Petroleum Exploration in West Greenland: New Data, Regional Models, and Opportunities

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ABSTRACT

A wealth of new information on the basin development off West Greenland has been provided from extensive seismic data acquisition, integrated interpretation using magnetic and gravity data and new analytical results from seabed sampling, wells and onshore field work. Many new promising exploration models have been developed within the last couple of years, and recently acquired data from poorly covered areas challenge the overall understanding of geology, tectonic history and perhaps even the overall models for major part of the Labrador Sea and the southern part of the Baffin Bay.

Although details of the tectonic models are yet to be understood, there is now good geophysical and stratigraphic evidence of a system of connected deep basins with inferred thick Palaeozoic and Mesozoic successions. These basins link regions with discoveries or shows of oil and gas. This is particularly clear along the NNE–SSW trending Ungava zone between Labrador/Baffin Island and West Greenland. A number of other subbasins with N–S or NW–SE trends offshore West Greenland connects to this system. The basins west and north of Nuussuaq in Baffin Bay seem to be very deep and the location west of onshore oil seeps make them interesting for the oil industry. The so far limited amount of modern seismic data in the Labrador Sea indicate that the opening of the Labrador Sea could have happened in the Cretaceous or earlier, and that the West Greenland Kap Farvel basin area may be identical to the Orphean Basin. These areas could hold large oil and gas reserves and the large number of potential traps could be our new exploration play ground for many years to come.

The deepest stratigraphic interval penetrated by drilling offshore West Greenland terminates in Santonian reservoir sandstones in the Qulleq-1 well that was drilled in the year 2000. However, new high quality seismic data demonstrate thick and widespread older sedimentary successions. Only little is known on the precise age and depositional environment of these sediments. Reworked palynomorphs from sidewall cores, dating and geochemistry of seabed samples from inversion structures and eroded canyon systems and the use of age-specific biomarkers

from onshore seeps all indicate the existence of Palaeozoic and Mesozoic successions. The analytical data furthermore suggest possible oil-prone source rocks of Late Ordovician, Late Jurassic, mid-Cretaceous and Paleocene age.

Four relatively large areas offshore West Greenland, each between 5000 km2 and 11 000 km2, have recently been offered for licensing in 2004 by the Greenland authorities. The four areas were selected based on distribution of large leads and prospects in the region and the presence of deep basins containing possible mature source rocks. Examples of basin geometry, structural style, leads and prospects, and evidence of live petroleum systems from all four areas will be shown together with examples from other interesting areas off West Greenland.