

Pennsylvania State Senate Majority Policy Committee

Honorable Jake Corman, Chairman

The state of the Marcellus shale gas play in Pennsylvania up through late 2008

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Wall Street predicted that 2008 would be a breakout year for the Marcellus shale gas play in the Appalachian Basin. In Pennsylvania, this proved to be the case based on the facts that lease rates jumped to over \$2500/acres during the late spring and that there were 480 permit applications for drilling in the Marcellus through November 1, 2008. By late in the year gas from Range Resources wells was flowing through a separator plant built by Mark West to serve gas production in Washington County. Finally, the major's major, Exxon-Mobil entered the Marcellus play by submitting the high bid on six of eighteen State Forest land tracts opened for bidding during the late summer in Tioga and Lycoming County.

The 2008 sweet spot in the Marcellus play was the southwestern part of the state where Range Resources announced initial flow rates averaging 4.1 mmcf/d (million cubic feet a day) for nearly a dozen horizontal wells in Washington County. Atlas was equally successful with their vertical drilling program in the vicinity of the Fayette-Green County boarder. From information available in private meetings, I understand that tests of the Marcellus in Centre, Lycoming and Susquehanna Counties are favorable suggesting that the Marcellus may be productive along a fairway in the state extending from Green County in the far southwest to Susquehanna County in the northeast. Chesapeake, the country's largest gas producer, places the core of the Marcellus under 31,000,000 acres. At a 2008 investor and analyst meeting Chesapeake announced that the Marcellus in the core area as between 30 and 150 billion cubic feet (Bcf) of natural gas in place per section (square mile). The company feels that a 30% recovery rate is reasonable but it should be noted that this rate is three times the rate used in the Penn State calculation of January 2008. If one assumes that the average gas-in-place per section is 75 Bcf but that only one-third of the sections are accessible, then a 30% recovery rate yields 363 Tcf of commercial gas. This number is much larger than that presented by PSU in January because of the very conservative assumptions used in the January calculation.

The success of the Marcellus play depends on water management. The gas shale is so impermeable that larger fractures are required to allow for easier flow of gas toward the well bore. Large volumes of water under immense pressure serve to fracture the shale.

Surface water is plentiful in the state provided that water withdrawal does not occur during extremely low flow periods. Water is treated with minor amounts of several chemicals to allow for easier fracture without damage to the rock. All water flowed back following fracturing operations is transported to permitted wastewater treatment facilities for safe disposal. The operators are collaborating with water treatment companies to assure that the quality of Pennsylvania water is maintained. In this regard, there are three parties involved in water quality and use issues: the operators, the Department of Environmental Protection, and the river basin commissions including the Susquehanna and Delaware. During 2008, these three parties have learned a great deal about interacting for the benefit of people of the state of Pennsylvania and its environment. However, there is still room for further streamlining the permit and regulation system built around a time invariant set of rules. Streamlining also involves building an adequate regulation staff for the purpose of effective inspection presence.

The success of the Marcellus shale gas play also depends on building infrastructure including gathering systems, gas treatment plants, high pressure pipe lines, and compressor stations. Pennsylvania presents other challenges for the operators including difficult topography and vast tracts of undeveloped forest land held both publicly and privately. Finally, the lack of transparency (production records remain proprietary for five years) will also slow development. Repeated, unnecessary mistakes will be made because each operator must move up the same learning curve without the benefit of the specific knowledge that production records might bring. Here, the shallow operators might be protected by subjecting deep production including that from the Marcellus to more immediate disclosure.