

Lula Field Brazil: A Unique Giant Carbonate Discovery in the South Atlantic

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ABSTRACT

The Lula Field is located in the Santos Basin, offshore Brazil, at a water depth of >2000 m. It was discovered in 2006 and brought onstream in 2010. At the time of discovery, it was a new play type in the South Atlantic and still has few global analogues. The field has an EUR of 6.5 BBO with the total potential pre-salt resources in the deep-water Santos basin being estimated at more than 30 BBO. The geological success rate in the Pre-salt to date is around 46%. The Lula Field is situated on the Outer High of the Santos Basin, which comprises a 12,000 km² four-way closure at the base Aptian salt level. This regional basement structure comprises a segmented series of tilted rift fault blocks, which were inverted, uplifted and eroded during the late Barremian. A thick evaporite salt seal overlies the Aptian carbonate reservoir. The 400 m-thick lower Aptian Barra Velha Formation, which contains the majority of field reserves, consists of shallow-water lacustrine microbialite or abiotic limestones. The Itapema Formation consists of coquina (bioclastic debris) limestones and is a secondary reservoir. The Barra Velha reservoir has layer-cake architecture, but is highly heterogeneous due to depositional and diagenetic complexities. Typical porosity and permeability values are 8-20% and 20-500 mD, but permeabilities up to 5 D are observed locally. The reservoir contains 28 °API oil with a high GOR. Reservoir energy is provided by solution-gas and rock and fluid expansion drive. A phased development program began with two extended well tests in 2009, undertaken to better understand reservoir behaviour before committing to a final production strategy and facilities. Subsequently, production pilot tests were implemented to evaluate the performance of different recovery methods. Lula is being developed in a hub-and-spoke configuration, with clusters of subsea wells tied back to FPSOs capable of handling both produced hydrocarbons and injection fluids. Rather than venting or sequestering the produced CO₂, an early decision was made to maintain reservoir pressure and enhance recovery by implementing CO₂-WAG injection concurrent with development drilling. Already the Pre-salt production accounts for 47% of Brazils oil production. There were 75 wells in production in April 2017. The 10 top Brazilian producing oil wells in April 2017 were all producing from the Pre-salt, with the average productivity around 30,000 BOPD.