IMPROVED PROCEDURES FOR ASSESSING THE UK SHALE GAS RESERVE

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Background: Exploitation of shale gas has transformed the energy resources of the USA, and a recent study by the British Geological Survey estimates that such resources in the UK are relatively large. However, the work to date is based on a pyrolysis technique, Rock-Eval, to assess the magnitude of shale gas reserves in the UK that does not measure methane generation directly. In order to provide a much improved overall assessment of shale gas reserves, it is important to relate the timing of gas generation as a function of temperature and pressure over geological timescales, to the holding capacity of the rock. Further, to understand the quantities of extractable shale gas, research is required on both the mechanisms of its formation, and how the gas is held within the shale, *i.e.* by adsorption on the kerogen and shale rock, and by dissolution in fluids as a function of pressure.

It is well established that laboratory water (hydrous) pyrolysis experiments closely simulate natural oil generation in geological basins. Equipment at the University of Nottingham has the capability of operating at high water pressures, and we are the only researchers in the UK that can conduct such high water pressure pyrolysis experiments. The proposed approach will be to quantify the maximum amount of gas that can be generated as a function of temperature and pressure from a number of UK shales.

Timeliness and aim The proposed research will catalyse a new collaboration between BGS and Nottingham that will fundamentally improve our understanding of the generation and retention of shale gas. It brings together the applicants unique experience with high pressure systems and will lead to the engagement of DECC and the oil industry.

The aim is to conduct an extensive high pressure water pyrolysis study to determine the amount and composition of gas generated up to a maturity corresponding to a VR of 3.0% Ro. The matured source rocks will be characterised to relate the aliphatic content of the shale in relation to its methane-generating capacity and the pore structure to the methane-holding capacity. The characteristics of the matured source rocks in terms of their porosity and methane adsorption characteristics will be compared with actual shales.

Research programme The following types of samples for a number of UK shales are available from BGS.

(i) An outcrop of low, pre-oil window maturity.

(ii) A core sample of mid-oil window maturity.

(iii) higher maturity samples will be provided to draw comparisons with those matured by high water pyrolysis.

The successful candidate will be expected to apply their knowledge of organic geochemistry, analytical chemistry as well as fuel science toward an improved shale gas resource estimate for the UK. Scientists will be allowed to develop their own programme of work and explore novel experimental approaches to deliver a solution over 3 years. Core analytical skills might include knowledge of hydrous pyrolysis techniques and use of GC/MS and GC/IRMS instrumentation to elucidate aliphatic and other compound classes. Additionally, the candidate will be expected to seamlessly integrate these detailed geochemical interpretations within a broader team of geoscientists (palynologists, geologists and geophysicists) working in sphere of unconventional energy.

This research opportunity is suitable for organic geochemists, petroleum geochemists and fuel scientists