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Southern Main Karoo Basin: Assessing the Lower Permian shale formations potential for shale gas

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The Karoo Basin, South Africa's largest sedimentary basin, is known locally and internationally as a basin with potentially vast shale gas resources. The US Energy Information Administration (EIA) estimates 370 trillion cubic feet (tcf) of technically recoverable resources for the Karoo Basin, ranked the eight largest potential shale gas resource globally. This extensive resource estimate and the controversial extraction method of hydraulic stimulation (also-known-as fracking) has sparked much interest and debate from oil and gas exploration companies and interested and affect parties alike.

In the midst of on-going public concerns surrounding fracking and excessively low oil prices, assessments of the Lower Permian shale formations shale gas potential is essential in order to facilitate and help guide policy and regulatory developments to boost investor confidence and appease the concerns of civil society.

The organic rich shale formations of the lower Ecca Group; the Prince Albert, Whitehill and Collingham formations, is considered the most likely to generate and produce shale gas. The assessment methodology applied in evaluating the shale gas potential of these shale formations considers both 1D basin modelling and Common Risk Segment Mapping, which had been successfully applied in exploration efforts for conventional hydrocarbons.

The aim of the study is to evaluate and understand the driving mechanisms of the basin's evolution and timing of the maturity of the individual shale formations to qualitatively assess the source rocks potential for shale gas generation, to quantify the amounts of adsorbed and free gas. The factors considered first order parameters for the generation of shale gas are total organic carbon, maturity, thickness, burial depth and mineralogy and structural setting, and only those factors of significant variations and impetus were considered for the CRS maps. This traffic light styled CRS map, illustrates areas of high risk (green), moderate risk (orange) and low risk (red). The delineation of the Karoo basin into low, moderate and high risked area allows for the quantitative estimation of the resource potential both deterministically and probabilistically.