

RESERVOIR SYMPOSIUM

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Reservoir Characterization for Energy Security

Integrating Subsurface Reservoir Characterization with Advances in Drilling Designs: A Case Study from the Sunrise Thermal Asset

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ABSTRACT

Robust reservoir characterization is the foundation for making informed decisions throughout the lifecycle of SAGD developments, from planning and drilling to production and long-term reservoir management. Specifically, in early stage development, multidisciplinary reservoir characterization supports understanding of key subsurface features like pay zone continuity and thickness, fluid saturations and the presence of baffles or barriers that directly influence steam distribution and bitumen mobilization.

The Sunrise project is located ~70km NE of Fort McMurray and exploits the McMurray Formation of the Athabasca sub-basin. The reservoir comprises a thick package of stacked fluvio-estuarine channel complexes within the main McMurray A-Valley, remnants of older incised valleys and Lower McMurray fluvial deposits. At Sunrise, Cenovus subdivides the McMurray informally into stacked channel systems. The oldest deposits are those within McMurray Unit 1 (MU1; Lower McMurray) bounded at its base by the sub-Cretaceous unconformity and contain medium-coarse grained fluvially dominated channel deposits capped by variably preserved floodplain deposits and common coal facies. The MU2 and MU3 packages are successively younger, overlying fluvio-estuarine channel systems with point bars and channel-abandonment facies positioned in the Middle and Upper McMurray. Highest-performing development areas occur where stacked channel systems have vertically aggraded within a low accommodation setting, leading to reservoirs dominated by high net-to-gross sandy facies. Remnant heterolithic facies related to lateral accretion processes reduce vertical permeability and can negatively impact SAGD efficiency. Across Sunrise, well pairs have been drilled within and across each of these 3 stratigraphic units.

3D reservoir geomodels have been built by incorporating geological and petrophysical interpretations with 3D seismic reflectivity and pre-stack multi-component joint inversion volumes.

Cenovus has drilled three contiguous pads at different stratigraphic levels within the McMurray. We will discuss how enhanced drilling designs across these pads have helped strengthen our reservoir characterization and capture additional resource during the first phase of development.

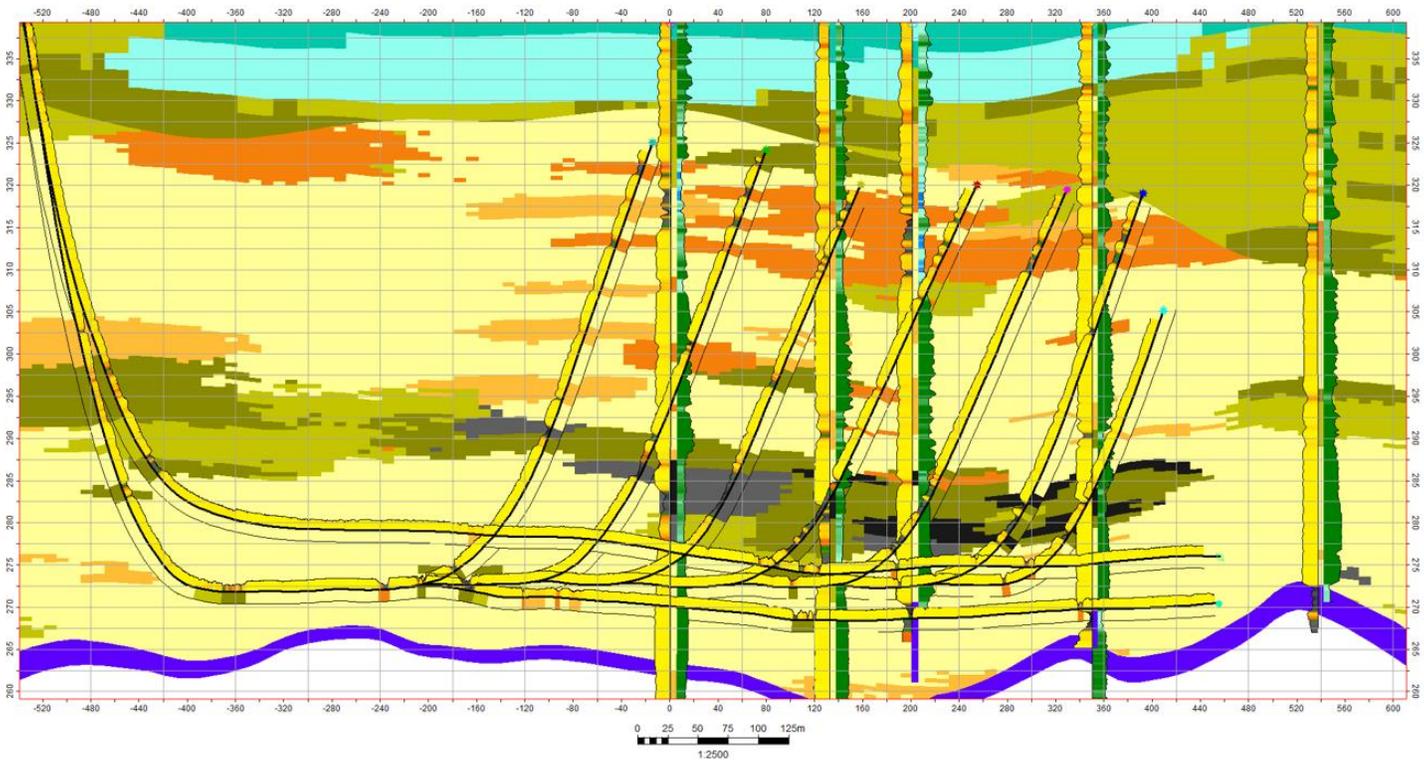


Figure 1: Geomodel cross-section illustrating facies associations. Producer and injector horizontal wells are shown with 7 unlined uptracks.