



There has been significant attention focused recently on developing natural gas from the Marcellus Shale formation in Pennsylvania, along with questions about the drilling process, especially in areas of the state unfamiliar with oil and natural gas exploration and production.

The oil and gas industry is not new, however, to the people in dozens of counties, primarily in the western part of the Commonwealth, that have produced oil and natural gas for decades – successfully and safely.



Pennsylvania has been a leader in the production of oil and natural gas, dating back to the world's first oil well, drilled by Col. Edwin Drake near Titusville, Venango County in 1859. This first well was called "The Pennsylvania Start-Up that Changed the World" by a Forbes Magazine columnist in 2009. The state's independent oil and gas industry has provided tens of thousands of good-paying jobs and contributed billions of dollars to local economies for decades, while producing an indigenous source of energy.

(Photo courtesy of the Drake Well Museum)

These operators and the companies that support them have provided good jobs to local workers and contributed to local and regional economies, and continue to do so today.

Oil and natural gas wells drilled by Pennsylvania's traditional industry are often called "conventional" wells, which are drilled vertically into conventional geological formations where oil and gas has been found for decades. Marcellus wells fall into the "unconventional" category, due to the more dense characteristics of the hard shale formation.

These segments of the industry have a number of similarities, along with a number of differences.

Similarities with Conventional/ Unconventional Drilling

The greatest shared trait of these oil and natural gas industries is that both produce indigenous energy that can be used here in Pennsylvania and other states. Both industries are also regulated by the state Department of Environmental Protection and other agencies as applicable.

Conventional oil and gas formations can be found in many areas of the state and have been proven by years of geological research to contain economical quantities of oil, natural gas or both minerals. These formations can be as shallow as 1,500 feet below ground or as deep as 21,000 feet. Like a Marcellus well, the first step in drilling a conventional well involves a lease between the developer and a property owner, including provisions for a "bonus" payment and royalty payments over the life of a producing well.

FAST FACTS

- A 2008 study found that Pennsylvania's conventional oil and natural gas industry supported more than 26,000 jobs and generated over \$7 billion to the state's economy, including significant investment in the state's rural areas.
- Direct payroll from the state's conventional industry is estimated to be more than \$1 billion each year, with an additional \$200 million in annual royalty payments to landowners.
- Conventional oil and gas producing geologic formations in Pennsylvania can be found between 1,500 and 21,000 feet below ground surface, and can produce marketable quantities of oil and natural gas for decades.

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A conventional well is drilled vertically using a drilling rig and other supporting equipment, following the same regulatory requirements as those that apply to a Marcellus well. The well must be "cased" using a series of steel pipes and a cement barrier to isolate the length of the wellbore – starting on the ground and continuing to the targeted formation – from all groundwater sources and non-targeted rock formations.

After drilling, conventional wells must be stimulated, like Marcellus wells, using water, sand and small amounts of dilute chemicals to force open the fractured rock and hold it that way to allow oil and natural gas to flow into the well. Wells are typically drilled and completed vertically with fewer well stimulation processes than are needed in a longer, horizontal wellbore.

As it enters the production phase, a conventional well pad is re-vegetated, with a small area used for a well head, water and/or oil tanks and necessary pipes to transport the oil and natural gas for use. Oil wells also require a small pumpjack to bring the oil to the surface. Underground gathering lines for natural gas connect wells to larger transmission lines, while oil produced by these wells is often conveyed by gathering lines to larger storage tanks, where it is later collected in trucks for processing at refineries.

Like Marcellus Shale wells, conventional oil and natural gas wells can remain productive for decades. Well tenders visit the wells regularly to ensure they are operating properly and maintained as needed. At the end of a well's production phase, the equipment is removed and the wellbore is filled with cement, as is the case with a Marcellus well.

Differences Between Conventional/Unconventional Drilling

Long before interest grew in developing the Marcellus Shale, there was a healthy oil and gas industry in Pennsylvania. The world's first commercial oil well was drilled near Titusville, Venango County, in 1859. An estimated 350,000 oil and gas wells have been drilled in Pennsylvania over the years, with



Pumpjacks like this can be found in many parts of western Pennsylvania, extracting oil from shallow geological formations. Some shallow wells produce both oil and natural gas; these wells often remain in production for decades.

about 70,000 currently in production; by contrast, an estimated 2,330 wells have been drilled in the Marcellus Shale formation since 2008.

Conventional oil and gas wells can be found in parks and on public land, along highways, even in residential neighborhoods. A 2008 study showed the industry supported more than 27,000 jobs and generated more than \$7 billion in annual economic activity – much of it in the state's rural areas, supporting local businesses with revenue, farmers with royalty income and workers with excellent wages.

An important distinction of the conventional industry focuses on the cost to develop those wells, their reduced production and the smaller return on investment they usually achieve, in comparison to Marcellus wells. This translates into reduced profitability from these wells, and the influence that oil and natural gas commodity prices and taxes have on their viability. If either the cost to drill these wells increases, or if the cost of oil and gas decreases, to certain levels, conventional wells become less viable.

A well pad cleared for a conventional oil or natural gas well is smaller than that of a deep well and requires a smaller drilling rig to drill vertically and reach the targeted formation. It typically takes less than two weeks to drill these wells, with a few additional days required to stimulate and complete the well. Since the number of fractures into the rock are fewer than those of a horizontal well, the scope of the well stimulation operation is not as significant and does not require as much equipment or water.

Conventional wells in Pennsylvania are also not limited to just producing natural gas. These vertical wells can produce oil, natural gas and both forms of energy. There are many uses for “Pennsylvania Grade” crude oil due to its high quality, including refining into gasoline, motor oil, lubricants and white oil. It is also further processed and used in cosmetics and topical ointments.

The state's traditional oil and natural gas industry has been a vital part of many communities across the Commonwealth. Pennsylvania's traditional oil and gas producers generate enough natural gas to meet 25 percent of the state's needs and 3.6 million barrels of Pennsylvania crude oil used by area refineries. Both will continue to be produced safely by this segment of the industry well into the future.