

waters was stimulated by the Canadian Federal Government's Petroleum Incentive Program (PIP). Currently, 350,000 BOPD are produced from three large oil fields and several smaller satellite fields within the Jeanne d'Arc Basin of the Grand Banks of Newfoundland. A further production of 150,000 BOPD is expected by the end of the decade from the Hebron field. In Offshore Nova Scotia, 450 MMCFGD flow from the five gas fields in the Sable sub-basin, whereas the Deep Panuke field will start producing later this year and is scheduled to reach 300 MMCFGD peak sales gas.

The offshore basins of Newfoundland and Labrador and Nova Scotia had a complex geodynamic evolution including Mesozoic extension, salt tectonism, subsidence, and localized exhumation that have created numerous and varied hydrocarbon trapping styles and play types. However, the main ingredient of the Atlantic Canada's petroleum system is the extensive presence of a rich and thick Late Jurassic (mostly Kimmeridgian), predominantly restricted-marine-origin source rock in the basins off East Newfoundland, and predominantly terrestrial-derived on the Scotian Shelf and slope basins. This difference in source rock origin and quality is due mainly to differences in paleotectonic and paleogeographic conditions.

The presence of Late Jurassic source rocks in less known, deep water Newfoundland offshore basins was initially postulated by correlating the associated seismic markers from the established basins through seismic regional mapping and basin-to-basin correlations. In 2003 their presence was confirmed in the Flemish Pass Basin by drilling of the Mizzen L-11 well. The well intersected Late Jurassic source rock and discovered oil within an Early Cretaceous reservoir. In 2009, the Mizzen O-16, drilled 10 km up-dip, confirmed a larger discovery in the basin. The Great Barasway F-66 well in the East Orphan Basin intersected a Late Jurassic sequence that appears to contain source rocks that can be extrapolated to adjacent mini-basins and troughs.

These new wells prove that both Flemish and Orphan basins are part of the Kimmeridgian-aged source rock "super-highway" that partially follows the Atlantic rift trend connecting the Scotian Shelf to offshore Newfoundland basins and extending into the Porcupine, Rockall Trough and Slyne basins of West of Ireland and from there into the North Sea and Norwegian Sea basins and sub-basins. While not directly proven by drilling at this time, it is hypothesized that arms of the Kimmeridgian Sea may have extended into the present day Labrador Sea's earlier basins and troughs, now situated on the present day shelf slope and within the deep waters of both the Greenland and Labrador margins. The key to further oil and gas discoveries in these and other regions of the North Atlantic lies in identifying through the use of regional seismic grids the Late Jurassic source rock intervals and mapping the source rock super-highway.

Late Jurassic source rock super-highway in the North Atlantic: proven and possible hydrocarbon systems

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In the past decade, the offshore of Atlantic Canada has become an important petroleum-producing province. The largest hydrocarbon discoveries in this area were made during 1979–1984, when drilling in the high-risk, high-cost North Atlantic