Innovative Methodology for Detection of Fracture-Controlled Sweet Spots in the Northern Appalachian Basin

DE-AC26-00NT40698

Goal

The aims of the project are to evaluate a number of exploration tools currently used in the petroleum industry to locate fracture-controlled gas accumulations in New York State. Tools of interest were aeromagnetic surveys, soil gas sampling surveys, surface fracture mapping, lineament recognition, well logs, and seismic to verify drilling targets. The Finger Lakes region of New York became the target area for more detailed mapping and sampling surveys based on the aeromagnetic trends and the linear features of producing horizons in the Trenton to Black River formations. Evaluation of the E&P tools completed Phase 1 of the project.

Phase 2 goals were to locate a prime target based on aeromagnetic features, geologic fracture mapping, and soil gas surveys and to run seismic to define a drilling target. A well completed in the reservoir would be the ultimate test of the integrated technologies in defining optimum gas reservoirs in the Appalachian Basin.

Performers

State University of New York at Buffalo (SUNY-Buffalo)
Amherst, NY

Nornew, Inc.
Amherst, NY

Fortuna Energy, Inc.
Horseheads, NY

McGill Seismic Research Group
McGill University
Montreal, QC, CANADA

Pearson, deRidder and Johnson, Inc.
Lakewood, CO

Results

Phase 1 has been completed. Accomplishments include the following:

• Regional aeromagnetic surveys were obtained and interpreted relative to basement lithology and structure to identify large linear features.

• Fracture mapping and soil gas surveys defined fracture orientations that influence the distribution of gas in the deep reservoirs over basement faulting.

• Several targets were identified and accepted as well locations in the study area. After several starts with a number of operators, the subcontractor obtained access to a horizontal well with a company that would allow a core and well logs to be run as part of its development drilling operation.

Benefits

Results of this project should lead to an increased understanding of regional- and field-scale dolomitized reservoirs in the Appalachian Basin and may be exportable to other domestic oil and gas producing basins. Results will likely lead to new, reduced-risk exploration and step-out development play concepts as well as a better and more complete understanding of the local subsurface distribution of reservoirs to guide enhanced production efforts close to a high-demand customer base.

Background

The Appalachian Basin is a mature hydrocarbon basin that has been recognized by the petroleum industry as a substantial gas producer from shallow (<5,000 ft) reservoirs.

Current activity in the basin is mostly concentrated on development of unconventional gas and deeper reservoir exploration. For example, the US Geological Survey estimates 1.7 trillion cubic feet of gas potential just in the Devonian shale formations. Current production rates in the Trenton and Black River formations are greater than any previous production and volumetrically above USGS estimates for the basin. Several DOE NETL research projects are providing characterization information on these significant dolomite reservoirs for future development.

Summary

Phase 2 of the project consists of drilling a horizontal well to retrieve core samples in the fractured dolomite play as part of the SUNY-Buffalo contract.

The well was drilled to over 9,700 feet MD to a core point at which time the coring equipment was deployed and two successive runs were made into the Black River dolomite just below the Trenton Formation contact. Core was obtained from both core runs and was sent to Core Laboratories for reservoir characterization analysis. A portion of the core will be returned to SUNY Buffalo for more detailed evaluation of fluid inclusions and integration of the core data.

A well logging suite was run to verify fracturing over the entire length of the horizontal section upon completion of the drilling. The operation was a success. SUNY-Buffalo, Nornew, and Fortuna Energy participated in the well demonstration project as part of Phase 2 to verify a fractured reservoir in the northern part of the Appalachian Basin.

Current Status (January 2007)

The contract final report is currently being written to synopsize the project results.

Funding

The contract was funded through a FY2000 request for proposals and selected as part of the Advanced Diagnostic and Imaging technology area to develop a better understanding and application of integrated exploration and production tools in the Appalachian Basin. Several aspects of this project were cofunded or coordinated with the New York State Energy Research and Development Authority.

Project Start: May 31, 2000
Project End: March 31, 2007

Anticipated DOE Contribution: $911,505
Performer Contribution: $775,810 (46 percent of total)

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