

NATURAL GAS: Barnett Shale has surprisingly more to give, Texas researchers find *(Wednesday, September 25, 2013)*

Peter Behr, E&E reporter

A University of Texas computer model of the Barnett Shale natural gas play concludes that the "sweet spots" in the 4,172-square-mile formation underneath Fort Worth are even sweeter and potentially more prolific than earlier studies assumed.

Researchers at the Bureau of Economic Geology at the university's Austin campus published an initial report this year projecting that the Barnett Shale is likely to deliver about 45 trillion cubic feet of pipeline-ready "dry" natural gas through 2050. That figure nearly doubled Energy Information Administration estimates.

A follow-up report by bureau researchers digs deeper into areas of the Barnett formation with the greatest potential. Gas production in the most productive parts of the play is higher than expected, researchers conclude, a finding that scrambles assumptions that the Barnett -- the oldest of the unconventional plays -- has lost its geological luster as drillers exploit other fields around the country.

"It's happening because the rock is draining better than we thought," said Scott Tinker, director of the Bureau of Economic Geology. "That means there are more locations to drill in the top tiers."

From Tinker's vantage point, "There is still quite a bit of drilling that can go on economically for 15 to 20 years."

The report, newly published in ScienceDirect, a search engine of scientific reports, and summarized this month in the *Oil and Gas Journal*, provides detailed estimates of the expected production from 10 "tiers" of hydrocarbon-bearing shale rocks. The analysis includes how production from each tier could change depending on the price of gas and amount of drilling and the presence of "wet" gas liquids.

The study is the first to be based on production data from more than 16,000 wells drilled in the Barnett through July 2011. That allowed the team to subdivide the Barnett into zones, based on output from existing wells through July 2011.

"Even those with varying opinions agree this is the most complete public look anyone has done," Tinker said.

Shale gas wells are characterized by very high rates of initial production, followed by declines that

are just as steep. That unique profile poses a question of whether shale gas output will keep up if demand for natural gas should accelerate later in the decade, as some experts predict. The productivity of the Barnett wells described by the University of Texas researchers bears on that issue.

Will gas demand take off?

New York-based consulting firm PIRA Energy Group has also predicted a surprisingly strong jump in demand for natural gas in the United States with a significant impact on gas prices. Even if demand from electric power utilities converting their fleets from coal to gas is more limited than expected, PIRA analysts say gas demand will expand by as much as 20 billion cubic feet a day by 2020.

The growth in gas demand comes from five sectors: industry, power generation, transportation, liquefied natural gas exports and shipments to Mexico. Increases in LNG exports and gas consumption in U.S. petrochemical manufacturing should feed a "super cycle" of demand for gas, PIRA said, with yearly growth of about 4 billion cubic feet a day later in this decade.

"Such an unprecedented demand growth cycle raises compelling questions about the ability of lower-48 production's ability to supply such growth without market-disruptive gas price increases," said Greg Shuttlesworth, executive director of PIRA's North American Gas Group and an author of the PIRA study.

By contrast, EIA's "base case" long-range forecast projects an increase of 15 billion cubic feet a day in gas demand by 2025.

Unbound demand

Where domestic gas supply intersects with the industry's drive to export what it can in the form of LNG is scrambling projections about the effect of future demand for the fuel. Can the U.S. supply enough gas to meet all the demand without causing prices to hit the roof?

An update on the outlook for new U.S. exports of LNG by ClearView Energy Partners forecasts 14.4 billion cubic feet a day of additional cumulative gas demand by the third quarter of 2018, if all 10 planned and proposed LNG export terminals satisfy permitting requirements and are commercially competitive. Of this amount, 10 billion cubic feet a day would come online in 2017, ClearView's assessment concludes.

Still, EIA's 2013 annual outlook cautions that trying to predict the future of LNG this early in the development of a global market is a fool's errand. There are too many factors to gauge, its analysts say, including how fast foreign suppliers build LNG export terminals and the pace of Arctic gas development.

Another ClearView analysis estimates that U.S. EPA's rules on emissions of mercury and other

toxics should result in the retirement of 42 gigawatts of coal-fired generation, out of about 317 GW of U.S. capacity in 2011. Possible regulations on coal plant carbon emissions could force the shutdown of an additional 55 GW of coal boilers by 2020, ClearView analysts predict. The carbon rules could add as much as 6 billion cubic feet a day of gas demand.

But it added that such forecasts are clouded by uncertainty over how much renewable power will grow to take coal's place and by the political response to EPA's emerging agenda.

Benchmarking the Barnett

Back at the University of Texas, where the Barnett remains among the biggest producing onshore gas fields in the country, researchers divided the Barnett into dry and wet sectors. The former supplies ordinary pipeline gas for electric power plants and local gas distributors.

On the other side of their ledgers, the researchers looked at areas in the Barnett producing gas with high heat values based on large amounts of ethane, propane and other gas liquids. Those hydrocarbons are bought by chemical companies to create the building blocks for plastics and other manufactured goods.

The demarcation line separating dry and wet zones runs north to south through the western sides of Tarrant and Johnson counties.

The project worked out break-even points and commercial viability for production in each of the 10 tiers using price assumptions, estimates for drilling and processing costs.

Among the key assumptions are a cost of \$3.5 million for a 4,000-foot horizontal well. The model includes separate estimates for water disposal and treatment costs, for example, separating these from general expenses.

For the top five tiers, the most important for producers, about half the estimated ultimate recovery is produced in the first five years and about three-quarters in the first decade. The break-even costs on that vary sharply.

A top-tier dry gas well would require a gas price of \$2.91 per million British thermal units to generate a 10 percent rate of return. A wet gas well in the same category would have a break-even price of just 55 cents per MMBtu because of the assumed added value of gas liquids.

The break-even point rises steeply for the poorer-quality tiers, to \$7.34 for a midtier dry gas and \$4.79 for the high-Btu wet gas wells. A dry well in the poorest category would need a price of \$9 or more to warrant development.

"Our results indicate that an average dry gas well in the top two tiers can be viable at about \$4 per 1 million Btu, but average high-Btu wells in these tiers are economic at \$2," the authors said.

Tinker said researchers are completing similar studies on the Fayetteville, Haynesville and

Marcellus shale plays.

In the Barnett, the researchers calculated a 10 percent chance that at least 55 trillion cubic feet will be produced. There's a 90 percent chance that production will be at least 35 trillion cubic feet.

Tinker said analysts have drawn conclusions about the prospects of shale gas wells based on estimates of average production.

"What we've found is that the average doesn't describe the field very well," he said.

It is important to look at the differences within fields that can be pulled out of drilling data, he said.

"Many of these fields are still being drilled."

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