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Abstract

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Examination of Potential Factors Affecting Successful Exploration and Production of Devonian Marcellus Shale Gas, Eastern United States

The Devonian Marcellus Shale is one of several, very high profile shale gas plays in the United States and is the most significant new play in the Appalachian Basin in several decades. The following key factors will probably determine whether or not this play will develop into a natural gas resource that meets national expectations:

(1) The volume of economically extractable resources. Assessments of the amount of undiscovered, technically-recoverable gas vary and depend on the effectiveness of horizontal drilling and multi-stage hydraulic fracture stimulation. Estimates of undiscovered, technically recoverable natural gas range from 0.8 to 3.7 trillion cubic feet by the U. S. Geological Survey (USGS) in 2002 to more than 100 times these amounts by industry consultants in 2008.

(2) The availability of sufficient fresh water for drilling, stimulation, and completion of the wells. Current shale gas well designs call for use of three to nine million of gallons of fresh water per well to attempt a successful completion. Given the number of forecasted wells necessary to extract the resource, there is concern that there will not be enough fresh water available for the work.

(3) The capacity for effective disposal or reclamation of post-completion drilling and completion fluids and

solids. All of the material pumped into the reservoir that is recovered back to the surface must be disposed or recycled. Currently, there is inadequate capacity to handle this flow-back material properly at the scale planned for full development.

(4) The potential for significant wildlife habitat fragmentation caused by drill pad density and gathering, compression, and pipeline facilities. In areas of large, contiguous habitat, the activities associated with well-site construction, maintenance, and production activities may produce unintended consequences with respect to forest health and invasive species.

With collaborators, the USGS is studying the relative importance of these factors and the role that they may play in the evolution of the Marcellus Shale gas play so that we can meet our mission obligation to improve the nation's understanding of ecosystems and resources. Proper and prudent planning with foresight to managing the entire natural resource base will be necessary if the Marcellus shale gas play will reach its stated potential. The first steps in this planning effort involve examining and understanding the baseline conditions of these four factors.

James L. Coleman Jr.



Jim Coleman is the Director of the Eastern Energy Resources Science Center, U. S. Geological Survey (USGS), which conducts research and resource assessments on fossil fuel resources and examines the effects of their presence and use on human health and the environment. At the USGS, he has continued his research on unconventional gas systems and oil and gas resource assessments in the Appalachian, Gulf of Mexico, and Arkoma-Ouachita Basins. Before joining the USGS in 2003, Jim worked for 25 years with Amoco and BP on a variety of international and domestic oil and gas exploration and production and produced water management projects.

Jim has published articles on unconventional gas reservoirs, oil and gas resource assessments, basin and petroleum system evolution, deep water sandstone deposition and reservoir development, thrust-

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and fold-belt structural geology and petroleum accumulations, and carbonate sedimentology. His work comparing the American Petroleum Industry with the American Whale Oil Industry was recognized with the best presentation award for his talk at the Energy Minerals Division session at the 1994 Denver AAPG annual meeting. He received an M.S. in geology from Mississippi State University in 1978. He lives in Sterling, Virginia, with his wife Jane.

Recent publications relevant to lectures:

Coleman Jr., J. L., 2008, Tight-gas sandstone reservoirs: 25 years of searching for “the answer”, in S. P. Cumella, K.W. Shanley, and W. K.Camp, eds., Understanding, exploring, and developing tight-gas sands— 2005 Vail Hedberg Conference: AAPG Hedberg Series, no. 3, p. 221– 250.

Coleman, James, 2009, Tight-gas sandstone reservoirs: the 200-year path from unconventional to conventional gas resource and beyond, in T. Carr, T. D’Agostino, W. Ambrose, J. Pashin, and N. C. Rosen, eds., Unconventional energy resources: making the unconventional conventional – 29th Annual GCSSEPM Foundation Bob F. Perkins Research Conference, December 6-8, 2009, Houston, TX, Proceedings CD, p. 397 – 441.

Coleman, J. L. and C. S. Swezey, Examination of Potential Factors Affecting Successful Exploration and Production of Devonian Marcellus Shale Gas, Eastern United States (abstract): 2009 AAPG Annual Convention and Exhibition, Denver, Colorado, June 7-10, 2009, AAPG Search and Discovery Article #90090
<http://www.searchanddiscovery.net/abstracts/html/2009/annual/abstracts/coleman.htm>