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Seismic-sequence stratigraphy and petroleum system modeling of the downdip Tuscaloosa-Woodbine, LA and TX

Seismic-stratigraphic and 1D and 2D petroleum-system modeling evaluated the regional geologic framework, potential hydrocarbon source rocks, hydrocarbon generation and migration, and reservoir compartmentalization to assess undiscovered gas resources in the overpressured, downdip Upper Cretaceous Tuscaloosa and Woodbine Formations. Seismic profiles in two major producing areas downdip from the Lower Cretaceous shelf edge define a Cenomanian, shelf-margin to deep-water system overlain by Turonian marine shale. Seismic also reveals higher-order highstand and lowstand systems tracts, growth faults, and potential source rocks within the system. Interpretations based on the seismic model served as the framework for the computer model. Four potential source rocks were evaluated to determine the source(s) of gas in the system: 1) Jurassic carbonates and shales, 2) Lower Cretaceous carbonates, 3) laterally equivalent and downdip Upper Cretaceous shales in the Tuscaloosa and Woodbine, and 4) shales in the Upper Cretaceous Eagle Ford Group and upper Tuscaloosa marine shale. Model results show that gas in lower Tuscaloosa and Woodbine reservoirs was predominantly derived from Tuscaloosa and Woodbine marine shales downdip and along strike to known fields. The simulation further reveals that the bulk of reservoired gas migrated over short distances and is compartmentalized by growth faults and overpressured shales. Minor oil in the Pilot can be accounted for by downward migration from the Eagle Ford Group/upper Tuscaloosa marine shale. The combined seismic-stratigraphic and petroleum system models indicate that significant undiscovered gas resources exist in unexplored areas downdip and along strike where additional sandstone reservoirs and growth faulting are thought to be present.