

AN INTEGRATED PETROLEUM SYSTEM STUDY FOR THE ARADEIBA AND BENTIU PLAYS, BLOCK 4 CENTRAL MUGLAD BASIN, SUDAN

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Sudan is the largest country in Africa with an area of 2.5 million km² and common borders to eight countries. Muglad Basin is a northwest-southeast trending rift basin in Central Sudan. Blocks 1, 2 and 4 lie in the Central part of this basin. Greater Nile Petroleum Operating Company operates these Blocks for a consortium of China National Petroleum Company (40%), Petronas Carigali Overseas Bhd (30%), ONGC Videsh Limited (25%), and Sudanese Petroleum Corporation (5%). Blocks 1&2 have been actively explored and significant reserves have been discovered.

Block 4 has been relatively immaturely explored and presented itself as a technical challenge to the operating company. A team from Greater Nile Petroleum Operating Company (GNPOC) and BEICIP-FRANLAB has conducted an Integrated Petroleum System Study on an area of 23,000 km² for the two main Upper Cretaceous Plays, namely the Aradeiba and Bentiu Plays. The study comprised a stratigraphic and structural model building for seven key horizons. The study has been conducted on a 3D block comprising up to 43 layers from "Abu Gabra" to surface. After building the thermal and maturity model, the hydrocarbon charging has been studied along 2D seismic sections using Temis 2D® software. The HC generation occurs over short periods, and is governed by the nature of the organic matter (lacustrine) and main heating events related to rifting. The amount of hydrocarbon expelled was determined and this allowed defining a migration efficiency of 1-5% for the Bentiu and 1% for the Aradeiba. The plumbing system consists of normal faults and permeable sands which allow for complex distribution of accumulations over the plays. Using a probabilistic approach and 3D map-based HC migration system, hydrocarbon charging for 10 catchment areas was determined using Temis 3D® software. This presentation will discuss results of the study and results of the subsequent exploration.