

Hunting Deep Marine Reservoir Sandstones off Nova Scotia, Canada

John Gjelberg¹, Boye Flood¹, Trond Lien¹, Mogens Ramm¹, Lars Russwurm¹, Gyrd Sundsbø¹, and Ron Steel²

¹ Hydro Oil and Energy, Global Exploration,

² University of Texas, Austin.

The Scotian Shelf on the Canadian East Coast has been subject for hydrocarbon exploration since the late sixties/early seventies, and so far six gas fields with a total of 130 GSm³ gas (= 4.6 Tcf) have been developed. The current total gas production is close to 11.5 Mm³ gas/day (400 MMcf/day). All of the producing fields are located on the shelf itself, but during the last decades, an increasing exploration activity has been focused on the deepwater areas. Hydro has been involved in this exploration activity since the NS98-3 land-sale, when we were awarded shares in two deep-water blocks. The Annapolis gas discovery was made in 2002 within reservoirs of Lower and Upper Missisauga Formation of Early Cretaceous age (Hauterivian – Barremian age) in one of these blocks.

Most of the sandstones encountered in the deepwater wells are located in a limited stratigraphic interval of Early Cretaceous age, and represents amalgamated and isolated turbidites. However, the reservoir development within the deepwater wells is relative poor and only a few tens of metres of sand have been encountered in each well. In the Annapolis Field the two main reservoir intervals are approximately 20 and 30 metres thick respectively, with a relative low net/gross ratio. The reservoir sand development encountered in the few deepwater wells drilled so far is somewhat surprisingly low compared to the extremely sand-rich development on the Scotian Shelf itself. Core studies suggests that most of the Early Cretaceous sand on the shelf was deposited in a shallow marine deltaic (bay dominated) and inner shelf environment, with some elements of fluvial channels and thick mouth bar accumulations. The distance between the wells within the palaeoshelf setting to the Annapolis well (deep water setting) is less than 40 km, and may represent a palaeoslope, but seismic data do not reveal any well defined clinoforms in the area.

An important question concerning further exploration is if the relative poor sand development is representative for the whole deepwater area and, in case, what is the reason for this. Calculations on sedimentation rates suggest that this was a relative low sediment supply system. This, in combination with a relative wide palaeoshelf may suggest that the shelf itself had sufficient accommodate capacity to host most of the sand in the system, and that shelf by-pass only took place during periods with relative long lasting low-stand.