THE 4TH GEOLOGICAL CONFERENCE
OF
THE GEOLOGICAL SOCIETY OF TRINIDAD AND TOBAGO
June 17-22, 2007, Hilton Trinidad & Conference Centre,
Port-of-Spain, Trinidad and Tobago

"Caribbean Exploration – Planning for the Future"

ABSTRACT

THE UPS AND DOWNS ON THE "ANGOSTURA" EXPLORATION ROLLERCOASTER: A GEOLOGIST'S PERSPECTIVE

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Trinidad has somewhat affectionately been known as the "geologist's graveyard" and nevermore so has the threat of such a fate hung over those that work the islands Eastern offshore area. Here, the complex geology associated with an active fold and thrust belt contains a proven and potentially prolific working hydrocarbon system.

Since the mid nineties, BHP Billiton Petroleum and partners have been actively exploring in the areas of the shallow water Blocks 2(ab), 2(c) and 3(a) in the Eastern offshore. The initial play concept entering the blocks was to explore for the Tertiary sandstone reservoirs which are exposed and evident in the subsurface of onshore Trinidad and the Eastern Venezuelan Fold Belt, i.e., at El Furrial. However, from the data available, reservoir presence was considered to be the principal risk, with only thin Pointe á Pierre and Nariva Tertiary sandstones exposed on Trinidad. In 1999, whilst testing this concept, a substantially thicker Paleogene reservoir was discovered and informally designated as the "Angostura Sandstone" after the well which first penetrated the section. With the discovery of a high net gas bearing sandstone section with a gross thickness approaching 1000ft at Angostura-1 and a later oil discovery at Kairi-1, the Angostura play was born.

Over the years, BHP Billiton and partners executed an aggressive work program to evaluate the extent of the "Angostura" play fairway. Seismic imaging has been a constant challenge in the area with over 4000 km^2 of 3D seismic now having been acquired and interpreted on 6 different surveys (OBC, PSTM, PSDM, and various reprocessing phases). Drilling activities have been ongoing constantly for the last 8 years with over 19 exploration wells, 6 appraisal wells and 30 development wells having been drilled. Despite this wealth of both geophysical and geological data, the "Angostura" play remains at times enigmatic and, to say the least of it, controversial.

In this contribution, we shall present the development and evolution of geological thinking from the early days to the present; through the discovery and appraisal of the Angostura Field, the improvements in the quality of seismic imaging and the testing of geological models in subsequent exploration wells. Throughout, we will focus on the key, play defining tectono-stratigraphic

relationships between the coarse clastics of the Angostura section, the underlying thrusted substrate and the overlying Nariva/Cipero Fm cover.

An understanding of the dynamics and evolution of this fold belt are not without their challenges and the “Angostura” play remains a high risk venture. However, continued improvements in seismic imaging coupled with the testing of ideas through the drill bit, should contribute to keeping at least one geological foot out of the grave!