

Total Play Fairway Analyses and Yet-to-Find Hydrocarbon Volume in Unconventional Cretaceous Plays in the Eastern Cordillera, Colombia: From HC Retained Volume Modeling to Reservoir Pore Volume Characterization

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Abstract

The assessment of the hydrocarbon potential in Colombia's Eastern Cordillera play uses a qualitative snapshot coupled with a quantitative analysis of this untapped unconventional opportunity. The project assesses the HC potential of the Chipaque Formation, an equivalent of the Upper Cretaceous La Luna. Both source rock and reservoir characteristics in this complex area were evaluated to produce a Total Play Fairway Analysis (TPFA) and a Yet-Find assessment.

The analysis is based on the integration of Triassic to Present-day events (rifting, post-rift marine and non-marine depositional phases) and complex uplift involving major thrust fault systems with significant amounts of eroded sections. The analysis is supported by cross sections and the assessment of sonic logs to estimate erosional thicknesses of 4,000-6,000 feet.

A conventional La Luna play with oil and gas is associated with production from Cretaceous and Tertiary sandy reservoirs in the nearby Los Llanos and Magdalena basins. Retained HCs remain as the unconventional play source.

The results of these analysis feature composite risk maps combining the presence and effectiveness of the formation as a source rock and as a low permeability reservoir. Common risk segment maps are created for the net effective source rock thickness, maturity, retained HCs, adsorbed gas, porosity and a preliminary brittleness evaluation. Brittleness is assessed from the calculation of mechanical parameters utilizing sonic and density logs. These maps begin to define the potential for oil and shale gas in the Eastern Cordillera play.

A numeric chance of success (pos, pg, geologic chance) is evaluated by combining common risk segment maps with the assessment of the quantity and quality of the data; spider diagrams display the strength or weakness of each of the risk components.

A Monte Carlo based Yet-to-Find assessment is developed that considers a probabilistic assessment of the retained hydrocarbons. This assessment includes the variable net effective thickness of the total porosity which includes nanoporosity and adsorbed gas.