Depth Imaging of the Drake Structure in the Ultra-Deep Shelf Play of the Gulf of Mexico

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ABSTRACT

The offshore Gulf of Mexico ultra-deep shelf play has recently generated exploration interest due to numerous large undrilled structures, potential for huge gas reserves, and close proximity to existing infrastructure. The Miocene and Paleogene reservoir targets are updip and downdip of productive equivalents and often beneath shallower producing fields. A critical element of exploiting the play is to obtain accurate and high quality depth imaging of the prospect trap to validate the initial time structure interpretation, refine prospect reserve estimates, and high-grade exploration well locations. A common play trap type is a 3-way dip closure against a fault or salt weld, with a 4-way closure component.

The Drake prospect, in the South Marsh Island protraction area, is representative of a typical ultra-deep shelf prospect. The trap is interpreted as 3-way dip against a steeply-dipping weld, with over 24,000 acres of structural closure. The primary target is the Paleogene, thickened within the core of the structure, at drill depths of 30,000 ft. The mean reserves are estimated in excess of 1.7 trillion cubic feet of gas.

BHP Billiton, seismic contractor Fairfield, and partners Newfield and Petrobras have completed a proprietary pre-stack depth-migration project, covering the Drake structure. The key to the high quality depth image was the construction of a detailed velocity model, with sediment velocities derived from tomography and migration velocity analysis, and inclusion of a number of salt bodies and velocity variations across a composite weld surface.

The current depth imaging results show the steeply-dipping to overturned trap-defining weld and the low-reflectivity lower Paleogene section in marked contrast to the high amplitude reflectors of the surrounding section. The depth imaging is currently being used to refine an exploration well location designed to test the Drake prospect.

Zemlicka, G., R. J. Bruce, P. Gale, J. E.G. Savage, K. L. Sherlock, D. Li, M. Plumlee, W. J. Schneider, G. Denyer, R. Haworth, J. Menard, and R. J. De Campos, 2006, Depth imaging of the Drake structure in the ultra-deep shelf play of the Gulf of Mexico: Gulf Coast Association of Geological Societies Transactions, v. 56, p. 909.