

Profile

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OETR Offshore Energy
Technical
Research
Association

Play Fairway Analysis

A Study of Nova Scotia's
Offshore Basin

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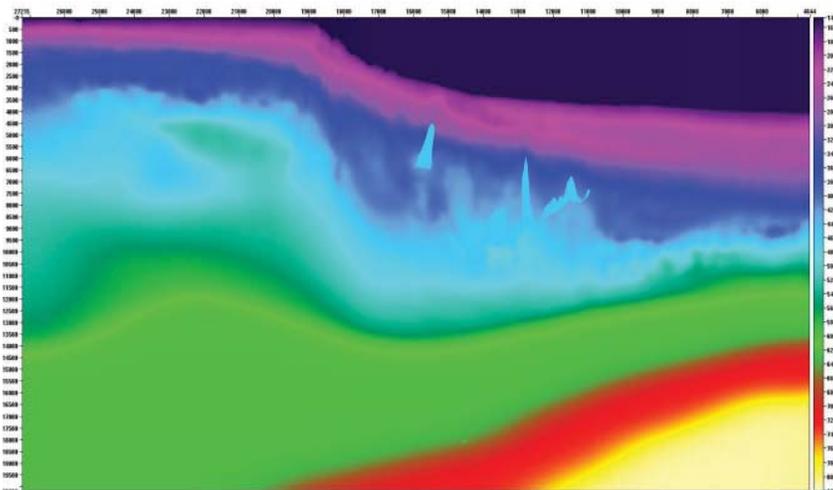
Innovative Geoscience: Revitalizing interest in exploring Nova Scotia's Offshore

We are pleased to introduce 'Profile' - the first in a series of newsletters which will be published as the OETR Association (OETR) Play Fairway Analysis (PFA) program unfolds. 'Profile' will report on progress and highlight the talented researchers who are working as part of the PFA to build geoscience knowledge and a better understanding of offshore Nova Scotia's petroleum potential. In this issue, we present the PFA's history and provide an update on the overall research program.

The Background Story

Offshore Nova Scotia has deep roots as a petroleum exploration region. The basin's history goes back more than 40 years, with 1967 marking the first drilled well. The first discovery occurred in 1969. Over 200 exploration, delineation and production wells were drilled during the last four decades with discovered reserves in the range of 2.1 billion barrels of oil equivalent (boe). The first oil production took place at the Cohasset Panuke development. The Sable Offshore Energy Project produced its first natural gas in 1999 and first gas from the Deep Panuke development is expected in 2011.

Despite Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) estimates ranging from 12 to 39 trillion cubic feet (tcf) of natural gas and between 1.3 and 4.5 billion barrels of oil, exploration activity has declined sharply over the past decade. Exploration licenses dropped from a high of 59 in 2002 to just 10 by the end of summer 2009. This severely diminished a potential key revenue source for Nova Scotia



Line NS-2000: Calculated Velocity During 2010 Reprocessing
Photo courtesy of ION-GXT

from resulting petroleum taxes and royalties.

Although production and proven discoveries demonstrate that there is a working hydrocarbon system, many oil companies left Nova Scotia for other opportunities prior to completion of their exploration program. Companies paid Nova Scotia millions of dollars in forfeiture penalties as unsuccessful wells prompted them to surrender or let exploration licenses expire without completion. This led to the idea that some of the forfeiture money could be used to improve the exploration investment by, first determining why companies left the region and, second gaining a better understanding of what is needed to rekindle exploration company interest in Nova Scotia's offshore.

To respond to these questions, the Nova Scotia Department of Energy commissioned a fiscal competitiveness study and a geoscience gap analysis. Study results pointed to a fundamental issue: the existence of a complex petroleum geology offshore which carries an inherently higher risk for exploration companies. In September 2008, the Government of Nova Scotia invested \$15 million and tasked OETR with directing a Play Fairway Analysis program to undertake research with the goal of stimulating renewed offshore petroleum exploration activity.

Launching the Play Fairway Analysis

A play fairway analysis is an assessment of exploration risk at the scale of a marine basin. Exploration companies traditionally used risk analysis for specific prospects. This approach narrows geoscience and resource evaluation examinations. By enlarging the scope of a study to include a basin-wide assessment of risk, companies can devote exploration resources to a basin's most prospective sections, which

enables a greater ability to classify different basins or rank parts of a specific basin. In addition, through the use of different geological, technical or environmental concepts, new plays in less explored basin areas can be examined. OETR's PFA method employs the use of various 'projects', each undertaken by different researchers, that will be combined into the final Play Fairway Analysis.

The PFA responds to the issues raised by the Department of Energy's commissioned studies. Increasing overall geological knowledge and sorting out basin petroleum geology is at the heart of the PFA. This information is considered key to reducing the geological uncertainties associated with the risks to exploration. New enhanced geoscience information forms the basis for regenerating interest in exploring offshore Nova Scotia. This new knowledge can prove especially useful for oil companies that do not have the resources to conduct a full scale basin analysis. The PFA deliverables promise lower entry barriers for a large proportion of the oil industry by making an industry-credible geological framework publicly available.

The PFA's second goal was to reduce the difficulty of locating and accessing relevant geological data. The creation of a data package is an important element to accompany the PFA. This package will enable interested companies to test proposed hydrocarbon models on real data to aid their evaluation of prospects. The PFA data package is made up of two parts. First, data owners have agreed to commercial terms under which digital data can be used for the study and images can be presented in a way that does not compromise the market value of the base data. Second, where data may be enhanced, OETR and data owners have negotiated reprocessing activities to improve imaging that increases the predictive quality of the data.

Leading with a Novel Approach

To our knowledge, this is the first time this level of geoscience effort has been applied outside of an exploration company. When an exploration firm conducts a Play Fairway Analysis, results are typically retained in-house by the firm that has conducted the particular study. OETR’s approach is noteworthy because it combines proven industry experts who have had the benefit of extensive front line exploration decision-making, with world-class research geoscientists in an integrated framework to define and solve complex geological problems. R&D teams engaged in the project come from local universities, government research labs, as well as exploration specialists within regulatory organizations and exploration contractors.

The research work is intended to understand interrelated geological problems covering plate tectonics, biostratigraphy, geochemistry, seismic reprocessing, salt structural interpretation, and reservoir quality. All these research activities feed directly into the work being performed by the PFA contractor, Beicip-Franlab, who will integrate the input from these projects and develop appropriate tools in order to provide the oil industry with new plays and exploration models.

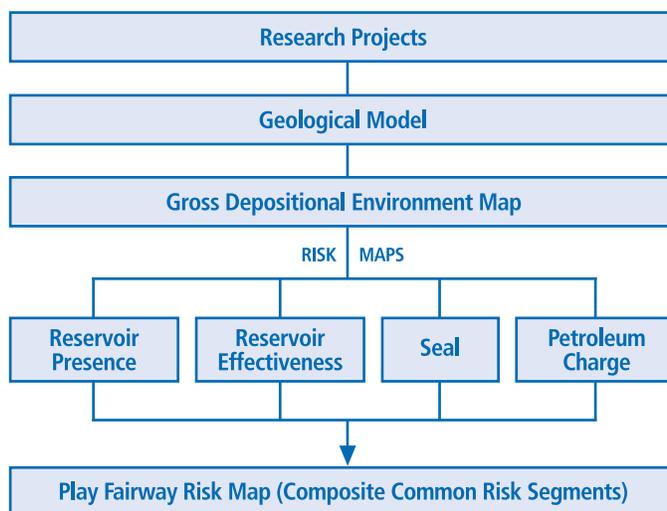
Integration is happening throughout the duration of the research work and outputs are shared along the way to inform the work being performed by Beicip-Franlab.

Program Components

The work covers a diverse range of geological expertise in biostratigraphy, seismic stratigraphy, petrophysics, clastic and carbonate sedimentology, geodynamics, geochemistry, thermal history, salt and plate tectonics, and petroleum systems modeling.

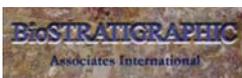
As part of the process, Beicip-Franlab, with assistance from other members of the PFA Team, have built a project database, created a stratigraphic model, and have undertaken seismic interpretation. This has relied on significant integration which has included:

- A team of biostratigraphers, seismic stratigraphers and petrophysicists/sedimentologists worked together on well-seismic ties;
- The seismic interpretation team worked collaboratively with the seismic processing teams to reprocess TGS and GXT data;
- Integration of the substantial existing work of the CNSOPB technical team on salt mapping into PFA work flow;
- The tectonics team collaboratively worked out issues of rifting history, timing and accommodation space for source rock deposition;
- Seismic and well data gathering missions were conducted by Beicip-Franlab in Halifax and Calgary;
- RPS exploration experts periodically review the work conducted by Beicip-Franlab in Paris to advise on program direction and to guide the quest for new exploration insights.



Play Fairway Analysis Activity Flowchart

PFA Partners



The first formal “whole project” integration meeting was held on July 6-7th 2010 in Halifax. Project leaders and team members met to share their working results on the following topics:

Stratigraphy and seismic interpretation - biostratigraphy results, seismic interpretation, salt interpretation, and salt modelling;

Well correlations and sedimentology - well correlations and stratigraphic charts, Lower Cretaceous Sedimentology Project;

Geochemistry & petroleum systems modelling - Geochemistry – Rock Eval & Vitrinite Reflectance, Fluid and source rock GCMS analyses, Fluid inclusions (salt, clastics & carbonates), Apatite Fission track, Petroleum systems initial results and plan;

Plate tectonics program - Refraction line/ Magnetic data/Structural modeling/SISMAR reprocessing.

Program Deliverables

The results of all these projects build up to an industry standard evaluation of the remaining hydrocarbon resources in the basin. This will include the creation of Gross Depositional Environment (GDE), and Common Risk Segment (CRS) maps on each key sequence. In turn, these are used to estimate the ultimate Yet-to-Find hydrocarbon potential in the basin.

Next Steps

The PFA team is now turning its attention to deliverables which will roll out in March 2011 and will include a digital atlas presenting the results of the analysis and special projects. The atlas will contain montages of maps that have been derived from the various analyses. In addition, it will have scientific appendices

providing the technical background behind each of the projects and a GIS compilation of the maps. Work is planned to present the results in a special edition of a peer reviewed journal.

Plans for a marketing campaign are also in hand that will communicate the program findings to the global exploration industry. We are confident that the result of this study will showcase the expertise of the Halifax-based research community and reframe the exploration potential for offshore Nova Scotia. There was an early opportunity to share the technical story of the PFA at the Conjugate Margins Conference in Lisbon in September, 2010.



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OETR is a not-for-profit corporation dedicated to fostering geoscience research that will enhance Nova Scotia's offshore petroleum exploration and development. OETR's members include the Nova Scotia Department of Energy, Dalhousie University and Saint Mary's University.