

Quality of Marcellus Shale Varies

Location and depth important says local geologist

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People think of Marcellus Shale as a uniform layer. “That’s a misconception”, petroleum geologist Don Zaengle told members of the Tioga County Landowners Group last week. The gas-producing quality of the formation varies, depending on where it is located and how deep the shale is.

Zaengle also cleared up another misconception Thursday night: that because the NY Department of Environmental Conservation (DEC) hasn’t finalized their Supplemental Generic Environmental Impact Statement (SGEIS) for horizontal drilling/ hydraulic fracturing in black shales, no one is drilling gas wells.

More than Marcellus

Marcellus isn’t the only game in town, Zaengle said, adding that last year DEC issued more than 550 permits. Companies are drilling into Oriskany, Trenton Black River and other gas-bearing strata under existing regulations that permit vertical wells. In 2009, NY wells produced about 45 billion cubic feet (bcf) of natural gas – enough to heat 650,000 homes, Zaengle said.

“The number one producer last year was the Nowlan 1 well in Erin,” Zaengle said. That well produced close to 2.5 bcf natural gas. “So there’s significant activity going on in the state despite what you hear about a moratorium.”

There’s much more drilling activity in PA because Marcellus is where many of the companies want to invest their drilling energy. “Unfortunately, Cabot has done a lot to create bad publicity for Marcellus exploration,” Zaengle said. “Their operation in Dimock is not a clean, good quality production scenario.” Zaengle, who spent 20 years with Shell Oil Company, criticized what he sees as haphazard drilling by Cabot. He hopes the company will go to more “environmentally friendly” drilling, placing six wells on a single pad instead of the current scattering of vertical and horizontal wells across the landscape.

Still, geologists have learned much from Cabot’s production figures. Wells in the 7-square mile Dimock gas field are producing 100 million cubic feet (mmcf) each day, Zaengle said. “At \$4.75 per thousand cubic feet (mcf), that gas is bringing in \$475,000 each day – \$173 million per year.”

The length of lateral well bores has increased as well, Zaengle said. Most horizontal wells in PA are being drilled with 5,000-foot laterals and, in southwest PA, Range Resources has been drilling 7,000-foot laterals. They do 18 stages of frack, Zaengle pointed out. Ironically, as companies pursue gas trapped in the tight Marcellus shale, one of the most productive wells drilled in PA is in the Purcell limestone.

Gauging Shale Quality

One of the things geologists are discovering is that Marcellus shale has many layers in its formation. “Most of the gas produced in PA is coming from the ‘lower’ Marcellus at this time,” Zaengle pointed out. He shared some of the data from drilling logs: gamma radiation increases in the lower Marcellus; the rock has a lower density, and total organic carbon spikes in the lower layers.

There are eight things a gas company looks for in a formation, Zaengle said. One is the total organic carbon (TOC), measured as a percent by weight. Anything over 2 percent is good – the Marcellus in Tioga County averages between 4 - 6.6 percent TOC.

The companies look at thermal maturation, or how much heat the rock experienced. Thermal maturation determines the type of hydrocarbon trapped in the rock; anything over 4 percent is “cooked out”.

Companies want to know about regional faulting, as this has great implication for fracking. They also want to know how much gas is “in place” – trapped in the stone – and how porous and permeable the rocks are, as those traits influence how well gas flows into the well.

Drillers need to know what minerals constitute the rock in their particular location. “High silica-to-clay ratios fracture better because they are more brittle,” Zaengle said. “In rock with higher clay content, the clay absorbs the energy of the frack and makes it harder to fracture the shale.”

Depth is important as well. Deeper is usually better because there is more pressure on the shale, and subsequently more gas has been trapped into the pores. But thickness is important too, and in Tioga County the shale ranges from 50 feet thick in the northernmost part to 150 feet thick in the southernmost part.

Zaengle emphasized that thickness can change dramatically over a short distance. Drilling logs from the Cotton Hanlon 1 well in Spencer show a Marcellus layer measuring 90 feet thick. Just five miles away, the Winter G1 well log shows a layer of Marcellus measuring close to 150 feet thick. Another 10 miles or so south, in the Olin well, the Marcellus layer measured 27 feet thick. This variability accounts for the diversity of leasing offers seen in different areas.

Tioga County Landowners Group, which hosted the educational seminar, provides a lot of information about geology and drilling on their website, www.tiogagaslease.org. Their next seminar will be August 18. The topic: Radiation and Radioactive Materials associated with the well drilling process.