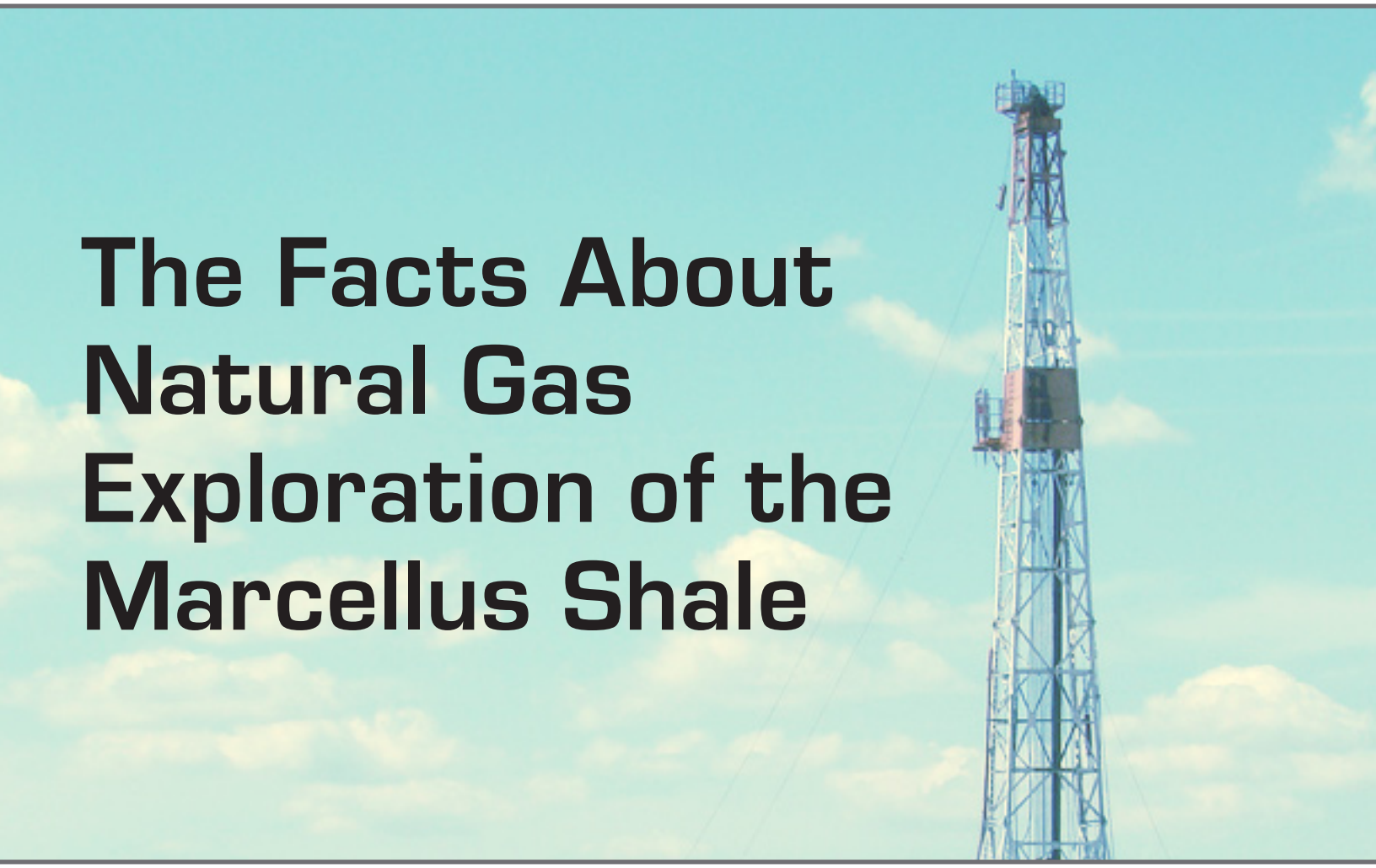
Homegrown Energy



The Facts About Natural Gas Exploration of the Marcellus Shale

Independent
Oil & Gas Association
of New York

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Introduction

At a time when energy costs are spiraling out of control and the price of everything from bread to milk is skyrocketing, we must find ways to reduce our expenditures on fuel – and New York State's natural gas wells are an economically viable option.

Drilling for natural gas is not new to New York. In 1821, the first gas well was drilled in Fredonia New York and, to date, more than 75,000 oil and natural gas wells have been drilled. Approximately 14,000 of these are still active and have had an excellent track record on environmental compliance and safety standards.

The Marcellus Shale is one of the largest natural gas fields in North America, and its scope is expanding. It has the potential to generate a multi-billion-dollar direct impact on the economy, with multiplier effects rippling through virtually all regional industries.

In 2002, a U.S. Geological Survey estimated that the Marcellus Shale formation held 30.7 trillion cubic feet (tcf) of natural gas – a colossal amount for the U.S. considering that the U.S consumes about 23 tcf of natural gas per year, but only produces about 19 tcf.

But according to a recent study, which takes into account the technological advances made in the industry from 2002 to the present, the Marcellus formation could hold a volume up as high as 500 tcf – more than 16 times the old estimate.

A report from the Penn State Workforce Education and Development Initiative estimates that for each $1 billion of royalty income generated by the Marcellus Shale reserves, the State could gain 7,880 jobs this year, and close to 8,000 next year.

Currently New York must import 95 percent of its natural gas from other states including the southwest. Now is the time for change. We have an opportunity to supply New York – and the rest of America – with a proven energy source that is not only clean burning and has a low carbon-content, but is also homegrown and will reduce our reliance on others by giving us our own source of low-cost energy.

This tremendous resource will yield new economic development opportunities and create substantial job growth. This is the time to embrace this opportunity, not shy away from it.

Brad Gill,
Executive Director of the Independent Oil and Gas Association of New York

Marcellus Shale Overview

The Devonian Marcellus Formation (or Marcellus Shale) lies 300 to 6,000 feet below the Allegheny Plateau Region of North America and covers 54,000 square miles, running through Ohio, West Virginia, across Pennsylvania and into New York's Southern Tier. The formation also touches small areas of Maryland, Kentucky, Tennessee, and Virginia. It gets its name from the original exposed portion of shale (outcropping) found near Marcellus, New York during a geological survey in 1839.

The shale itself is a fine-grained sedimentary rock that is formed when quartz and clay minerals or mud are compacted by pressure over an extended period of time. Shale has a very compressed layer structure and such low permeability that it releases gas very slowly. Shale is rich in organic material and sufficiently brittle but rigid enough to maintain open fractures. Natural gas found in shale is held in its own natural fractures, pore spaces, and on the surface of the organic material is released over time as the pressure in the shale decreases.

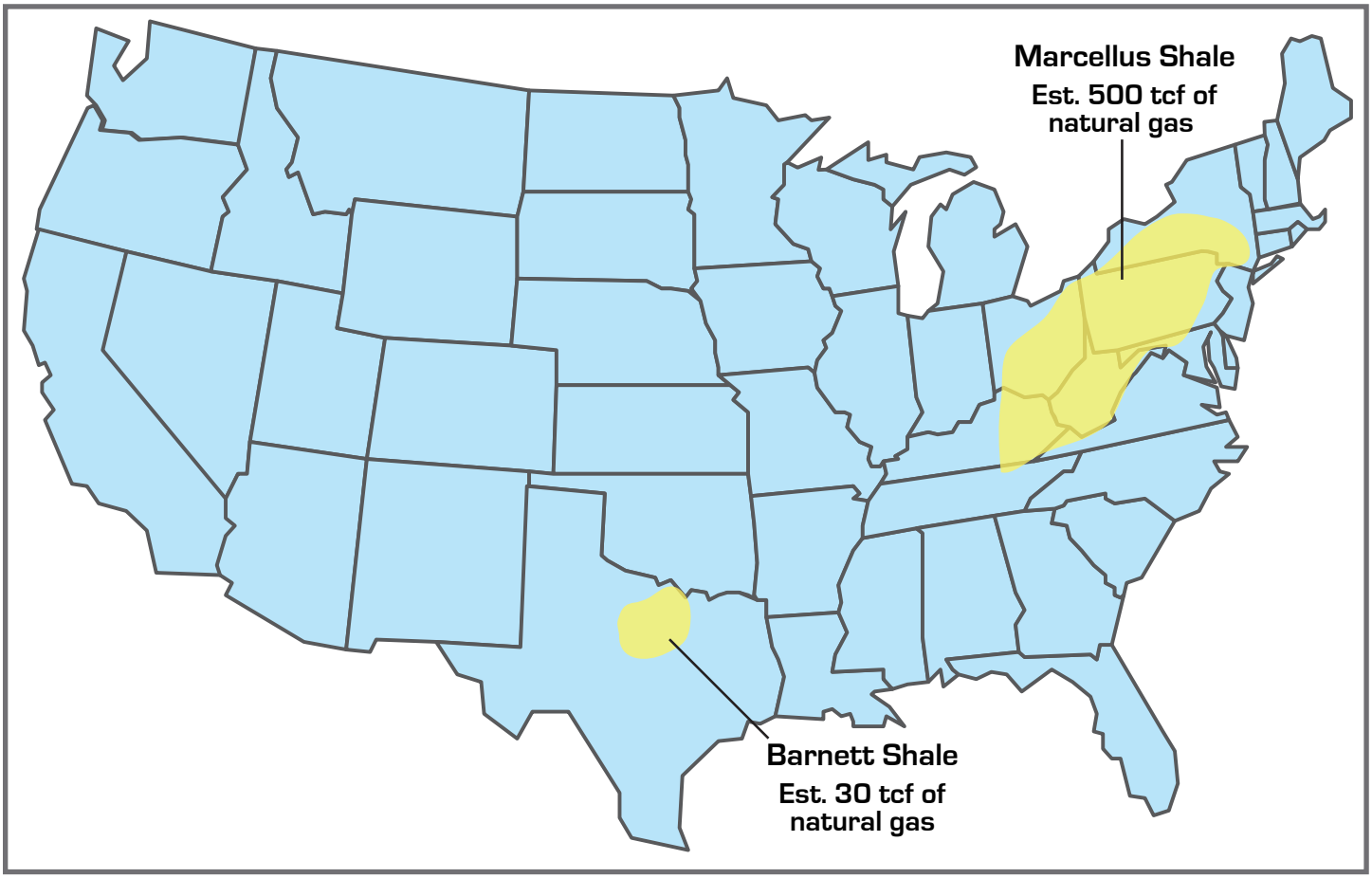
The Marcellus shale layer becomes thicker from west to east beginning at about 50 feet in Ohio to more than 100 feet thick in Pennsylvania and New York. Geologists have known about the gas here for years, but the shale has been virtually impossible to permeate – until now. Thanks to recent improvements in horizontal drilling and hydraulic fracturing, and an upturn in the price of natural gas, recovering natural gas in the Marcellus formation has become a viable option.

Shale thickness, depth and reservoir varies significantly across mapped region affecting expected recoverable reserves.

Economic Benefits of the Marcellus Shale

Coined America's next super giant in natural gas production, the Marcellus Shale formation is twice the size of the Barnett Shale of Texas, which until recently was regarded as the largest shale formation in the U.S. Research conducted by Pennsylvania State University and the State University of New York at Fredonia suggests that the Marcellus formation may contain more than 500 trillion cubic feet (tcf) of natural gas. Utilizing some of the same new drilling technology that has been used in the Barnett Shale, perhaps 10 percent of that gas – 50 tcf – might be recoverable, maybe more. That volume of natural gas would be enough to meet demand for all of the U.S. for about two years – an estimated value of one trillion dollars.

The Barnett Shale formation, which stretches from Dallas to west of the city of Fort Worth and covers approximately 5,000 square miles, can be used to forecast the economic benefits that Marcellus Shale formation could yield. To date, the Barnett Shale formation has generated thousands of jobs and tens of billions of dollars in investments. The field has yielded 2.5 tcf of natural gas, and is widely estimated to contain as much as 30 tcf of natural gas resources. Further, the total effects of Barnett Shale activity (based on year-end 2007 levels) were found to include $8.2 billion in annual output, $2.4 billion in annual retail sales, and 83,823 permanent jobs. This level represents a significant gain from the prior year – more than 50% from the estimated impact of almost $5.2 billion in annual output and 55,385 permanent jobs in 2006. Based upon this, it is reasonable to predict huge economic benefits for New York if the Marcellus Shale formation is developed.



The Facts about Hydraulic Fracturing

Application of hydraulic fracturing techniques, to increase oil and gas recovery, is estimated to account for 30 percent of U.S. recoverable oil and gas reserves and has been responsible for the addition of more than 7 billion barrels of oil and 600 trillion cubic feet of natural gas to meet the nation's energy needs.

Horizontal Drilling

Horizontal drilling is a technique often used to help encourage natural gas production. Unlike traditional vertical drilling techniques, horizontal drilling is more economical, as multiple wells may originate from the same "drill pad" (the use of which is required under a new law in New York), and has the ability to extract more production from the well. Horizontal drilling provides great access with a smaller footprint on the surface. Multiple horizontal wells from a single drilling pad could drain 200-640 acres disturbing very little of the natural habitat above.

In this technique, drilling begins with a central vertical wellbore descending to just above the Marcellus Shale. At that point, the drill makes a gradual 90 degree turn and drills horizontally for up to 3,000 feet.

The first phase of the drilling is designed to protect ground water aquifers. An initial wellbore is drilled well below aquifer levels. Thick steel pipe is then placed in the hole and sealed with cement on the outside of the pipe. With the fresh water zones now protected from invasion, drilling recommences to the deeper zones of interest and when this depth is reached, a second string of steel pipe is run inside the first and additional cement is used to provide a permanent seal. This procedure will now allow for a double wall of steel plus cement protecting the fresh water zones from any chance of contamination. The design for this pipe and integrity of the well exceeds all specifications by regulatory authorities.

After penetrating the shale, the rock must be hydraulically fractured, or "fraced", to maximize the production of natural gas from the Marcellus Shale. A fracture stimulation fluid comprised of fresh water, sand, and additives is injected into the well under high pressure to enhance fractures in the rock and free more gas. These fractures start at the wellbore and extend as much as several hundred feet into the shale.

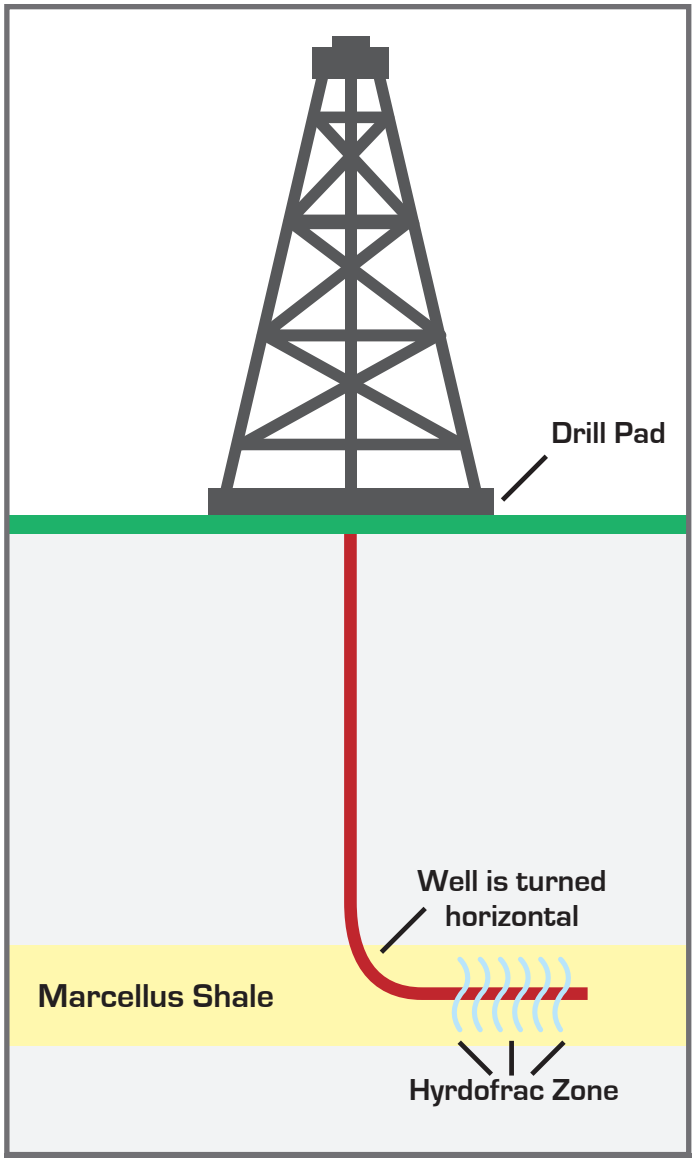


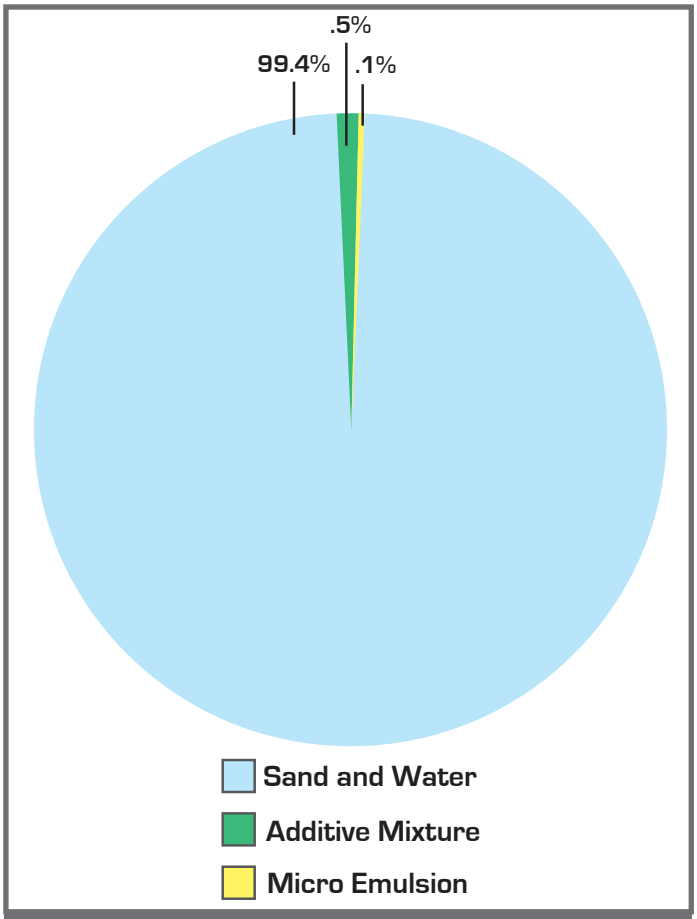
Illustration of a horizontal drill structure. The production ratio for horizontal wells versus vertical wells is 3.2 to 1, while the cost ratio of horizontal versus vertical wells is only 2 to 1.

The Facts about Hydraulic Fracturing

The Process of Hydraulic Fracturing

The vast majority of the nation's newly drilled natural gas wells do not produce gas at sufficient rates to make a well economically viable. Hydraulic fracturing is a technique used to allow natural gas to move more freely from the rock pores where it is trapped to a producing well so it can be brought to the surface at higher rates. This technique is done by sealing off a portion of the well and fracturing fluids under very high pressure into the isolated portion of the hole. The high pressure fractures the rock and pushes the fractures open. This technology was developed in the late 1940s and has been continuously improved upon since that time.

During hydraulic fracturing, "fracturing fluids" consisting primarily of water and sand are injected into the producing formation under high pressure. Sand, a "propping agent", is pumped into the fractures to keep the rock from closing when the pumping pressure is released, allowing the natural gas to migrate from the rock pores to the surface wellbore. Water and sand typically make up 99.5 percent of the liquid phase of fracturing fluids. The remaining .5 percent contains three primary additives: A friction reducer, similar to Canola oil, which thickens the liquid; and a bactericide, like Chlorine used in swimming pools and hot tubs to kill bacteria. The fracture fluid also contains a 0.1 percent portion of a micro emulsion element, a lubricant, similar to those found in personal care products. This additive ensures coating of the formation and effective fracture fluid recovery.



Water and sand make up the majority of the fracturing fluid mixture while common additives are also used to increase recovery efficiency.

Minimizing the Environmental Impact

Beyond full compliance with all applicable state and federal environmental rules and regulations, IOGA of New York recommends that its members perform extensive supervision and inspections during all phases of operations from surveying, drilling, and pipeline construction through production and final reclamation.

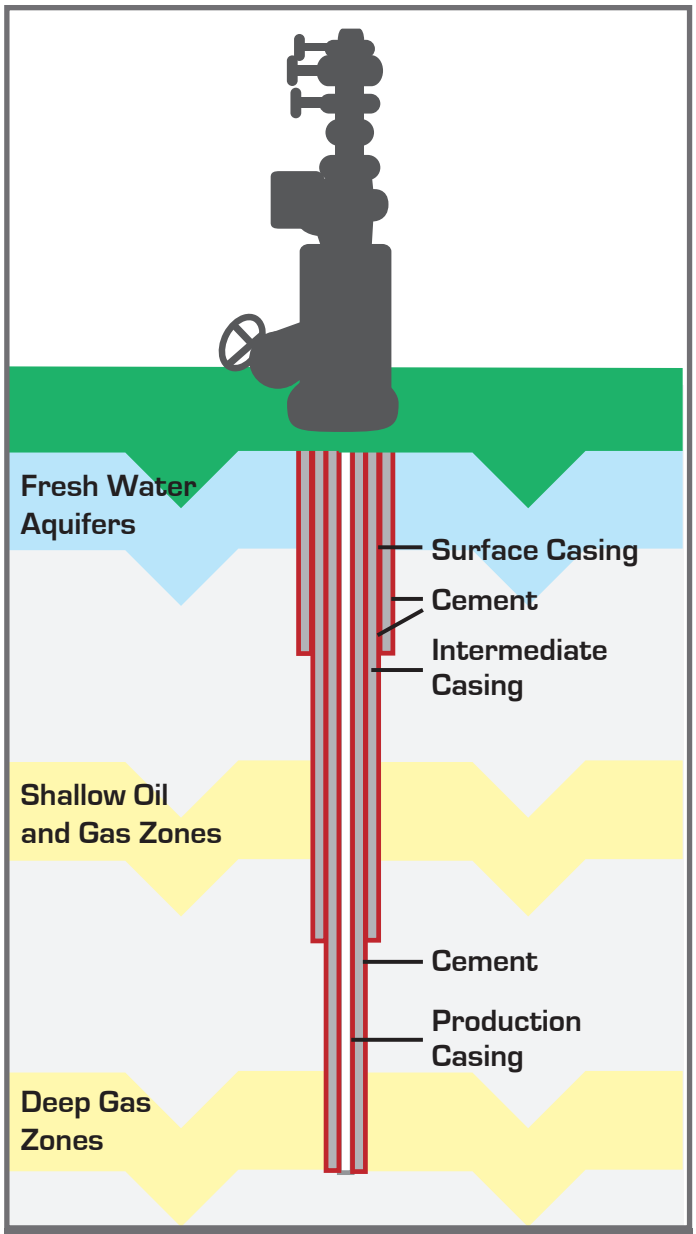
Our members have exemplary safety and environmental records and work to ensure that all property and roads are ultimately restored to equivalent or better condition that they were when exploration operations began.

Noise and Traffic

During the drilling and fracing period, there will be an unavoidable increased flow of traffic, with the potential for dust and noise due to heavy equipment in the area. To minimize the adverse impact to local communities, dirt roads are sprayed with water and calcium to keep dust down. In order to mitigate traffic disruptions, movement schedules are provided to local fire districts, emergency services centers, and traffic departments. Activities are scheduled around school bussing hours and community events whenever possible and on roads that will not be damaged by these temporary conditions.

Water Use, Storage and Disposal

All natural gas operators currently using or planning to use water to develop natural gas wells in the Marcellus Shale formation in the Susquehanna watershed must have approval from the Susquehanna River Basin Commission (SRBC). The same is true in the Delaware River watershed which requires approval from the Delaware River Basin Commission (DRBC). Both the SRBC and the DRBC make frequent well site inspections, monitor all water withdrawals and handle the disposal of all fluids. Cease and desist orders have and will be issued to companies not in compliance with either the SRBC's or DRBC's stringent standards. The SRBC's and DRBC's approval process is a critical step in environmental protection while supporting the development of a potentially viable energy source.



The Division of Mineral Resources' well casing and cementing regulations provide maximum protection for New York State's fresh water aquifers.

Regulatory Guidance

New York's Oil and Gas Regulatory Program

Hydraulic fracturing has been used for decades in New York. In 1963, the State's oil and gas regulatory program was established and has been through two substantial revisions – the first in 1981 and the second as recently as 2005. Since that time, the program has effectively protected New York's ground water and drinking water sources. This has been accomplished through the administration of this comprehensive program by the State's Department of Environmental Conservation (DEC) through a permitting program and regulations that mitigate, to the greatest extent possible, any potential environmental impact of drilling and well operation.

To protect the environment during and after oil and gas extraction, DEC imposes strict drilling permit requirements that inhibit oil spills, prevent ground water contamination and require proper disposal for all wastes and proper containment of drilling and fracing fluids. Drilling permits also protect groundwater by mandating a casing and cementing program for each well, which prevents the flow of oil, gas or salt water between underground formations. Drilling rules and regulations require setbacks from municipal water wells, surface water bodies and streams. Further, the DEC reviews all oil and gas drilling permits in accordance with the State Environmental Quality Review Act (SEQR) to ensure that the environmental impact of resource extraction will be mitigated to the greatest extent possible. The end result is effective oversight of hydraulic fracturing and ample protection of the State's ground water and drinking water sources.

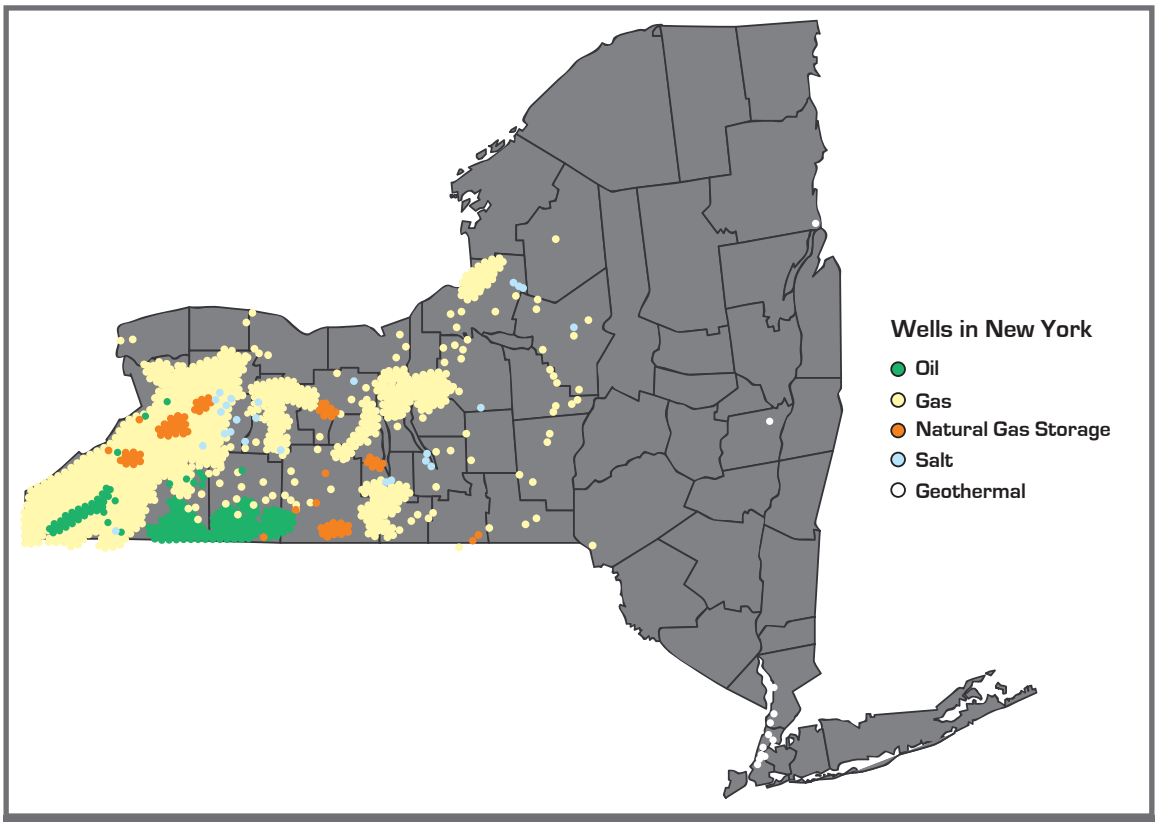
Safe Drinking Water Act

Congress enacted the Safe Drinking Water Act (SDWA) in 1974. By then, hydraulic fracturing had been used for 25 years with no environmental problems. Under the SDWA, states developed extensive underground injection control (UIC) programs to manage liquid wastes and produced waters. These programs addressed injected liquids, including those intended to remain in underground geologic formations however they did not include hydraulic fracturing.

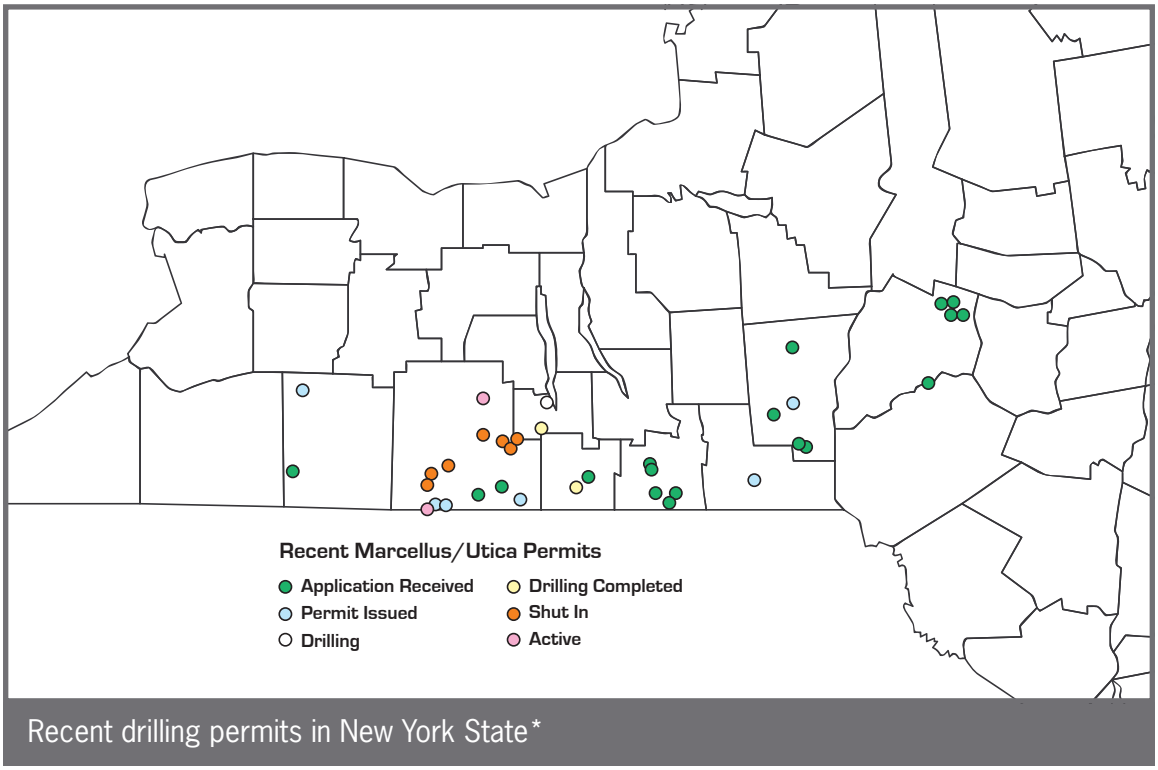
In 1980, Congress recognized that many states had their own injection programs in place, so they modified the SDWA to give states the option of gaining federal "primacy" for existing injection programs based on the demonstrated effectiveness of state oil and gas UIC programs. And even though hydraulic fracturing was not covered under the UIC program, litigation in the 1990s made Congress realize they needed to clarify the hydraulic fracturing issue.

The Energy Policy Act of 2005 (EPAct) addressed hydraulic fracturing by preserving the state regulatory system that has worked so effectively for the past half century. EPAct spelled out that the SDWA was not the appropriate law for regulating hydraulic fracturing with one exception. During the previous referenced analysis of environmental risk from hydraulic fracturing, EPA hypothesized that the use of diesel fuel as a solvent in the fracturing process of coalbeds might pose a risk. While no incidents of actual damage were identified, Congress preserved the option for the application of the SDWA for regulation of hydraulic fracturing if diesel fuel was utilized.

When the Ground Water Protection Council (GWPC), an association of state regulators, studied the environmental risk of hydraulic fracturing, they found one complaint in the over 10,000 coalbed methane wells reviewed. Subsequently, EPA initiated its own study of coalbed methane hydraulic fracturing environmental risks. EPA released its completed study in June 2004. This study confirmed that there are no significant environmental risks from hydraulic fracturing when properly executed.



Current drilled wells in New York State*



Recent drilling permits in New York State*

*Maps recreated from New York State Department of Environmental Conservation presentation, Marcellus Shale Exploration - Energy Development and the Environment, 6/15/08

Additional Marcellus Shale Resources

MarcellusFacts.com - Informational Blog about the Marcellus Shale
Website: http://www.marcellusfacts.com

Marcellus Shale - Appalachian Basin Natural Gas Play
Website: http://geology.com/articles/marcellus-shale.shtml

ShaleBlog.com - News about Natural Gas from Shale
Website: http://shaleblog.com/category/marcellus-shale/

New York State Department of Environmental Conservation – Marcellus Shale Information
Website: http://www.dec.ny.gov/energy/46288.html

Cornell Cooperative Extension Natural Gas Exploration and Leasing Resources for New York State
Website: http://blogs.cce.cornell.edu/gasleasing/

Times Herald-Record - Drilling for Dollars: The Rush for Gas in Sullivan County
Website: http://www.recordonline.com/apps/pbcs.dll/section?Category=NEWS58

DRBC – Natural Gas Drilling in the Marcellus Shale Formation
Website: http://www.state.nj.us/drbc/naturalgas.htm

SRBC - Marcellus Shale and Natural Gas Well Development
Website: http://www.srbc.net/programs/projreviewmarcellus.htm

About IOGA of New York

IOGA of New York is a trade association, founded in 1980, to protect, foster, and advance the common interests of oil and gas producers, professionals, and related industries in the State of New York.

Comprised of members from numerous states throughout the country, we represent most of the larger oil and gas operators and producers in New York State, as well as many smaller independent companies.

Our association aggressively interacts with local, state and federal agencies and representatives regarding regulations and issues affecting the oil and natural gas industry in New York State.

IOGA of NY takes great pride in its commitment to members by organizing informative workshops, seminars, and technical meetings in an effort to provide educational opportunities and promote technology transer within the industry.

To learn more about IOGA, visit our website at http://www.iogany.org

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