

SHALE RESEARCH

UT BEG COMPLETES STUDY OF ARKANSAS FAYETTEVILLE SHALE

A new study from the **Bureau of Economic Geology (BEG)** at *The University of Texas at Austin* forecasts that one of the nation's most productive shale gas basins, the Fayetteville Shale, will continue to be a major contributor to U.S. natural gas supplies for years to come, with economically recoverable reserves of **18 trillion cubic feet (TCF)** through **2050**, as described in a summary report in this week's edition of the *Oil & Gas Journal*.

The assessment of the Fayetteville Shale, part of a four-basin study of shale gas reserves funded by the **Alfred P. Sloan Foundation**, follows the same methodology as the BEG's 2013 assessment of natural gas production in the Barnett Shale, the nation's most commercially developed unconventional gas play. Both studies integrate engineering, geology and economics and are designed to be among the most rigorous assessments to date of production in U.S. shale gas basins.

Drawing on production data from all of the individual wells drilled in the Fayetteville Shale from **2005 to 2011**, the new assessment estimates technically recoverable gas reserves for the region at **38 TCF, of which 18 TCF will be economically feasible to recover at natural gas prices near \$4 per thousand cubic feet**. (For perspective, current U.S. natural gas prices are below \$4 per mcf, and according to the U.S. Energy Information Administration, the United States consumed about 25 tcf of natural gas in 2012.)

The BEG plans to complete assessments this year of two other major U.S. shale gas basins, the Haynesville (in Arkansas, Louisiana and Texas) and Marcellus (in the Appalachian region), followed by a study of U.S. shale oil reserves, all funded by the Sloan Foundation, which makes grants to support original research and broad-based education related to science, technology and economic performance. Most other assessments of shale gas reserves have taken a "top down" view of production, relying on aggregate views of average production. In contrast, this study takes a "bottom up" approach, starting with the production history of every well and then determining what areas remain to be drilled, says **Scott Tinker, the BEG's director and co-principal investigator**. The result yields a more accurate and comprehensive view of the basin.

Integral to the project is a new method of estimating ultimate production for each well based on the physics of the system rather than the traditional application of a mathematical decline curve. The authors believe this innovation offers a more accurate means of forecasting production declines in shale wells in the Barnett, Fayetteville and other basins.

The BEG team further enhanced the view of the Fayetteville Shale by identifying and mapping six production-quality tiers in the basin and using those tiers to forecast future production. The economic feasibility of production varies tremendously across the basin depending upon production quality tier.

Using the tiers, the researchers created and mapped an inventory of future feasible drilling locations based on economics and estimated gas-in-place. In the pricing scenario of \$4/mcf natural gas, production from the Fayetteville Shale reaches a plateau during the period of 2012-2015 and begins a gradual decline as the annual well count decreases.

The BEG model can adjust for higher gas prices (and several other parameters such as pace of technological innovation), but according to the authors, the production outlook for the Fayetteville is “only moderately sensitive to natural gas price.”

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

Even within the tiers, however, distinct areas of the Fayetteville Shale show great diversity in productivity, with high- and low-performing wells sometimes existing side-by-side within the same production blocks. With recent increases in U.S. natural gas production and the ensuing fluctuations in price, some analysts have attempted to label entire shale basins as “economic” or “uneconomic.” Tinker cautions against such labels.

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

The Fayetteville study, in addition to forecasting long-term production, may help delineate areas where future drilling is likely to occur and under what economic conditions.

The Fayetteville Shale formation holds natural gas in a fine-grained matrix, and hydraulic fracturing is required to release the gas, according to the *University of Arkansas*. The average well in the shale formation has been estimated to hold 1.3 billion cubic feet of gas, the ***U.S. Energy Information Administration (EIA)*** said in its ***Annual Energy Outlook 2012*** according to a review of the study by *Rigzone*, January 13, 2014.

The University of Texas at Austin is committed to transparency and disclosure of all potential conflicts of interest of its researchers. Co-principal investigator Scott Tinker has received research funding from various government and private sector sources, including the Department of Energy and Shell, and has also received compensation for speaking engagements and serving on boards and councils affiliated with various energy companies. A complete record of his external engagement can be found at http://www.beg.utexas.edu/Tinker/tinker_boards.php. Team members **Eric Potter** and **John Browning** hold stock in oil and gas companies. The university is not aware of potential conflicts of interest for any of the other team members.