Somalia: Preparedness for Exploration

In the last few years Somalia has made great strides on the road to effectively exploiting its natural resources. Our the goal is to achieve a sustained peace, stability and shared prosperity for all Somalis whilst also protecting our natural environment. We strive to maintain the principles of inclusiveness, equal opportunity, transparency and accountability in our work to build sustainable development of the petroleum sector.

The Ministry is now operating from a new building with a dedicated data room and our employees have undergone extensive training both internally and externally with the help of our partners. In the last 2 years we have entered into key agreements with seismic services companies such as Spectrum to acquire modern, high quality seismic data which will greatly assist in oil and gas exploration activities.

With assistance from the African Development Bank and the World Bank we have made substantial advances in developing a solid legal and regulatory framework through appropriate amendments to the Petroleum Law, the completion of a Petroleum Registry, the introduction of a Downstream Law and resource sharing agreements within Somalia’s upstream sector. In addition we have developed a new Production Sharing Agreement model including fiscal terms.

With all this in place the Ministry is pleased to announce our intention to hold Somalia’s first ever offshore Oil and Gas Licensing Round, set to open in the first half of 2017.

We will shortly be finalising bid round details, block delineation, tender documents and the framework in which to execute a fair and transparent competition. We continue to communicate with our existing concession holders who are willing to continue with their exploration efforts and will convert their concessions into Production Sharing Agreements.

Finally, we continue to focus on improving transparency, maintaining environmental awareness and ensuring that the Somali people can effectively benefit from future hydrocarbon resource revenues.

H. E. Mohamed Mukhtar Ibrahim
The Minister of Petroleum and Mineral Resources.
The Federal Ministry of Petroleum and Mineral Resources, Mogadishu, Somalia
A Vision for the Petroleum Sector

Somalia will exploit its petroleum resources effectively to achieve peace, stability and shared prosperity for all Somalis without damaging the environment.

The principles of inclusiveness, equal opportunity, transparency and accountability will guide sustainable development of the petroleum sector.

Eng. Abdulekadir A Hussein, Technical Director General
The Federal Ministry of Petroleum and Mineral Resources, Mogadishu, Somalia

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<th>OFFICIAL NAME</th>
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Main Activities in the development of the Petroleum Industry

PREPARING FOR EXPLORATION:
- In 2014-2015, offshore seismic data was acquired covering both the shallow and deep water of the southern Indian Ocean of Somalia, by Soma Oil and Gas.
- Recent completion of a 20,566 km Multi-Client seismic survey in the southern Indian Ocean offshore Somalia by Spectrum.
- The completion of the construction of the new Ministry building and making it operational.
- Data room set-up is now complete, enabling the Ministry to store and use the acquired seismic data.
- Training both in-house and by 3rd parties, has raised the knowledge and capabilities of the Ministry’s available human resources.

Legal & Regulatory framework

- Amendment of the Petroleum Law due to the federalization of the country with assistance from the World Bank. Drafting is now complete.
- The completion of the Petroleum Registry for legacy right holders and for new interested international oil and service companies.
- The discussion and agreement of the management and resource sharing of the upstream sector in Somalia between the Federal Member States and the Federal Government with assistance from the World Bank.
- The introduction of the Downstream Law.
- The newly developed PSA Model of Somalia and its fiscal terms with assistance from the African Development Bank and the World Bank.
Article on the prospectivity of offshore Somalia written by Spectrum Geo Ltd., published in GEO ExPro magazine, April 2016.

The East Africa region has seen several notable successes to date through discoveries of multi-billion barrel exhumed oil fields within the Permo-Triassic basins of Madagascar and the huge undeveloped Permo-Triassic gas fields of the Ethiopian Ogaden basin. Significant discoveries within Jurassic sediments have been made onshore Yemen, and the Cretaceous petroleum system has proven to be a strong producer in South Sudan. The Sunbird oil discovery proved potential in Miocene sediments offshore Kenya, and numerous gas discoveries (Windjammer, Orca, Mamba, Songo Songo, etc.) have been made in the Rovuma Basin offshore Tanzania and Mozambique.

However much of East Africa remains underexplored due to previous above-ground risks. It is only now with the recent developments in political stability that the potential of these basins can begin to be unlocked.

Exploration in Somalia began onshore in the 1950s with the drilling of a number of wells mostly in the north. Dagh Shabul-I well (1959) established the presence of a working Jurassic hydrocarbon system. However, the collapse of the Government in 1991 and the onset of Civil War meant that Somalia became inaccessible to exploration companies for 25 years. The majority of Somalia’s existing legacy geological and geophysical data were either lost or destroyed.

The inauguration of the Federal Government of Somalia in 2012 has created significant advances towards political stability, encouraging explorers to return to the region. Installation of the country’s first ATM in Mogadishu in 2015 hints at the steps being made in Somalia toward developing a new degree of civil society determined to bring peace, progress and foreign direct investment.
The Federal Government recently boosted hydrocarbon exploration activity by allowing the acquisition of two 2D exploration seismic surveys. An initial offshore 2D seismic acquisition program concluded in 2014, with over 20,500 km of seismic data acquired across a 122,000 km² area. However, the record length of this data was mostly limited to 9 seconds (TWT), only capturing the top of the syn-rift section in the deep offshore.

Spectrum's 2015 Multi-Client survey, extending over 20,560 km, complements and infills the 2014 grid. Recording to 20 seconds (TWT) also allows explorers to build a complete understanding of the evolution of the rifted margin.

Successful completion of both these offshore seismic acquisition programs, with no security incidents, is testimony of the developing political stability and proof of an effective offshore operating environment.
Tectono-Stratigraphic Evolution

The hydrocarbon story of Somalia began with the deposition of the Karoo Supergroup from the Permian-Triassic through to the Jurassic. The Karoo Supergroup is synonymous with the deposition of a world-class source rock observed from Yemen to South Africa. The initial rifting of the Gondwana super-continent began in the Late Carboniferous. Break-up commenced in the Early Jurassic and saw the formation of an oblique rift valley between Somalia and the Madagascar-Seychelles-India (MSI) block. This coincided with a marine transgression in the Early Jurassic, which resulted in the regional deposition of organic-rich marine sediments in a restricted embayment, where northerly transform faults created partial barriers to oceanic circulation.

Following the separation of East Africa and Madagascar, a period of uplift and erosion occurred in Somalia during the Cretaceous as the Jurassic rift shoulders responded to unloading. From the Early Cretaceous, northern Somalia saw the deposition of a marly-mudstone sequence, distal to an aggradational carbonate platform throughout the Cretaceous. Cenozoic sediments are characterised by a thick aggradational passive margin carbonate platform sequence or pro-platform marly mudstones.

The southern offshore saw increased coarse clastic input from the Shabeelle / Jubba / Tana River Deltas in the Early Cretaceous, depositing a significant postrift pro-deltaic sequence. This pro-deltaic sequence provides a potential source rock interval in the south. A number of lignitic potential source rock intervals have been observed in onshore wells in Tertiary sediments, including the Eocene Coriole and Scobeli Formations. The Palaeogene consists of predominantly deltaic clastics capped by thick marls, overlain by Miocene and younger deltaics and platform carbonates.

Regional Geology

The Somalia seismic programmes have highlighted a number of structural and stratigraphic plays. Seismic sections clearly show rotated fault blocks and inversion structures with thick Jurassic and possible Permo-Triassic fill, carbonate build-ups on Jurassic highs, trapping geometries within extensional and compressional domains of gravity slides, and stratigraphic traps at multiple levels.

Offshore Somalia can be divided into three basins, each defined by their own individual structural regimes: Obbia Basin in the north, the central Coriole Basin, and the southerly Juba-Lamu Basin.

The Obbia Basin, offshore northern Somalia, exhibits characteristics of a magma-poor rifted margin;
with a wide continent-ocean transition zone, limited volcanism with no SDRs, and serpentinised exhumed mantle observed at the palaeo-seabed. Post-rift Early Cretaceous to Recent stratigraphy is primarily calcareous mudstone 1.5 to 3 km thick, overlying very large Permo-Triassic to Jurassic tilted fault block structures, some of which are crowned by carbonate build-ups, comparable to the Sunbird discovery offshore Kenya. In the south, large antiformal Cretaceous to Early Cenozoic flower structures and inversion anticlines post-date Early Cretaceous gravitational slump structures, indicating that regional tectonics have significantly deformed the Cretaceous sequences. Karoo and Jurassic source rocks are a very likely oil source for these potentially very large traps.

The Coriole Basin is characterised by large scale flower structures and inversion anticlines related to the N-S strike-slip motion of transfer faults along the Dacie Fracture Zone and southward movement and rotation of Madagascar. Tertiary sediments comprise a thick siliciclastic section, deposited from historic avulsion of the Shabeel / Juba / Tana River Deltas. Using a moderate geothermal gradient, but pending confirmation by more detailed basin modelling studies, it is reasonable to assume that structural and stratigraphic traps at Cretaceous and Tertiary levels are likely to have access to oil-rich hydrocarbons generated from Jurassic and Cretaceous source rocks in this basin.

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The Juba-Lamu Basin in the south has the thickest post-rift stratigraphy, up to 12 km. The deep water post-rift comprises siliciclastic deltaic sediments, sourced by the Shab深刻/Jubba/Tana River Deltas. The Cenozoic section is characterised by mobile shales and large gravity slides on multiple décollements, which may be coincident with early mature organic-rich mudstones. These slides have created large, stacked toe thrust structures down dip, analogous to areas of significant success in the Rovuma Basin, offshore Mozambique. Beneath the décollements, thick Cretaceous clastic-rich sequences of basin floor turbidite fans drape tilted fault blocks and stacked post-rift mass transport system deposits. A significant observation from Spectrum’s preliminary satellite seep studies is the identification of an active oil seep located directly over the toe-thrust structures where these features come close to seabed.

**Gigantic Structures**

Spectrum’s seismic data from offshore Somalia is revealing extraordinary structures, in an oil-prone frontier province that is yet to be seen or explored before. The data correlate closely with the potential field results, and the most recent seismic is imaging gigantic structures that have never been mapped before.

Striking resemblance to the astonishingly successful plays in Kenya, Tanzania and Mozambique indicate that offshore Somalia is about to become the hottest exploration prospect offshore East Africa. It not only promises huge hydrocarbon potential, but also gives a strong indication that this time the hunt is on for black oil.

**Spectrum Acquisition Complete**

On the 5th September 2015 Spectrum ASA and the Federal Government of Somalia entered into a Multi-Client master co-operation agreement with the federal government of Somalia during a signing ceremony at the SYL Hotel, Mogadishu.

Spectrum have now completed the majority of the 2D seismic program offshore south Somalia following the acquisition of 20,566 line km of data. The new acquisition complements 20,500 km of existing seismic data acquired in 2014, and the two datasets will allow the in-depth study of hydrocarbon prospectivity offshore Somalia. The survey was completed without any incident.

Spectrum have already begun to process and interpret the latest data. Findings will be announced in due course by the Federal Government. This effort will reveal the resources, whether oil or gas, that are hidden beneath the sea-floor of the Indian Ocean.

Seven Ministry geoscientists participated in the acquisition of the data and trained on the vessel executing the seismic shooting. These trainees also travelled to Egypt where they studied data processing and geologic interpretation at Spectrum’s imaging centre there.
Exploration background

- Somalia came to the attention of IOCs in the early 1950's, mostly onshore.
- Most major IOC's had acreage in Somalia before 1991, before the collapse of the state.
- Geophysical data was gathered, exploration took off and more than 60 wells were drilled in the efforts preceding 1991.
- The existence of petroleum systems was confirmed, but exploration activity was limited to the shelf region using 2D seismic data.
- The lack of exploration activity across the whole margin, from shelf to deep water, presents a vast unexplored region with huge potential.
- Somalia is now recovering and emerging from more than two decades of political conflict and instability.
Moving towards the onset of Exploration

- The Federal Ministry is finalising the legal and regulatory framework.

- The Ministry has finalised the Production Sharing Agreement (PSA) Model of Somalia, including the fiscal terms.

- Two phases of seismic data acquisition have now been completed. All data will be stored in the data-room at the Ministry and elsewhere. Clear first steps in a new phase of exploration.

Petroleum Management

- The Council for Natural Resource Management:
The council’s main task is to oversee the management of, and to resolve the conflict that may arise from, the sharing of earnings from our Natural Resources. It is chaired by the Prime Minister and its members are the heads of the Federal Member States.

- The Somali Petroleum Authority (SPA):
The Allocation Agreement, or the Petroleum Management and Revenue Sharing document, establishes the Somali Petroleum
In 2017 the Ministry will prepare bid rounds and tender documents, in order to execute a fair competition and award PSA's afterwards.

The Ministry has continuous communication with prior concession holders and will seek to continue working with them going forward.

The Ministry works and co-operates with the relevant civil society organisations (local and international) focused on benefiting from resource revenues, and improving transparency and environmental issues.

Authority (SPA) in accordance to Article 8 of the Petroleum Law of Somalia. SPA is the competent authority that regulates upstream and midstream petroleum operations in Somalia by ensuring that all activities from exploration, production and marketing adhere to the requirements of the Petroleum Law. The authority will be headed by a board of directors consisting of the Federal Government and the Federal Member States and is managed by a CEO who is a member of the board.

Somali National Oil Company (SONOC):
SONOC is a government owned company that is currently being established to represent the commercial interest of Somalia and to boost the downstream activities.
Available data for Upstream Activities

In preparation for Somalia’s first licensing round, Spectrum has completed acquisition of 20,566 km of 2D long-offset seismic data. This program complements 20,500 km of existing seismic data that was acquired in 2014.

The survey design, which covers water depths of 30 m to 4,000 m, has allowed for seismic coverage over the shelf, slope and basin floor with dip, strike and recording time intervals suitable for defining a range of leads and prospects. Streamer lengths of 10,050 m have been used in order to adequately record information at all offsets, further assisting imaging of the underlying syn-rift geometries.

Modern processing algorithms are being applied to the raw data to achieve optimal imaging of the steeply-dipping extensional and compressional features and illumination of subtle amplitude anomalies.

Fast-track PSTM data is now ready to be viewed with final PSTM stacks expected to become available Q4 2016.

Legacy data holders:
CGG also manages and brokers legacy data on behalf of the Federal Government. The data, mostly onshore, consists of maps, seismic, magnetic, gravimetric, geological and field reports, and drilling and well logs.
Ongoing

Upstream Activities

- Block Delineation.
- Petroleum Registry: Legacy contract holders have been contacted. Some terminated their onshore contracts; some expressed their interest.
- Opening and closing of areas: The offshore India Ocean will be open for bid rounds in 2017.
- Production Sharing agreement licenses are not yet awarded.
- Somali Model agreement is ready for companies to use.
- Health, Safety and Environmental (HSE) protection.
Latest Seismic Imaging Results

The Somalia seismic programmes highlight a number of plays with structural and stratigraphic trapping potential. Seismic sections clearly show very large Permo-Triassic to Jurassic rotated fault blocks, large-scale anticlinal structures related to post-rift transform movement, carbonate build-ups on palaeo-highs sealed by post-rift mudstones, and strong structuration within extensional and compressional domains of deltaic gravity slides. Laterally extensive basin floor fans and turbidites may also create stratigraphic traps at multiple levels.

Data courtesy Spectrum Geo Ltd.
What next on the road to Discovery?

- License Round expected to open Q1 2017.
- Global roadshow events during 2017.
- Announcement of fiscal terms and full regulatory framework.

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PREPARING FOR HYDROCARBON EXPLORATION SOMALIA 2016