Australia: Depth Reprocessing Rejuvenates Gippsland Basin

For some years, the Gippsland Basin of south-east Australia has been the ‘dowager queen’ of the country’s oil and gas industry – in decline but maintaining wealth and dignity.

The world-class oil and gas fields of the Gippsland Basin, with original recoverable reserves of more than four billion barrels of oil and around ten trillion cubic feet of gas, were discovered following a 1962 2D seismic survey with a 19 x 27 km line spacing. Ten of the first eleven wildcat wells were successful and all the discoveries were related to a single play: porosity in top Latrobe Group clastic reservoirs below the regional seal.

Despite considerable exploration, it has long been known that unresolved seismic depth imaging issues have had a significant impact on data quality. As a consequence, the province probably has unrealised exploration potential, particularly in the deeper stratigraphic section. The basin-wide Gippsland ReGeneration reprocessing project by CGG has changed the paradigm and the basin is now seen as rejuvenated, with new exploration opportunities and significant upside potential.

The ‘elixir of youth’ was provided by new processing technologies, which have overcome the depth imaging issues that have plagued the basin since the beginning of offshore exploration in the 1960s.
Over the last ten years CGG has gained extensive experience in the processing and reprocessing of legacy datasets in the Gippsland Basin. Leveraging these experiences, we recognized that further advances to new recent innovations in data processing could be critical in overcoming the imaging challenges of the basin.

There are two main challenges, driven by the geology and the seismic character. The north-eastern section has waters depths of less than 180 m and in general a shallower seabed which leads to extended migration and data contamination. The impact on data quality in this area is exacerbated by the presence of high-velocity carbonate channels in the shallow section and highly absorbing and scattering coal reflections in the deeper strata. The eastern area has a very rugged seabed at the shelf break, and complex velocity variations associated with high-velocity carbonate-filled channels, adding to structural imaging challenges that lead to large well mis-ties.

By applying our latest innovations in velocity model building and imaging algorithms, CGG reprocessed the vintage data, to the highest level of quality, to provide the highest-fidelity depth images available for improved prospect mapping. The outstanding success of the multi-client re-stack reprocessing project with the latest data processing technology has led to a resurgence of interest in the Gippsland Basin.

Geological Development and Petroleum Systems

The Gippsland Basin formed as a result of Mesozoic rifting and the subsequent breakup of eastern Gondwana. The Gippsland Basin formed as a result of Mesozoic rifting and the subsequent breakup of eastern Gondwana. The Gippsland Basin formed as a result of Mesozoic rifting and the subsequent breakup of eastern Gondwana. The Gippsland Basin formed as a result of Mesozoic rifting and the subsequent breakup of eastern Gondwana. The Gippsland Basin formed as a result of Mesozoic rifting and the subsequent breakup of eastern Gondwana.

Throughout the Tertiary there were several periods of canyon formation and fill, including a major canyon phase in the mid-Eocene which enhanced the developing channels. Minor vacuoles are specifically present throughout the entire section. These depositional and structural elements have to an significant impact on seismic images.

With regard to petroleum system elements, the primary source rock consists of Latrobe Group organic-rich, claystone and dolomitic shales (Type 1-3). The main reservoir unit is the Latrobe Group marine, sand-rich, facies dominated sandstone and clastic-dominated channel. The channel is sealed by a thin, fine-grained marine sandstone and mudstone seal.

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