The Raven High Pressure Gas Field in West Nile Delta: Evolution of Subsurface Understanding From Appraisal to Development

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ABSTRACT

The Nile Delta is a world class gas and condensate province. In 2010, the USGS estimated means of 1.8billion barrels of recoverable oil, 223 trillion cubic feet of recoverable gas, and 6 billion barrels of natural gas liquids in the Nile Delta basin. Shallow Pliocene-Pleistocene plays are relatively easy to identify as a result of advances in seismic 3D imaging and the utilization of direct hydrocarbon indicators (DHI). The deeper Pre-Pliocene plays are more challenging to image due to lower seismic data quality and complex overburden geology. The Raven field is located in the West Nile Delta (WND) province in about 600m water depth, offshore Egypt, 60km to the North of Alexandria. The hydrocarbons are mainly contained in Miocene aged sandstone reservoirs within a number of turbidite channel complexes draped across a NE plunging anticline. In 2014 the seismic data was reprocessed to preserve the low frequency content which is vital for full wave form inversion. This was followed by a multiscale 3D full waveform inversion (FWI) and five iterations of reflection tomography. This approach has led to a significant improvement in reservoir imaging and allowed the building of a high resolution earth model which was used for both imaging and depth conversion. The significant advance in seismic quality and the use of different seismic AVO products has revealed some of the expected reservoir heterogeneity. These improvements have resulted in an opportunity to create useful images of the channel systems that distinguish different depositional facies. Consequently the reservoir description has evolved from being predominantly well and analogue-based to being much more integrated, based on well, seismic and dynamic data. The degree of lateral variability in the reservoir between close spaced wells highlights the high degree of reservoir heterogeneity. Even with the improved seismic data, some of this heterogeneity is present at a spatial scale considerably below seismic resolution. Raven development drilling began during 2015-2016 with the first three wells suspended above their target reservoir. One well provided a new reservoir penetration in a channel complex above the target interval and confirmed the presence of reservoir sand in both constructional and aggradational parts of the channel complex. The drilling of the remaining production wells and completion of the suspended wells will be carried out in 2017-2018. First gas for Raven field is expected in 2019.