Data Integration and Multidisciplinary De-risking of the Vaca Muerta Resource Play: Sierras Blancas and Cruz de Lorena Blocks, Neuquén Basin, Argentina

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ABSTRACT

Shell's derisking strategy is built around the concept of "knowledge hubs" (local areas where extensive static and dynamic data from 1 to 3 wells are gathered in the appraisal stage). If the results are promising, 4 to 6 wells will be drilled as an "extension" of the initial data hub with the following goals: (1) execute well configurations to test key uncertainties (landing zone and basic completion design), (2) demonstrate progress on cost control, (3) gain confidence on well deliverability, and (4) demonstrate commerciality. The results from these wells will move the area into the development phase.

Shell drilled its first multi-well pad "SB knowledge hub" and brought it online in May 2015. The pad consists of 3 wells (SB x-1005: lower VM/Cocina/ kitchen; SB x-1004: Upper VM, organico). The third well SB x1006 was a deviated well crossing through the targeted UVM and LVM. The data collection included logs, micro-seismic, geochemical fingerprinting, water and oil based tracers coupled with production and pressure data. Additionally, we have leveraged 3D seismic data by building a well-calibrated seismic facies model that predicts with high reliability the static reservoir properties of the Vaca Muerta Formation away from the wells. This has helped us attain a detailed understanding of vertical and lateral distribution of rock and reservoir properties. We are able to create rock types using what we have learned from our data acquisition program at the core and log scale and translate them into the seismic scale. With the use of seismic inversion techniques, we can predict vertical and lateral reservoir properties away from the well bore.

The wells produced greater than 1000bbl/d rates under choked conditions. Higher drawdown has not shown any degradation in the production potential of these wells. Data shows that there is difference between the two target zones, which is evident from all diagnostic tools. The LVM is rich in TOC and clay content with lower Young's modulus as compared to UVM, which leads to a different profile in the simulated rock volume, impacting recovery factor and spacing. The upper layer has significantly more vertical and lateral variation characterized by carbonate-marl cycles with relatively lower storage compared to the lower layer but with more favorable geomechanical properties. Higher paraffin content in the oil produced from UVM adds complexity to the production strategy.