

## Feature Stories

**Innovative Methodology Underpins Look at Fayetteville Shale Potential**

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A recent study employed an unconventional methodology to find that the Fayetteville Shale natural gas play in Arkansas and Oklahoma holds about 38 trillion cubic feet of technically recoverable gas resources, although less than half of that is economically recoverable at current gas prices.

Researchers at the **Bureau of Economic Geology** (BEG) at the University of Texas at Austin determined the estimated resources of the Fayetteville using a complex methodology that study author and BEG Director Scott Tinker describes as a “bottom-up” approach.

“We said that production varies across these basins a lot, so we divided it into productivity tiers, and you can see a range of production across the basin,” Tinker told Natural Gas Week. “And because you have that range, we then asked, ‘How much of the acreage is left? How many wells would it take to drill up this acreage?’ ... We literally looked at the drainage of every single well on the field and determined what’s left to drill.”

This contrasts with the more traditional “top-down” approach taken by most other resource assessments that rely on broad averages, according to Tinker, and results in more accurate and useful estimates.

The BEG researchers identified and mapped six distinct “production-quality” tiers within the Fayetteville Shale based on the economic feasibility of tapping the estimated gas-in-place, which they then used to predict future drilling locations.

Tinker said the tiers were determined by several factors and assumptions, including the estimated well and development costs, what kind of technology might be available in the future that could make production more efficient and affordable, how much resource lies in each tier and at what price do those resources become economic to develop?

The study concluded that at prices around \$4 per thousand cubic feet, the six tiers hold roughly 18 Tcf of economically recoverable natural gas through 2050, most of which lies in the top two quality tiers.

“The higher productivity tiers are, not surprisingly, more developed,” said Svetlana Ikonnikova, an energy economist at the BEG and co-principal investigator of the study. “The lower tiers remain uneconomic at almost any foreseeable gas price.”

BEG says its model can be adjusted for gas prices higher than \$4 per thousand cubic feet as well as other factors, but maintains that the Fayetteville production outlook “is only moderately sensitive” to natural gas prices.

“Just as you find in conventional oil and gas basins, some locations within the Fayetteville are indeed uneconomic,” says Tinker, “but other locations are highly profitable.”

Tinker also stressed that pure economics shouldn’t be the only indicator of resource potential.

“[Sometimes] you see wells that get drilled even in today’s pricing environment in all the tiers, so people are still pushing the edges a little bit. They may be holding acreage, they may be spending money for a variety of reasons depending on the corporate situation,” Tinker said.

“So we actually look at history ... there is always natural gas that gets produced that is marginal, and that has to be part of that future portfolio as well.”

The study estimates that gas production in the Fayetteville will likely maintain its current peak of about 2.6 billion cubic feet per day through 2015, after which it will gradually decline to about 1.1 Bcf/d by 2030 as the best areas in the play are tapped and drilling becomes increasingly deeper and expensive.

Tinker said that US gas heavyweight Southwestern Energy – which discovered the Fayetteville Shale about eight years ago and is the largest producer in the play with about 1.3 Bcf/d expected in 2014 – was “quite supportive” of BEG’s methodology and results (NGW Oct.21’13).

The study is part of a four-part study of unconventional oil and gas resources basins in the US and uses the same methodology as BEG’s investigation into the potential of the giant Barnett Shale natural gas play in North Texas (NGW Mar.4’13).

The next leg of the study examining the Haynesville Shale in Arkansas, Louisiana and Texas should be published in early summer, according to Tinker, followed by an assessments of the prolific Marcellus Shale natural gas play in the US Northeast in late summer and the Bakken and Eagle Ford Shale tight oil plays in 2015.

Chris Raine, New York

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