Enhancing Reservoir Definition for Field Modeling and Simulation with Seismic Elastic Properties and Discontinuity Analysis— A Case History for Main Pass 61, Gulf of Mexico

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ABSTRACT

The reservoir modeling and simulation of Energy XXI's Gulf of Mexico Main Pass 61 Pod B Oil Field integrated seismic elastic properties and discontinuity analysis to improve reservoir definition, lithology distribution and to identify compartments and fluid flow pathways. The results provided key basis for improving the estimation of recoverable oil, field management decisions involving water injection and work-over completions, and the identification of un-swept potential for new drilling opportunities.

Conventional reservoir modeling and simulation field studies often underutilize information contained in the seismic data. Wells sample the earth with high vertical resolution at a single location, but seismic provides highly sampled information in the intra-well space. Utilization of the intra-well seismic information leads to better definition of the reservoir and simulation results.

The reservoir model integrated estimates of litho-fluid properties derived from pre-stack seismic inversion employing Bayesian classification methods. Reservoir boundaries and facies distributions were identified from shale and sand classification probabilities. Porosity distribution in the reservoir utilized acoustic impedance as a proxy. Seismic discontinuity analyses also provided a means to identify compartment boundaries, baffles, and lithologic barriers to fluid flow.

Together, the integration of these seismic properties improved the accuracy of the geologic model and provided better understanding of reservoir production mechanisms.