

Overview of the Trans-Atlantic "Mirror" Play

(Prepared exclusively for CGX Energy)

An emerging trend in oil and gas exploration is the "Atlantic mirror" play, in which analogs are drawn between the east coast of Latin America (LA) and offshore West Africa (WA). In the northern part of the South Atlantic, Tullow Oil has been the main proponent of this strategy, with active programs offshore Guyana and French Guiana across the Atlantic from recent discoveries in Ghana and Sierra Leone. Tullow and its partners' Jubilee discovery (estimated by IHS at 1.4 billion (B) boe gross recoverable) opened up an entirely new deepwater play offshore Ghana. In both public statements and in conversations with IHS Herold staff, Tullow geologists have confirmed that they are seeing "Jubilee-type" prospects offshore northern LA. A second discovery offshore Sierra Leone, the Venus-B1 well, has de-risked about 30 prospects between Venus and Jubilee to the east, opening up a new exploration play that stretches 1,100 km along the WA coast and mirrors the northeast LA offshore (both fields are detailed below).

The trans-Atlantic play is founded on the opening of the southern Atlantic Ocean, which began around the Cretaceous/Jurassic boundary (~150 mya) with the rifting of the proto-continent Gondwana." The rift split what is now LA from Africa. As the rift basin widened, conditions changed from lacustrine to marine, and sea level fluctuations raised and lowered the depth of the continental margin, alternately depositing fine- and coarse-grained silts and sands over the shelf and resulting in very thick sedimentary sequences on both sides of the basin, often rich in organic terrestrial material.

Nearshore exploration, especially offshore WA, has led some significant hydrocarbon discoveries. In recent years, however, improvements in technology have allowed companies to move into deeper waters. At the edge of the continental shelves of LA and WA, paleo-canyons focused sediment into submarine fans and "turbidite" deposits (effectively the leftovers of underwater landslides). These complex deposits often result in channels or lenses of reservoir rock, capped by finer-grained shales and charged by underlying organic-rich rocks. High resolution seismic and directional drilling now allows companies to image these reservoirs and to maximize the amount of pay zone penetrated.

On the WA side, the Jubilee field lies in the Cote d'Ivoire (CI) Basin, 84% of which is in deep water. Formed during the separation of LA and Africa, the basin is filled with about 10 km of sedimentary material dating back to the mid Cretaceous (~110 mya). The main source rocks in the area are Albian-Cenomanian in age (~95-110 mya). Deep canyons cut in the shelf edge by transgressive and regressive sea level changes funneled sediment into basin deltas and fans, blanketing fault blocks created by the continental pull-apart and creating both structural and stratigraphic traps. IHS estimates that discoveries to date in the basin comprise over 1.8 Bbbl of oil and condensate, and 4.7 Tcf gas. The Sierra Leone-Liberia Basin, to the northwest and home to the Venus discovery, is not as well explored, but has a similar rifting history and IHS recognizes mid-Cretaceous potential source rocks (detailed reports on basins attached).

This history compares favorably with the Guyana Basin, where rifting started somewhat earlier (late Jurassic, ~150-160 mya); however the sedimentary sequence starts with the lower Cretaceous. As with the CI Basin,