

## Public Executive Summary

**Title:** Gas Production Forecasting From Tight Gas Reservoirs: Integrating Natural Fracture Networks and Hydraulic Fractures

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The Uinta Basin in eastern Utah is a significant producer of “unconventional” gas in the United States. Tight gas reservoirs in the Basin, spread across several prolific formations span thousands of vertical feet and may contain as much as 14 TCF of natural gas. Because the very low permeability of the matrix rock, understanding the geometry and properties of natural fractures is critical to the development of effective ways of finding and producing the gas. It is also important to create hydraulic fractures to take maximum advantage of the existing natural fractures. The multiphase flow of gas and water toward the production wells depends on the interplay between the characteristics of fractures (natural/hydraulic), and prevailing relative permeabilities, and capillary pressures in the reservoir. The following objectives have been set forth to address these significant tight gas production issues.

1. Existing and new geologic data will be used to create fracture network maps.
2. Propagation of hydraulic fractures given the natural fracture system and the existing stress condition in the system will be examined.
3. Gas production from these systems will be studied by combining the natural and hydraulic fractures into multiphase discrete fracture network reservoir models.

Even though the initial focus of the project team will be the Mesaverde formation, deeper Dakota, and other formations will also be studied. Outcrop, log and other data will be used to create static fracture models, which will be evolved into dynamic models by considering well tests. State of the art geomechanical tools will be used to obtain hydraulic fracture geometries, given the fracture/stress state of the reservoir. These geometries will be represented explicitly in the University of Utah discrete-fracture network reservoir simulators to obtain realistic assessments of gas production from tight gas reservoirs.

The project team will develop a protocol for creating field-wide natural fracture networks, given static and dynamic reservoir information. Tools will be developed to determine more realistic hydraulic fracture geometries in vertical and horizontal wells. This will provide better understanding of designing hydraulic fractures to intersect existing natural fractures. Reservoir simulation of these realistic features will help optimize drainage and minimize costs.

The team to accomplish these tasks includes reservoir simulation and hydraulic fracturing experts at the University of Utah, fracture specialists at Utah State University, Uinta Basin specialist geologists at Utah Geological Survey, FRACMAN (fracture generation software) creators Golder and Associates and UDEC (Universal Distinct Element Code, hydraulic fracture creation software) developers ITASCA. Gas producers in the Basin, Anadarko and Windriver Energy will participate in the project.