



New insights on the Karoo shale gas potential from borehole KZF-1 (Western Cape, South Africa)

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A study on world shale reserves conducted by the Energy Information Agency (EIA) in 2013 concluded that there could be as much as 390 Tcf recoverable reserves of shale gas in the southern and south-western parts of the Karoo Basin. This would make it the 8th-largest shale gas resource in the world. However, the true extent and commercial viability is still unknown, due to the lack of exploration drilling and modern 3D seismic.

Within the framework of the Karoo Research Initiative (KARIN), two deep boreholes were drilled in the Eastern and Western Cape provinces of South Africa. Here we report on new core material from borehole KZF-1 (Western Cape) which intersected the Permian black shales of the Eccca Group, the Whitehill Formation being the main target formation for future shale gas production.

To determine the original source potential for shale gas we investigated the sedimentary environments in which the potential source rocks formed, addressing the research question of how much sedimentary organic matter the shales contained when they originally formed.

Palynofacies indicates marginal marine conditions of a stratified basin setting with low marine phytoplankton percentages (acritarchs, prasinophytes), good AOM preservation, high terrestrial input, and a high spores:bisaccates ratio (kerogen type III). Stratigraphically, a deepening-upward trend is observed. Laterally, the basin configuration seems to be much more complex than previously assumed. Furthermore, palynological data confirms the correlation of marine black shales of the Prince Albert and Whitehill formations in the southern and south-western parts of the Karoo Basin with the terrestrial coals of the Vryheid Formation in the north-eastern part of the basin. TOC values (1-6%) classify the Karoo black shales as promising shale gas resources, especially with regard to the high thermal maturity ($R_o > 3$).

The recently drilled deep boreholes in the southern and south-western Karoo Basin, the first since the SOEKOR exploration programmes of the 1960's and 1970's, provide new core material to determine the likely current potential for retention of shale gas with regard to the structural and thermal history of the basin. Thus, the KARIN research program will produce a valuable data set for future unconventional gas exploration and production in South Africa.