Nova Scotia
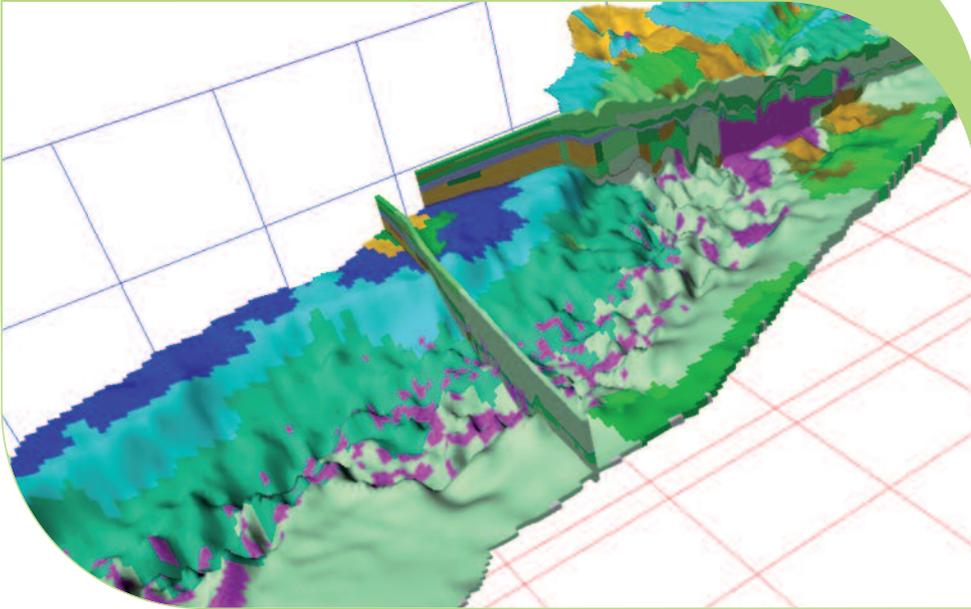## Deep Offshore Regional Exploration

SUCCESS STUDY EXPLORATION PROMOTION

> Beicip-Franlab made a major contribution work to the offshore Nova Scotia Play Fairway Analysis. The quality of the work was excellent and performed in a very timely manner. We highly recommend Beicip-Franlab to governments as well as oil and gas explorers.

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Executive Director, Petroleum Resources Branch, Nova Scotia Department of Energy, Canada

Context

Since the first seismic survey in 1960, more than 200 exploration, delineation and production wells have been drilled in offshore Nova Scotia (Canada) with discovered in place reserves ~2.1Bboe (billion barrels of oil equivalent). However in the past decade, the lack of exploration drilling success induced the decline in exploration licenses from a high of 59 in 2002 to only 10 in early 2008, most of which have been relinquished in 2009. To renew the interest of International Oil Companies for offshore exploration, the Government of Nova Scotia committed funds to the OETR (Offshore Energy Technical Research) Association who decided to invest in the Play Fairway Analysis (PFA) program consisting in scientific research for a better geological understanding of the petroleum systems. The PFA program was launched in 2009 as a vast multi-disciplinary project involving academic as well as industrial research teams. After a large audit of various consulting companies, in August 2009, the core interpretation analysis and modeling was commissioned to Beicip-Franlab.

BeicipFranlab

Technical Innovations

STRUCTURAL REINTERPRETATION

Synthesis of the results coming from associated academy and industrial projects was the key of the success.

More than 70,000km of 2D seismic and ~30,000km² of 3D seismic were reinterpreted using advanced structural salt tectonics concepts. The stratigraphy of 20 key wells was reconstructed from a full biostratigraphic analysis. Of critical importance was the ability to tie the stratigraphy from the slope onto the shelf based on a set of 2D seismic lines, which were reprocessed to further enhance imaging.

Thirteen horizons were mapped and constituted the basis for stratigraphy and basin modeling.

STRATIGRAPHY, SOURCE ROCKS AND HYDROCARBON PROVINCES

Coupling detailed geochemical analysis and studies and plate tectonic reconstruction of the conjugate margins of the Atlantic ocean allowed to propose new potential source rocks of Lower Jurassic age in the southwestern province. The presence of this regional source rock is confirmed by molecular and isotope analyses of discovered oil/condensate, piston cores taken along the length of the margin and supported by evidence from offset locations around the conjugate margin system.

Synthesis was achieved through the construction of a 3D basin model using TemisFlow which constituted the main integration tool for petroleum system evaluation. Calibration of the main parameters for thermal evolution and source rocks maturation was first done through 1D and 2D models.

Most of the lithologies of the deep offshore domains were totally unknown and these lithologies were partly constrained by sequence stratigraphy with extrapolation to the deep offshore through 3D sedimentary models using DionisosFlow software.

Customer Benefits

The Play Fairway Analysis (PFA) project has identified rich hydrocarbon potential offshore Nova Scotia with unrisked 120 TCF of gas and 8 Bbbls of oil in place.

The major innovative result of the work is the prediction of a substantial oil play in the South West of the margin that was previously considered as a gas prone area. Using conservative parameters ~3.3 Bbbls of oil in place are predicted in this area.

Following subsequent tenders, Shell in 2011 and BP in 2012, decided to invest each $1 billion for new exploration activity in the Nova Scotia margin.

BP Parcels Call For Bids NS12-1

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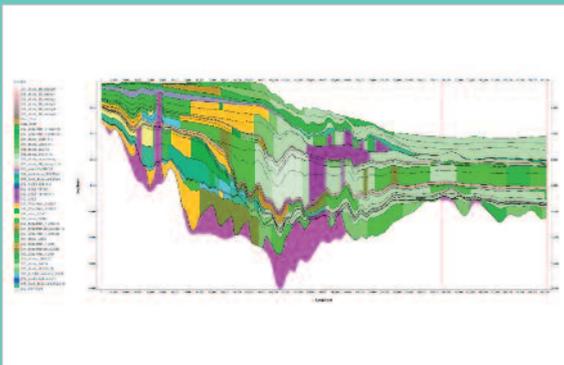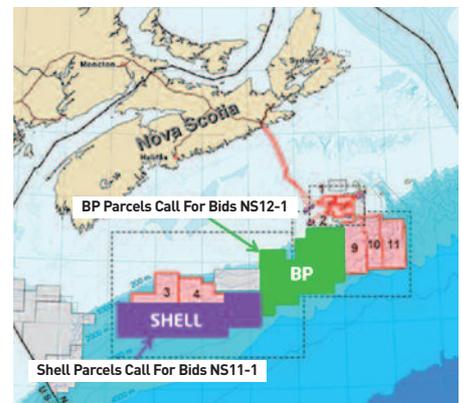
TemisFlow (3D Geological Model)

TemisFlow is the leading software for multi-dimensional dynamic basin modeling. From regional prospect assessment to the identification of local drilling opportunities, including pre-drill pore pressure prediction, **TemisFlow** provides a rigorous simulation of the petroleum system from source rock to accumulations. **TemisFlow** is used in the most challenging contexts such as salt environments, HP/HT reservoirs, over-pressured areas, unconventional resource assessment and prospect identification.

DionisosFlow
Facies predictions for the Berriasian-Aptan Sequence used in the 3D petroleum system modeling.

DionisosFlow is a unique software for generating high resolution stratigraphic models in carbonate, clastic or mixed systems. Through the modeling of sedimentary processes, **DionisosFlow** predicts stratigraphy and facies in undrilled areas while honoring available core logs as well as seismic data at available calibration wells. Dionisos' added value has been demonstrated on numerous real case applications in, amongst others, the Middle-East Cretaceous carbonate platform, Gulf of Mexico salt driven tectonics province, Niger delta turbiditic system and intra-cratonic depression in North Africa.