Technology tools for enhanced delineation, appraisal, and development in the Beetaloo Sub-basin

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Having confirmed the existence of a large and technically producible hydrocarbon resource within the Velkerri and Kyalla Formations, efforts in the Beetaloo Sub-basin have shifted towards the appraisal of possible development areas with the objective of demonstrating line-of-sight to commerciality.

Progressing along the learning curve quickly is critical for the success within the Beetaloo Sub-basin. As a result, Origin Energy and its Joint Venture partner, Falcon Oil & Gas Ltd, have undertaken a careful review of the potential challenges facing operators in the Beetaloo Sub-basin and have begun to build a technological toolkit to best enable the JV to accelerate along the learning curve. The toolkit employs both tried and proven technologies, as well as novel and customised solutions (**Table 1**). This hybrid approach recognises large gains can be made by applying relevant technologies used in commercial shale plays; however, it is also cognisant that new fit-for-purpose solutions will also be required to progress within the Beetaloo Sub-basin. Successfully building a technology toolkit is imperative for progressing along the learning curve quickly and unlocking the vast hydrocarbon resources in the Beetaloo Sub-basin.

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Table 1. Key identified challenges and potential technology solutions for the appraisal and development stages in the unlocking of hydrocarbon resources in the Beetaloo Sub-basin.

Challenge	Potential technology solution		
	3D seismic application	**Reservoir and completion quality assessment along laterals utilising LWD* data and cuttings analysis**	**Geosteering models utilising LWD data and cuttings analysis**
High grading areas for delineation and appraisal	Potential ability to screen large development areas using detailed structural mapping and/or attribute analysis to high grade areas at a significantly lower cost than pilot wells		
Lateral well planning and placement	Detailed structural mapping allows enhanced well planning placement to avoid geohazards and well loses, and helps reduce well length outside target shales		High-resolution modelling of facies and associated rock quality in real time while drilling laterals enables a high degree of confidence for geosteering decisions to place wells in optimised facies, and reduce well length drilling in sub-optimal facies
Fracture stimulation design optimisation and placement along lateral	Can inform placement of stages to avoid features proximal to the drilled lateral wellbore that may reduce stimulation effectiveness. Additionally, attribute analysis could allow optimised stimulation design by targeting a specific favourable identifiable attribute	The development of reservoir and completion quality models along laterals could allow for smart completions where stage spacing and design are targeted or tailored to a specific identifiable facies	Geosteering modelling data gives insights into structural attributes (fractures, faults, etc.) along lateral wells that may either want to be targeted or avoided. It also provides data inputs for the reservoir and completion quality modelling processes
Assessment of facies specific productivity and stimulation design evolution	Successful employment of attribute modelling within target shales could allow for the assessment of hydrocarbon production vs resolvable attribute distinctive facies. With sufficient production and Production Logging Tool (PLT) data, relationships between resolvable attribute facies and hydrocarbon productivity may be established thus allowing enhanced targeting of facies	Reservoir and completion quality models along laterals could be combined with PLT data, or enough well production data to evaluate the productivities of distinctive facies, in addition to testing varying completion strategies in different facies	

* logging while drilling