**The Southern Lamu basin, offshore Kenya: evolution; structure; and possible plays.**

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Abstract

The structure and prospectivity of the Southern Lamu basin, offshore Kenya, is the result of a long history of rifting, which resulted in the eventual break-up of West and East Gondwana, through to the incipient break-up of present-day East Africa, and marked inversion of the older rift structures.

The first recorded Phanerozoic rift event is the Karroo rifting, dating from Late Carboniferous to end-Permian, and extending along the whole margin of East Africa, from S. Africa to Somalia. The gross meridional trend is the result of compression related to the closure of the Cape Fold Belt in the South, and the incipient opening of neo-Tethys along the Arabo-indian margin to the North.

The sediments of the Karroo Group comprise syn-rift Late Carboniferous-Late Permian sands; and a post-rift Triassic sequence, also dominated by sands but containing the Maji ya Chumvi shales (potential source rocks) at the base.

The next phase of rifting commenced in the early Jurassic, and ceased with the onset of continental separation of W and E Gondwana, controlled by the N-S trending Davy Fracture Zone. Early Jurassic rift basins are recognised on both conjugate margins - in coastal Tanzania (Mandawa), Madagascar (Majunga), and India (Kutch): fill is dominantly sand, although source rock shales and significant thicknesses of salt are known from Tanzania and Madagascar. The Dogger Limestone and succeeding late Jurassic shales (potential source rocks) overlie the rift/drift unconformity and usher in a period of passive margin sedimentation throughout offshore Kenya extending through Palaeogene times.

Uplift of cratonic Africa in ?Apto-Albian times (co-eval with the Niger-Chad-Sudan rift system) is thought to have generated a major pulse of sand delivery to the Kenya-Tanzania margin.

Separation of India/Seychelles from Madagascar in the Turonian and India's subsequent rapid movement northwards during the rest of the Late Cretaceous resulted in an W-E compressive field which caused the inversion of a major Jurassic rift basin associated with the Davy Walu Ridge. This inversion resulted in an area of restricted marine circulation between it and the coast of Kenya, providing a mechanism for the deposition of Late Cretaceous to Eocene source rocks in the offshore Lamu basin.

The latest period of rifting to have affected the offshore Lamu is of Early Miocene age and represents an embryonic Eastern arm of the Gregory rift. It has resulted in a deep Neogene basin which parallels the coast and is characterised by steep dips and Miocene pinnacle reefs.

The outcome of this complex geological history is a complex but attractive selection of plays, which are currently being explored by the L-10 consortium (BG – operator; Premier Oil, Cove Energy/PTT, and PanContinental). Principal targets are considered to be:-

- Upper Cretaceous – Palaeogene turbidite sands associated with the flanks of the inverted Davy-Walu Ridge
- A Lower Miocene pinnacle reef trend in the inboard syncline
- Fault-dip closures (possibly inverted) with Lower Cretaceous sands as a possible objective

and examples of these structures as seen on the latest 2011 consortium seismic will be shown.