

Eastern Canada has plenty to offer

The region provides an offshore spectrum of frontier to mature oil and gas opportunities.

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Exploration off eastern Canada has become somewhat muted. But a recent renaissance of drilling and seismic activity has unearthed new reserves, new basins and an increased understanding of the offshore petroleum systems.

Newfoundland and Labrador

Recent discoveries offshore Newfoundland at Bay du Nord, Harpoon and Mizzen (Figure 1) have piqued interest once again in the cold waters of the Atlantic. Bay du Nord was described as Statoil's biggest oil discovery outside Norway and the world's largest conventional discovery of 2013, with initial estimates of 300 MMbbl to 600 MMbbl of recoverable oil. Resurgence of drilling activity and validation of new exploration models provides considerable optimism for this emerging region. In support of this activity, Geir Richardsen, Statoil's vice president of exploration, recently stated, "What we've decided to do after last year's discoveries is to come back and drill more wells in that area. The rig will be here later this year. It will start on a campaign that is going to be 18 months of drilling, so one-and-a-half years as a minimum commitment, and we will start of course a program in and around the Bay du Nord area." This activity continues to buoy optimism.

As with all things exploration, infrastructure, economics, geotechnical validation and a well-understood regulatory framework aid in the long-term evaluation and development of hydrocarbons. The Canadian Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) recently announced a new scheduled land tenure sys-

tem that is significantly different than what was previously in place and provides a visible horizon for those investing in the region. The new system provides more time for companies to assess hydrocarbon potential in the lesser explored regions: four years in low-activity areas with shorter near-term opportunities in those areas with proven petroleum systems (one year for mature areas, two years for high-activity areas). Robert Cadigan, president and CEO of the Newfoundland & Labrador Oil & Gas Industries Association, said, "This new system will significantly improve our province's ability to market our offshore globally and will help attract new explorers to our shores by providing advance notice of future licensing rounds."

Other significant regulatory changes for Newfoundland and Labrador include an evolution of "allowable expenditures" applied to an exploration license. Under the new regulations, the definition is expanded to cover the period of time from the initial announcement of the Call for Nominations or Areas of Interest.

Nova Scotia

Nova Scotia has witnessed a similar resurgence of activity

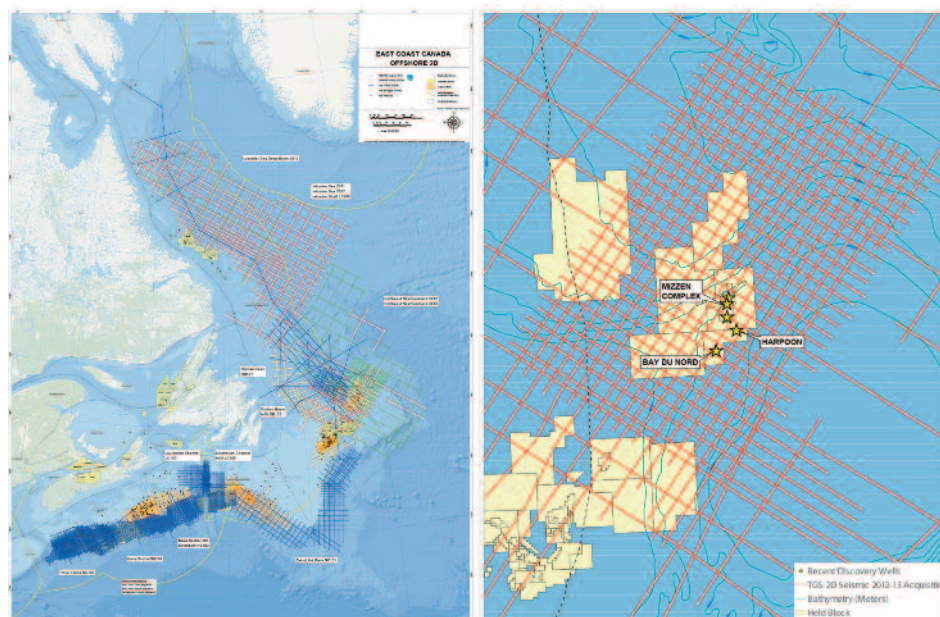


FIGURE 1. This map (left) shows regional seismic coverage of eastern Canada. Right, the map shows recent discoveries offshore Newfoundland. (Source: TGS)

following its government-sponsored play fairway analysis to encourage new exploration. The 2012 lease awards resulted in the largest total bid amounts offshore Nova Scotia by Shell (\$1 billion in work commitments) and BP (just more than \$1 billion in work commitments) as they search for potential oil accumulations. In 2013, Shell acquired a large wide-azimuth 3-D seismic survey and has plans for a drilling campaign of up to seven exploratory wells over the next five years. BP recently announced that it will be acquiring a 3-D seismic survey in 2014.

This new activity in Nova Scotia has resulted in the Offshore Petroleum Board announcing a robust three-year leasing program. This longer term outlook provides the industry with necessary timelines to review and update existing data and conduct new geoscientific studies to advance understanding of the region.

New geoscience data points

Since the last round of investigations in the late '90s, advances in technology related to seismic data imaging and data acquisition provide opportunity for new information. The map in Figure 1 shows historical seismic coverage for eastern Canada through 2010, the majority of which represents data from pre-2000. Primary targets during that time were lower Tertiary and upper Cretaceous, so both acquisition and imaging focused on these objectives using technology that was available at the time.

With new understanding of plate tectonics, basin dynamics and analogs along the Atlantic margin, TGS, in association with the play fairway assessments conducted by Nova Scotia, commenced reprocessing of a select grid of 2-D data in Nova Scotia in 2010 and has continued this effort with additional data in Newfoundland and Labrador and Nova Scotia. Application of newer technology provides considerable uplift (Figure 2). New imaging provides new data points to advance the understanding of basin-forming events and the related depositional sequences.

Working with Nalcor Energy (state energy company for Newfoundland and Labrador) and other related agencies in the Newfoundland and Labrador region, TGS determined that in addition to reprocessing older vintage data, new ideas and theories would benefit from modern acquisition with longer offsets. As a direct result, TGS (in cooperation with PGS) has supplemented its existing data—100,000 km (62,000 miles)—with an additional 47,500 km (29,515 miles) of new long-offset high-resolution 2-D over the past three seasons (Figure 2). Imaging from the new data supports interpretation of basin-forming structures, advanced

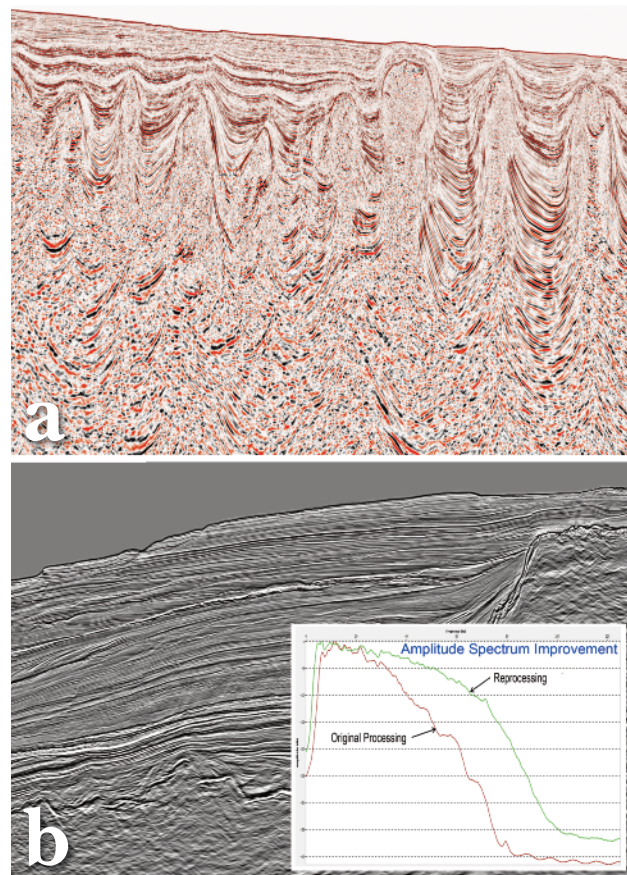


FIGURE 2. (a) The Renaissance flow is an advanced processing flow using both Kirchhoff and reverse time migration algorithms for Nova Scotia data. (b) Carson Basin data in Newfoundland with the application of TGS proprietary ClariFi broadband solution show considerable uplift in illumination of Tertiary through Jurassic-aged sediments. (Source: TGS)

depositional interpretations, rock property analysis and the understanding of potential hydrocarbons in Jurassic-aged rocks (establishment of deeper sub-basins) as identified in Bay du Nord.

Based on work conducted the past two seasons, early interpretations are providing new observations and extending/revising sub-basin boundaries. In the Labrador frontier region, this analysis has identified an extension to the Hawke Basin while also locating three new untested offshore basins—Chidley, Henley and Holton (as presented by Nalcor Energy).

The initiative for new data will continue in the upcoming operating season. Although initial focus will remain in the Orphan Basin/Flemish Cap/South Bank region (to align with upcoming leasing plans), additional data will be acquired in the Labrador and Baffin Bay areas for continued longer term exploration objectives.

Support from industry

Any discussion of efforts in this region would be remiss without recognizing the efforts of the provincial governments and associated agencies. In particular, Nalcor Energy, in collaboration with industry, has taken a fundamental geoscience approach to collecting new and supporting data points. In addition to new seismic data, the initiatives include basin pressure studies, seep analysis, plate tectonics and various other data points to advance regional understanding.

In the more remote region of Labrador (a “low activity” region as characterized in the new C-NLOPB classification), the new regulations require additional data to elevate activity and leasing plans. In support of this initiative, TGS has commenced plans for a seafloor sampling program offshore Labrador. Seafloor sampling’s aims are to recover *in situ* sediments for seismic control; sample known seep localities for identification and characterization of active petroleum systems; and improve geological understanding of frontier basins offshore

Labrador, including potential assessments of hydrocarbon phase. With no deepwater wells offshore Labrador these data will provide valuable geoscience data points to support future exploration initiatives.

With combined current production of approximately 220,000 boe/d—the majority of which is exported—eastern Canada could be regarded as an independent country by OPEC standards. The region possesses the infrastructure and experience to support new exploration while representing an area twice the size of the U.S. Gulf of Mexico with less than 1% of the drilling coverage.

The announcement of new discoveries will lead to new rounds of development and contributions to the world energy futures. Combining these recent discoveries with the improved transparency and predictability of the leasing opportunities will allow oil and gas companies time to gather geoscience data and integrate and make knowledge-based decisions on investments in the offshore region of eastern Canada. **ESP**