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## MARCELLUS DRILLING ... FAR MORE EFFICIENT

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In 2010 it took more than a month to drill a typical Marcellus Shale natural gas well. Recently, it took only 16 days to finish drilling the well's full length, more than 2½ miles.

"Since I came up here three years ago, it's 200 percent better," said David Dewberry, who manages this Lycoming County site in Loyalsock State Forest for Seneca Resources.

"We've become so much more efficient," Dewberry said.

Marcellus Shale exploration companies are drilling bigger wells in less time at less cost, and they are producing more natural gas than ever in Pennsylvania.

Despite a reduction in the number of drill rigs operating in Pennsylvania in the last two years because of the low price of natural gas, each rig is accomplishing much more. The Marcellus, which includes wells in West Virginia, now produces nearly a fifth of the nation's natural gas.

In the industry, productivity has become the watch-word. Gas producers vying for investor money tout their skills to more efficiently deploy capital than the competition.

Many of the improvements in recent years are attributed to the experience producers have acquired in the Marcellus formation.

The new fossil-fuel boom relies upon advances in horizontal drilling and hydraulic fracturing, the technique that involves pumping a mixture of water, sand, and chemicals under high pressure into source rock to crack it open to release oil and gas.

Despite ongoing controversy over fracking - activists want a drilling moratorium in Pennsylvania because they say it may cause groundwater pollution and other problems - the industry is investing here as though it will be impeded only by market conditions. And it is doing its best to make the business economical.

Seneca Resources, based in Pittsburgh, has been drilling gas wells in Pennsylvania for a century. It's owned by the National Fuel Gas Co. of Buffalo, whose utility has 733,000 retail gas customers in western New York and Northwestern Pennsylvania.

Seneca has mineral rights for 780,000 acres in the Marcellus, but its most productive wells are in Loyalsock State Forest that it leased for \$28.5 million in 2008 from the Department of Conservation and Natural

Resources. It has drilled 40 of 70 wells planned on the land, known as Tract 100.

The advent of "pad-drilling" - multiple wells from a single location - accounts for a lot of the saving. It means the 142-foot-high rigs do not have to be broken down and moved so often. A rig typically costs \$50,000 a day to lease.

Three-dimensional seismic imagery has also improved the accuracy of drilling - more of the well penetrates the shale, not unproductive rock. Switching from diesel to natural gas to power the rig reduces daily fuel costs from \$6,550 to \$585, said Robert Boulware, a Seneca spokesman.

Seneca expects rigs to drill 1,200 feet per day in Tract 100 in 2013, nearly twice as fast as in 2012.

After all of the wells are drilled, they will be hydraulically fractured in sequence. Seneca and other producers have installed networks of pipes to carry fresh water for hydraulic fracturing, eliminating thousands of truck deliveries for a process that can require millions of gallons per well.

Seneca says improvements in the last year alone saved about \$525,000 per well in Tract 100. Its break-even point for these wells is \$2.20 per 1,000 cubic feet of natural gas. The market price is nearly \$4, so these are very profitable wells.

A single pad with top-performing wells might produce as much gas as Seneca's 3,000 existing shallow wells in Pennsylvania, Boulware said. The Marcellus represents a quantum leap for the company.

(by Andrew Maykuth - Philadelphia Inquirer - 12/15/13)



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