

Genetic Relationship between Salt Mobilization and Petroleum System Parameters: Possible Solution of Finding Commercial Oil and Gas within Offshore Nova Scotia, Canada during the Next Phase of Deep-Water Exploration

Prasanta K. Mukhopadhyay¹, Paul J. Harvey², and Kris Kendall²

¹Global Geoenergy Research Ltd., Halifax, Nova Scotia, Canada B3K 5S3

²Nova Scotia Department of Energy, Halifax, Nova Scotia, Canada B3J 3P7

ABSTRACT

The results of recent deep-water drilling to explore for oil and gas in the deep-water Scotian Basin, offshore Nova Scotia, eastern Canada has indicated the presence of complex petroleum systems comparable with the deep-water Gulf of Mexico and West Africa (offshore Angola) and more complex than previously realized. Four factors have controlled the variations in the major petroleum system components: (1) salt movement; (2) hydrocarbon drainage patterns; (3) hydrocarbon sustainability; and (4) play types.

Although limited data are available in the deep-water Scotian Basin (500-2,100 m water depth), this paper presents a new analysis incorporating seismic stratigraphy, geochemical fingerprinting, and petroleum system modeling. The results of this work reveal that the formation, timing, and fluidity of several large allochthonous salt canopies are closely connected to source-rock anoxicity, bypassing of turbidite sands (in Early Tertiary and middle-Late Cretaceous time); and the survival of hydrocarbons within various play types. Early mobilization of Jurassic salt, which formed large canopies, especially within Tertiary sediments of the slope part of the Sable Sub-basin (east-central part of the Scotian Basin), possibly originated from enhanced heat flow and hydrocarbon migration during three-phase fluid flow in the Late Jurassic-Early Cretaceous time interval. Current studies within target areas of the Scotian Basin indicate that the turbidite sands which accumulated in the Eocene/Miocene or the Mid-Cretaceous may possibly be charged with three different types of hydrocarbon families; gas-condensate, light oil-gas and heavy oil-gas within the slope region of the Sable Sub-basin (beyond 2,500 m water depth) and the area between eastern parts of Shubenacadie I-100 and south of Albatross B-13 wells of the Scotian Basin (beyond 1,500 m).