Gabon: Staying Ahead of the Herd in the Ultra-Deep Waters

CGG has been investing in Gabon since 1932. Since those early days, the company has moved from the shallow waters, to the shelf and most recently to the thick sedimentary section of the lower slope and abyssal plain. In 2015, CGG acquired 25,168 km$^2$ of 3D BroadSeis™ seismic and potential field data, followed by a further 9,595 km of long-offset 2D seismic data in 2018.

To complement its acquisition of geophysical data, CGG has conducted three independent, regional, geological interpretation JumpStart™ projects. These highlight the prospectivity of the targeted geological domain and benefit from the newly acquired geophysical data.

Currently, the shallow water shelf plays of Gabon are considered mature. Explorationists have recently followed these plays into deeper waters and enjoyed some success with the drilling of the Boudji-1 and Ivela-1 wells. However, with declining production levels in Gabon and falling drilling prices, explorationists are now looking to open up the inferred ultra-deepwater plays, which have the potential for giant accumulations of hydrocarbons.
De-Risking Deepwater Plays Offshore Gabon

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When CGG acquired its 20 Deepwater Gabon South Davis in 2018, it was the largest, highest-impact 2D data set ever acquired in deepwater Gabon. The exploration program focused on the Upper Cretaceous post-rift series to bring insight to uncertainty over source rocks to identify the potential source rock intervals. We describe the seismic and well data used to explore the Upper Cretaceous source rocks offshore Gabon, in line with the analogue studies of Jurassic deepwater source rocks in the North Sea.

19 wells have been drilled offshore Gabon and, based on their marine environment to the Cenomanian–Turonian source rock intervals.

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structural and stratigraphic combination traps in the post-rift series of the nearby basins (i.e. Gabon North Basin and Looise Basin). A number of fields in those basins have proven post-rift source rocks, such as the Turonian Aile Formation, the Cenomanian Cap Lopez Formation and the Albian Madiela Formation. In the Gabon North Basin only the syn-rift source rocks of the Molokai and Korrina formations are proven, whilst the post-rift source rocks are inferred.

2D Seismic Data Observations

Underlying what we interpret as an Eocene–Oligocene unconformity there is a package of undulating, continuous, parallel reflectors that onlap against a prominent unconformity surface. From our previous studies, this lower unconformity surface allows us to date the package to the Cenomanian–Turonian, an interval in which the inferred Albian–Turonian post-rift source rocks are inferred.

To provide further support for these observations, a series of synthetic Amplitude Versus Offset (AVO) anomaly responses, producing a large decrease of impedance at zero offset that draws with increasing offsets. The effect of this is noticeable with as little as 2% Total Organic Carbon (TOC) or 1% acoustic impedance and TOC. This confirmed an inverse relationship between acoustic impedance and TOC. This confirmed an inverse relationship between acoustic impedance and TOC. This confirmed an inverse relationship between acoustic impedance and TOC.

As discussed in our previous article, AVO models for the Top Cenomanian and Top Turonian; (right) AVO cross plot for the Top Cenomanian and Top Turonian. (Left) AVO models for the Top Cenomanian and Top Turonian. (Right) AVO cross plot for the Top Cenomanian and Top Turonian. (Left) AVO models for the Top Cenomanian and Top Turonian.