

A View From Across a Major Transform/Transfer Zone: Petroleum Exploration Potential on the Atlantic Margin of Newfoundland and Labrador, Canada

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Recoverable reserves of more than 2.7 billion barrels of oil, 6 Tcf of gas, and 355 million barrels of natural gas liquids have been discovered in the Jeanne d'Arc Basin to date. Production from three giant oil fields-Hibernia, Terra Nova and White Rose has attained 400,000 bopd from the Jeanne d'Arc, which is only one of the many Mesozoic extensional basins located on or surrounding the Grand Banks of Newfoundland, Canada.

According to plate tectonic reconstructions, during the Late Triassic-Early Jurassic, the Grand Banks of Newfoundland was located within an elongated, NE-SW trending intracratonic rifted area extending from Gulf of Mexico to northeastern Europe. This Pangea wide mega-rift included newly formed sedimentary basins, now present offshore Nova Scotia and Newfoundland and Labrador and also basins on their respective conjugate margins, offshore Morocco and Iberia. A transform zone known as the Newfoundland Transform Zone, probably inherited from the Paleozoic Wilson cycle, separated during the early Mesozoic the northern basins from the southern ones. Thick salt deposited during this period and subsequent salt tectonism is a common characteristics to all basins located across the transfer zone. During the opening of the Atlantic Ocean, the transform zone became a major ocean transfer zone known as the Newfoundland-Gibraltar. This transform/transfer played a major role in segmenting the break-up of the North Atlantic and conduced to separate basin evolution and different petroleum systems across its transect.

While the Atlantic basins offshore Newfoundland continued their development through two more extensional stages in Late Jurassic-Early Cretaceous and subsequently in Late early Cretaceous to mid-Cretaceous, the basins south of the Newfoundland-Gibraltar transform/transfer zone have already entered in mid-Jurassic their thermal subsidence stage. The key to Grand Banks petroleum discoveries is the a) presence of abundant Kimmeridgian-aged marine source rock deposited in euxinic basins; b) existence of multiple alluvial to marginal marine reservoirs c) numerous fault and salt induced traps and d) preservation and maturation of the synrift sequence under a thick postrift-syndrift predominantly shaly sequence, conditions met only in a small number of basins. Rather than basin-wide, petroleum success on the southern margins of Nova Scotia and Morocco is probably restricted to secluded sub-basins that meet similar characteristics.