Marcellus Shale Energy and Environment Laboratory: Initial Results and Plans

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ABSTRACT

The Marcellus Shale Energy and Environment Laboratory (MSEEL) consists of a multidisciplinary and multi-institutional team undertaking integrated geoscience, engineering and social science research in cooperation in cooperation with the operator, Northeast Natural Energy, numerous industrial partners and the National Energy Technology Laboratory of the US Department of Energy. MSEEL consists of two legacy horizontal production wells, two new instrumented horizontal production wells, a vertical pilot bore-hole, a microseismic observation well and surface geophysical and environmental monitoring stations. Production from the new horizontal well began in December 2015. The goal is to develop and validate new knowledge and technology that can improve recovery efficiency and minimize environmental impacts of unconventional resource development. The MSEEL approach is data driven with a platform to store, manage, publish and share very large and diverse (multiple terabyte) datasets among researchers. MSEEL integrates drilling and fracture stimulation operations, geophysical observations, fiber-optic monitoring of high-resolution temporal and spatial flow of injected and produced fluids, and produced gases, mechanical properties logs, microseismic and core data to better to characterize subsurface rock properties, faults and fracture systems. Models at multiple scales are being developed to identify best practices for field implementation, and assess potential methods that could enhance shale gas recovery through experimental and numerical studies integrated with the detailed results of the production wells at the MSEEL site.

We provide several examples that illustrate technologies and approaches that are being developed to store, query, and display and analyze large and diverse data sources and new data types derived from surface and subsurface to design innovative stage spacing and cluster density practices that can be used to optimize recovery efficiency.