Value Creation in the Northern Paradox Basin – Paradoxical or not?

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Abstract

Zephyr Energy plc operates a 25,000 acre lease holding in the northern Paradox Basin that targets hydrocarbon potential within the Paradox Formation. The Company recognised the possibility for commercial hydrocarbon production from several of the Paradox Formation clastic reservoir zones based on observations suggesting continuous oil and gas accumulations, favourable matrix reservoir quality, significant overpressure and natural fracture permeability that had the ability to deliver substantial offset production, based on analogue wells from the Cane Creek reservoir in the nearby Cane Creek Unit.

The Company acquired a 40 sq. mile, wide-azimuth 3D seismic survey which imaged the Layered Evaporite Sequence (LES) of the Paradox Formation well. These data were used to map the interbedded salt and clastic horizons and the structural framework, to predict natural fracture potential, and to help well plan and guide geosteering once drilling operations commenced.

In 2020, in partnership with the NETL sponsored 'Improving Production in the Emerging Paradox Oil Play' project team, the Company drilled a vertical pilot hole that was cored and extensively logged. Preliminary subsurface models were built using newly gathered and offset data from the pilot hole to evaluate possible outcomes from various completion strategies. A side-tracked 4500' horizontal well that targeted the Cane Creek reservoir zone was then drilled. This horizontal well was drilled entirely within the Cane Creek reservoir and was hydraulically stimulated across 14 stages and subsequently tested. The stimulation and completed design were based upon pre-drill geomechanical and reservoir simulation models due to the lack of nearby analogue comparison wells. These models were updated with (mud logging data, through bit wireline log data and results from a diagnostic formation integrity test (DFIT)) and re-integrated with the 3D seismic and the earth and simulation models at various stages of the data gathering process.

Upon well testing, the data showed high well deliverability of a wet gas/condensate fluid with reservoir pressures close to 10,000 psia and with limited pressure drawdown witnessed during initial production. The well test was considered a success and may suggest the potential for a new commercial play in this part of the basin. This paper will describe the steps that led to the drilling of the well, the first horizontal well completed by modern stimulation in this part of the basin, the well results, the well implication for the potential of the Cane Creek reservoir and other stacked reservoir zones within the Paradox Formation that appear to be analogous to it.

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