Nubian Consulting

Petroleum Systems & Play Fairway Analysis Of the Murzuq Basin, SW Libya

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PETROLEUM SYSTEM AND PLAY
FAIRWAY ANALYSIS OF
THE MURZUQ BASIN

An assessment of the hydrocarbon exploration potential in the central and southern part of the Murzuq Basin with emphasis on the Tanezzuft-Haouaz/Memouniat petroleum system.

Prepared by
NUBIAN CONSULTING

Updated EPSA IV(3) Version - January 2007
Summary

This report presents a comprehensive regional geological analysis of the Murzuq Basin, SW Libya. Recently available stratigraphic and structural information has been combined in an empirical reconstruction of the basins history, to identify three discrete petroleum systems. Each of these had a complex history of expulsion, migration, entrapment and dispersal of hydrocarbons through intermittent periods of uplift, exhumation and reburial. The northern petroleum system is now at a fairly mature stage of exploration. A large number of oil and gas fields have been already discovered with combined reserves of over 2.5Bbbls in middle to late Ordovician (Haouaz/Memouniat Formations) sandstone reservoirs. In distinct contrast, the central and southern part of the basin has been largely ignored over the last twenty years, with only a few scattered wells and limited seismic. Logistic constraints, remote location and technical uncertainty about the southern extent of the basal Silurian source responsible for the oil and gas fields to the north, have so far discouraged significant exploratory activity in this south-central part of the basin. However the regional petroleum systems analysis included in this report, has highlighted its potential, with the possibility of oil reserves similar or greater than those found to the north. Analogue field size distributions adjusted for rather more favourable geological conditions suggest mean play reserves of 1.25MMbbls are quite possible. Comparatively few giant fields have been found anywhere in the world over the last few years. Even on a global basis, the south-central Murzuq stands out as one of exceptional promise.

Exploration interest in the central and southern Murzuq, revived in August 2004 with the announcement of the first EPSA IV licensing round. Three large blocks 131, 163 and 177 of between 10,381 -11317 sq kms were offered, in the central and southern part of the basin. These were eventually awarded to Occidental and Chevron in early 2005. Two (163 and 177) are in the south-east, located in a favourable position for charge, from a now proven Silurian basal Tanezzuft source just to the west. The chance of encountering flowing hydrocarbons was estimated to be 0.22-0.25, based upon a systematic risk assessment of the Tanezzuft-Memouniat/Haouaz play identified on the two blocks.

The second EPSA IV round was announced in May 2005. Six Murzuq blocks or grouped blocks 146-1, 147-3 and 4, 161-1, 161-2 and 4, 176-3 and 176-4 were offered, with a bid
deadline of early October that year. A revised and updated version of this regional analysis incorporating critical new data, suggested Blocks 176-3 and 176-4 immediately to the west of EPSA IV(1) Blocks 163 and 171, might be exceptionally well placed, with even greater blue sky exploration potential. The chance of successfully testing flowing hydrocarbons was assessed at 0.24. The blocks were awarded to Hydro, Turkish Petroleum, ENI and Japex. Although they were a quarter to a third the size of the first round licences, they attracted far more aggressive bids. Blocks 146-1 and 147-3/4 received most attention, perhaps because of their proximity to existing discoveries.

The third EPSA IV round was announced in the summer of 2006, with four blocks in the larger Murzuq region on offer. These comprised Blocks 162-1 and 162-2 in the deepest, central part of the basin and 113-3 and 113-4 on the Atshan Arch to the north, with a bid deadline of 20th December 2006. Blocks 162-1/2 are well positioned in the optimum play fairway highlighted by this analysis, but their potential is somewhat discounted by their relatively small size. In contrast, Blocks 113-3 and 113-4 lie in a well explored region of severe post-charge uplift and unroofing, with a correspondingly reduced chance of success. The two grouped blocks were awarded to CPC and Inpex respectively. Additional acreage elsewhere in the basin will be offered in future EPSA IV rounds. The region immediately to the south of Blocks 161-1/2 and 176-3 extending across the border into Niger holds most promise, with other perhaps less attractive areas in the north central and northern part of the basin.

Any assessment of this kind is of course weakly constrained and so inevitably rather subjective at a local or prospect specific level. Nevertheless it is based upon a comprehensive regional perspective, with critical insights into more general geological trends and controls governing Palaeozoic hydrocarbon distribution on the Saharan Platform. Consequently it should provide a robust framework with which to rank exploration opportunities within the Murzuq Basin and compare with competing prospects elsewhere.

A reconnaissance economic analysis of a notional 1.0Bbbl field in the larger south-central Murzuq, suggests a commercially attractive project. On the basis of ‘reasonable assumptions’, a field or field cluster of this size might generate an NPV of US$280-340MM with a ROR of over 20%
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Note: The information used in compiling this report was often ambiguous and sometimes conflicting. Where possible, it was tested by comparison with alternative independent sources, but the assessment on which is it based is necessarily only weakly constrained and speculative in part.