

Clarinete gas field, Lower Magdalena Valley Basin, Colombia- a significant discovery in an established hydrocarbon province.

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Summary

The Lower Magdalena Valley basin (LMV) of northwestern Colombia is a hydrocarbon province with a long productive history, the first gas discovery having been made in 1943. During the subsequent period, over 24,000 km of 2D and 7,000 km² of 3D seismic have been acquired and 240 wells drilled. This has resulted in the discovery of at least 20 significant gas fields (20-435 BCF) and numerous smaller accumulations, some with a significant liquids component. The LMV is a fore-arc basin related to the convergence of the Pacific and South American plates with associated subduction and strike-slip deformation. The basin is underlain by continental crust and bounded to the west by the Sinu-San Jacinto accretionary prism. The primary reservoir in the basin consists of thick (up to 5000 Ft) continental to marginal marine clastics of the Eocene-Lower Miocene Cienaga de Oro (CDO) Formation deposited in an active transtensional setting directly on basement. Regionally the CDO is overlain by thick marine shales of the Porquero Formation which provide an excellent topseal. Hydrocarbons are generally not encountered in the shallow section above the Porquero shale, attesting to its effectiveness as a seal. The source of the dominantly dry gas is generally ascribed to poor quality source rocks in the Porquero shale and CDO.

The Clarinete structure was mapped in LMV block VIM-5 on 2012 vintage 3D seismic as a large (3000 acre) three-way dip closure on a pronounced basement horst block. Mid-Miocene erosion appeared to have removed much of the regionally effective Porquero topseal over this high and topseal was therefore a significant pre-drill risk. The Clarinete-1 field discovery well was spud on October 8th 2014 and reached a total depth of 8,064 Ft MD on November 7th 2014. Clarinete-1 encountered the top of the CDO reservoir on prognosis at 5,926 Ft subsea. The well confirmed that the Porquero shale had indeed been eroded over the structure and the uppermost CDO sandstones encountered were wet due to breaching at the unconformity. However, excellent dry gas shows were encountered while drilling through the rest of the 1550 Ft CDO thickness to basement. Petrophysical analysis indicated 159 Ft of net pay with average porosity of 26%. The well confirmed that intra-CDO shales can form an effective topseal to sandbodies not in contact with the mid-Miocene unconformity and that the regional Porquero topseal is not a requirement for a substantial gas accumulation in the LMV. The well was subsequently tested over two separate intervals which flowed at 20.6 MMscfcpd (3,606 boepd) and 24.7 MMscfcpd (4,333 boepd) with no water. Combined deliverability from both intervals was 45.3 MMscfcpd (7,947 boepd). The discovery was appraised by the Clarinete-2st well which reached TD of 7,842 Ft MD on September 16th 2015. This well encountered 131 Ft (TVD) of net pay with 23% average porosity. A single test was performed resulting in a flow rate of 25.6 MMscfcpd (4,491 boepd). An additional 135 Ft pay section was encountered in the shallow Tubara sandstone and tested at 4.7 MMscfcpd (825 boepd). As of December 31st 2015 the field was estimated to contain 187 BCF of 3P reserves. The wells were tied in and commenced production in December 2015. The Oboe-1 well was drilled as a significant step-out into an adjacent fault block in February 2016. It encountered 158 Ft of net gas pay with 23% porosity. Three separate tests were performed in the CDO with a combined rate of 66 MMscfcpd (11,579 boepd). The well added an additional 38 BCF of 3P reserves.