SEISMIC STRATIGRAPHY, SALT STRUCTURES AND THERMAL AND PETROLEUM SYSTEMS MODELS ACROSS THE CENTRAL NOVA SCOTIA SLOPE BASIN

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Two regional deep seismic profiles, GXT NovaSpan 1400 and Lithoprobe 88-1A, are used to better characterize the sediment, salt and basement structures across the Central Nova Scotian Slope Province. Imaging of deeper structures is especially improved, using either pre-stack depth migration with the long offset streamer (NovaSpan 1400) or a combination of pre-stack time migration and wide-angle velocity models (Lithoprobe 88-1A). Seaward of the salt, basement morphology and crustal velocities suggest that highly-stretched and rotated continental crustal blocks extend further into the ultra-deep basin. Beneath the salt, basement is also well-defined except locally beneath major salt diapirs.

Petroleum systems models are derived along the two profiles for various potential source rocks and reservoirs. Along both profiles, salt flank and salt crest Late Jurassic and Early Cretaceous reservoirs form the primary exploration targets. However, significant differences also exist for the two profiles, primarily associated with variations in salt structures. Along NovaSpan 1400, Jurassic Verrill Canyon is the main source rock for both Jurassic and Cretaceous reservoirs. For the Early Cretaceous reservoir, hydrocarbons may contain a major volume of liquids (>75%) with an API of 45-55o and only mild overpressures. Along Lithoprobe 88-1A, Early Jurassic lacustrine and Late Jurassic salt-associated marine reservoirs are potential exploration targets, although these would lie within an over-pressured, dry-to-wet gas regime. Mass balance calculations for both seismic lines indicate that more preserved hydrocarbons are expected within the various reservoirs on NovaSpan 1400.

Model calculations of present day sea-floor heat flow predict a gradual landward reduction from 55 mW/m2 in the ultra deep-water basin to 45 mW/m2 on the upper slope. Large variations, however, are caused by high conductivity within the salt diapirs, yielding values as high as 85 mW/m2. In July 2008, we plan to take detailed measurements along both profiles in order to verify these predictions.