Infrastructure led exploration prospectivity in Jeanne d'Arc Basin

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ABSTRACT

On November 27, 2025, Canada's federal government announced it would lift the emissions cap, easing investor uncertainty and underscoring a shift back toward pragmatic, diversified energy policy.

Additionally on March 3, 2026, Newfoundland and Labrador announced it had reached an agreement with Equinor and BP to help the Bay du Nord project move forward, removing yet another hurdle towards revamping Eastern Canada's offshore energy industry. As momentum builds in the territory, it is foreseeable that a locally risk-averse exploration landscape will lean into infrastructure-led opportunities (ILX) in the Jeanne d'Arc Basin around Hibernia and other mature fields.

Integration and scoping of ILX opportunities within TGS' multi-client seismic library, public data and a Facies Map Browser (FMB) reveal an interconnected Triassic–Jurassic system extending northwest of the Hibernia field (Figure 1). The trend of potentially mature source rock, combined with amplitude anomalies in the Mesozoic and Tertiary sections emphasizes opportunities relevant to the Newfoundland and Labrador 2025 Call for Nominations (CFN).

Approximately 20,000 km of regional 2D and 7,500 km² of 3D seismic were evaluated, confirming Mesozoic section thickening from ~5,500 m to over 10,250 m across the Jeanne d'Arc Basin. Time-to-depth domain conversion was achieved using velocity models and arbitrary line ties. Key wells including Linnet E-63, Cumberland B-55, Sheridan J-87, Dominion O-23, Flying Foam I-13, Conquest K-09, Hibernia P-15, and Hebron D-94, were correlated to constrain chronostratigraphy. Isopach mapping and depositional interpretations support continuous Mesozoic petroleum system elements around the Bonavista Platform, framing new prospectivity for the 2025 CFN.

Jeanne d'Arc Basin is bounded on the west by the Bonavista Platform and Murre/Mercury listric faults, the Voyager fault to the east, the Egret fault to the south (Enachescu, 2009), and the Cumberland Belt Transfer Zone (CBTZ) to the north, coincident with the northern limit of the Argo Salt formation (Cawood et al., 2021). During the Triassic Tethys rift, Jeanne d'Arc migrated from northern Africa and Iberia accommodating syn-rift deposition of the Argo salt formation, establishing Jeanne d'Arc Basin as a unique setting for hydrocarbon development. The evaporite-prone rift basin began to subside into a shallow marine carbonate environment, then transgressive stage of clastic sedimentation depositing the Rankin Formation and Egret Member during the Kimmeridgian post-Tethys rift stage. Throughout the late Jurassic North American rift, Jeanne d'Arc underwent the Avalon uplift which created up dip extension along the Argo salt detachment while also setting up alluvial and deltaic environments for deposition of the late Jurassic to early Cretaceous Jeanne d'Arc and Hibernia Formations. Finally, the onset of the Labrador-Greenland rift transitioned Jeanne d'Arc basin back to shallow marine environment depositing sands of the Ben Nevis formation, reactivating extensional roll-overs and creating fault bounded anticline reservoir structures.

The Hibernia complex produces from Albian to Valanginian reservoirs in structurally trapped non-marine sands (Enachescu et al., 2000) deformed by salt tectonics. These intervals display AVO anomalies in the Aptian-Albian Ben Nevis formation and a muted AVO response at the deeper Jurassic Hibernia Formation. Located along the eastern flank of the Bonavista Platform, up dip from a basement graben with 5.6 km of accommodation space, salt-detached fault systems sole out on the Argo salt and create vertical migration pathways into Hibernia, Jeanne d'Arc, and Ben Nevis reservoir intervals.

Amplitude anomalies at Hibernia and surrounding fields highlight prospectivity of similar responses around Jeanne D'Arc Basin. Arbitrary 2D seismic lines show interconnected continuity of the Mesozoic Jeanne d'Arc basin northwestward where amplitude anomalies are observed in Cretaceous and Tertiary units. Immature source rock identified at Linnet E-63, thicken and deepen into a laterally continuous source kitchen, circumventing the Bonavista Platform and tying into the Hibernia field showing prospective leads between the Bonavista Platform, Central Ridge, and CBTZ.

This evaluation supports the recommendation of parcels for the 2025 Call for Nominations. Seismic attributes and angle stacks delineated block boundaries pursuing infrastructure-led exploration targets in a proven yet under-explored basin.

Figure 1: Data library map; JDA basin, arbitrary transect and potential source basin outline