facility..
- In parts of the Pittsburgh region there is shortage of office space.
- The Reading Blue Mountain and Northern Railroad is adding track into northeastern Pennsylvania to service burgeoning Marcellus development.
- TMK IPSCO recently announced plans to begin manufacturing oilfield pipe at it's Youngstown, OH plant.



Throughout the current recession Pennsylvania's unemployment rate was well below the national average.

Mineral Resources jobs in the state grew by 5.3% from December 2008 to December 2009. The average salary for PA's Gas workers is \$63,000, well above the state average.

In the near term it is obvious that these opportunities will Grow.

We project as many as 5,000 Marcellus well permit applications in 2010.

Rig counts, one measure of the activity continue to grow – from 20 at the beginning of 2009 to 70 today.



E& P companies continue to make investments in Pennsylvania's shale gas:

- Range Resources plans on spending roughly \$700 million in 2010.
- Atlas Resources \$175 Million.
- Norway's Statoil will spend \$2 Billion and Chesapeake another \$500 Million developing Marcellus acreage throughout NY, PA, and WV.
- The recent deal with Anadarko and Japan's Mitsu will invest \$1.4 Billion into Marcellus development over the next few years and as much as \$3 Billion more over the next decade.

Under Governor Rendell's leadership Pennsylvania is working to:



University of Pittsburgh at Johnstown Geology Students

Create the curriculums designed to prepare young Pennsylvanian's for Marcellus careers.

Capture supply chain opportunities for pipe, oilfield cements, and other supplies.

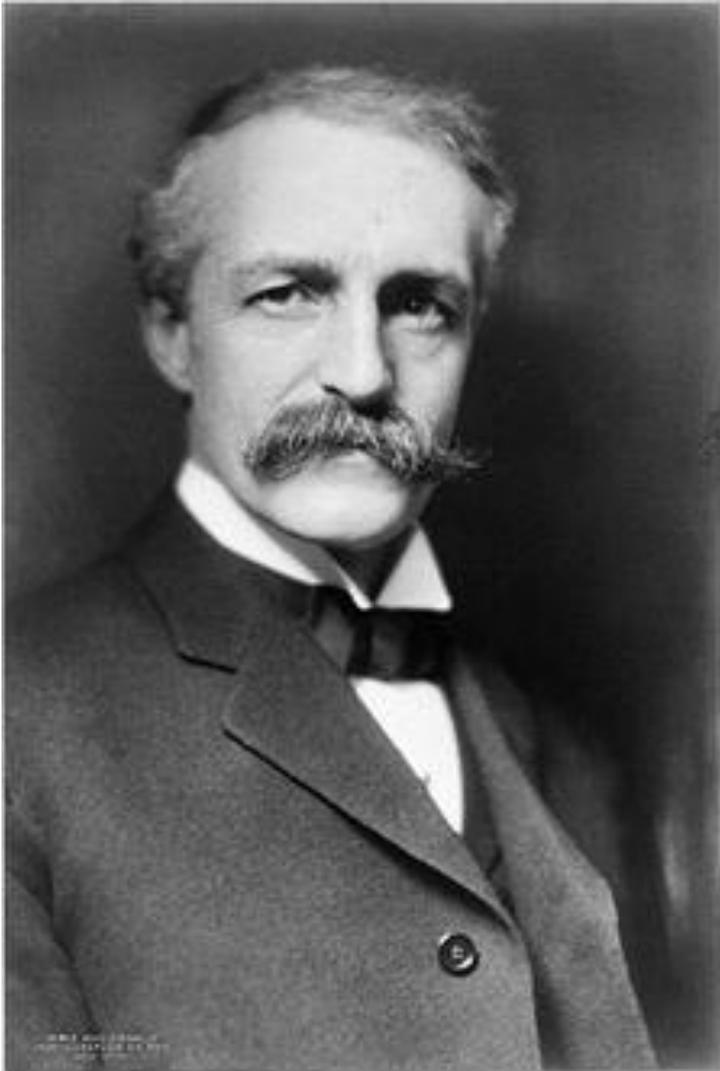


Expand natural gas consumption as part of an overall energy and climate strategy.



Produce much needed state revenue from Marcellus wells drilled on state property.

Pennsylvania's approach to shale gas, like the gas industry itself, is rooted in our past.

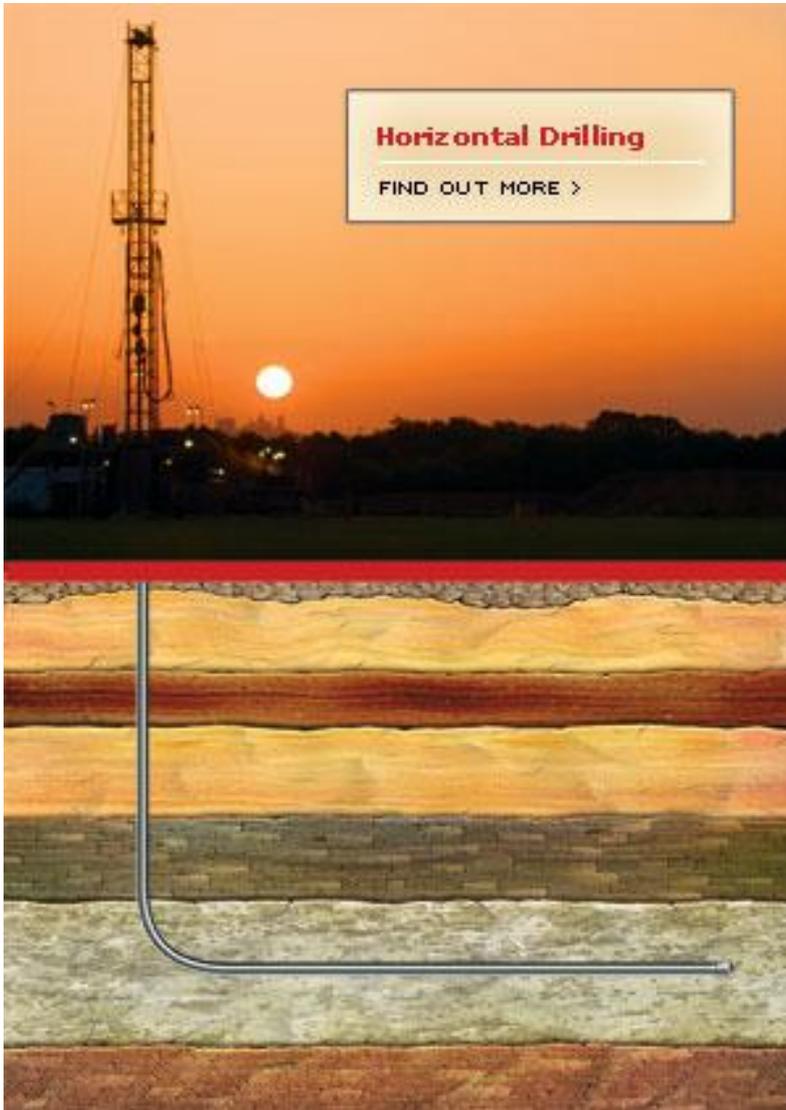


Gifford Pinchot c. 1905

Our 28th Governor, Gifford Pinchot, is often credited with establishing the philosophy of Conservation, an ethic of resource use, allocation and protection.

It should come as no surprise that the Commonwealth welcomes shale gas development but is insistent upon respect for, and protection of our land, water and natural resources.

Shale Gas relies the modern technologies of horizontal drilling and hydraulic fracturing.



Horizontal drilling reduces the amount of land disturbed for:

- Site access
- Drilling the well
- Laying gathering pipelines.



Anadarko Marcellus site in the Pennsylvania Wilds.

Hydraulic fracturing ('fracing') creates porosity and permeability in the rock allowing the gas to flow into the well.

After the well is constructed a mixture of water, sand, friction reducers, scale inhibitors, and bactericides are pumped down the hole under great pressure.

Issues swirling around fracing include:

Water Sourcing

- May need up to 5 million gallons per well
- Impoundment or container storage protects against excessive withdrawals.
- Working to eliminate barriers to use of AMD.

Composition of Mixture

- Varies well to well
- Proprietary
- Transparency is needed to allay concerns.



Contamination

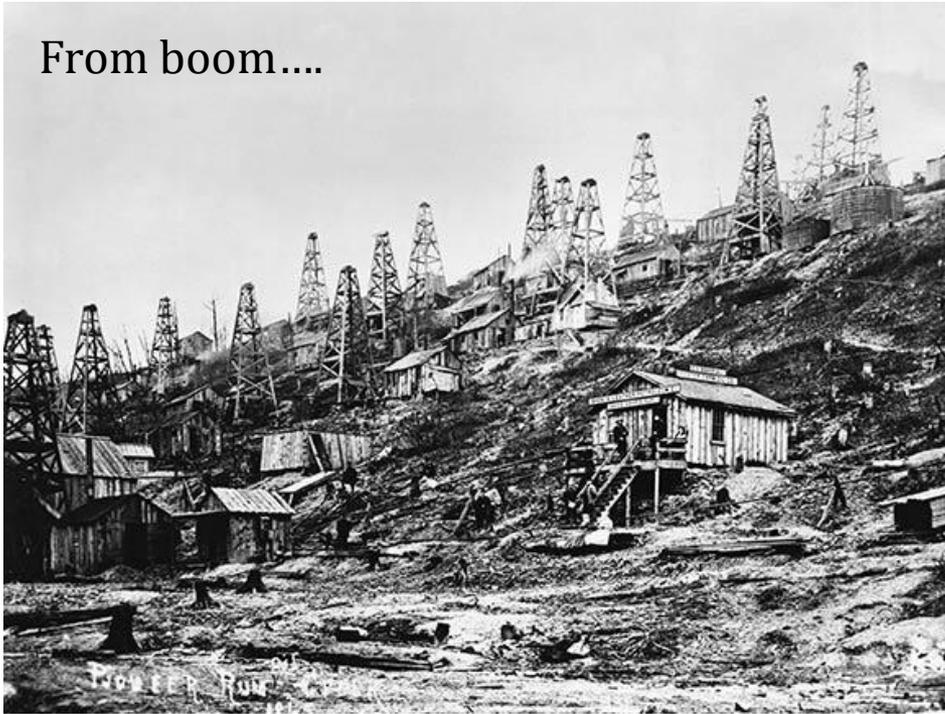
- Pathways from formation limited
- Well construction
- Spill Prevention and Control

Post-frac Treatment

- 20% - 40% flowback from well
- recycle, reuse
- TDS rule

Given our history, the opportunities and challenges of shale gas development are well understood in Pennsylvania, New York, Ohio and West Virginia.

From boom....



...to bust...

....we have effectively and professionally dealt with Oil and Gas Issues.

The Marcellus presents different wrinkles but the cloth is not new to us. We have the regulatory framework to protect our citizens and the environment while allowing development.

The background of the image features a large, faint watermark of the Seal of the Commonwealth of Pennsylvania. The seal is circular and contains the text "SEAL OF THE STATE OF PENNSYLVANIA" around the perimeter. In the center, it depicts an eagle with wings spread, perched on a shield. Below the eagle is a ship on the water, and at the bottom, there are three pillars. The text "Contact Information:" is centered over the top portion of the seal.

Contact Information:

**J. Scott Roberts, Deputy Secretary
Office of Mineral Resource Management
Pennsylvania Department of
Environmental Protection**

**Rachel Carson State Office Building
P.O. Box 2063
Harrisburg, PA 17105-2063**

Telephone (717) 783-5338

Fax (717) 783-0930

Email: jayroberts@state.pa.us