



Cheshire Energy Research Facility Site (CERFS): A new experimental observatory location for geoscience energy research.

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Addressing future energy challenges and new zero carbon targets will require increasing use of the subsurface. Utilising the subsurface with public consent requires impartial, independent and open data to adequately evaluate potential risks. De-risking of the subsurface is dependent on new standardised data, highly characterised locations and readily available subsurface experimental facilities to deliver the innovation needed.

To address this NERC and UKRI have provided funding to BGS to construct geoscience observatories at two UK locations to deliver new long-term research. Such observatories require the geology to be characterised in detail, to provide a database to baseline new hypothesis-led experimental science.

The observatories will benefit from a pre-existing database of high quality geoscience data to increase over the operational lifetime. Characterisation of each facility site has involved the integration of baseline monitoring, regional borehole data and where available 2D and 3D seismic which are beyond the limits of research budgets. Once completed each observatory site will comprise a wide range of publicly available data including: fully-cored and characterised boreholes, facilities to baseline the regional groundwater environment, a set of new downhole sensors for time-series monitoring of geophysical and geological parameters served in real-time via the internet to anyone.

The construction phase of the UK Geoenergy Observatories (UKGEOs) Cheshire Energy Research Facility Site will begin construction in summer 2020. The site has been chosen at an accessible location in a sequence of scientifically and significant Triassic to Carboniferous strata. This sequence is typical of the sediments under much of northern England, included areas which have been explored for oil hydrocarbons. Up to 50 boreholes between 50–1200m depth will be drilled, with a combined length of up to 8000m, including 3000m of core and geophysical logging, including resistivity borehole imaging.

The boreholes will be split in arrays to characterise the region including: baseline groundwater, quantify the baseline seismicity down to near globally unique resolution of -0.6 to -1.0 M and characterising a volume of rock so it can then be dynamically parameterised with properties. This will become a default locations for synthesis and testing of new solutions to energy by becoming

the basis for an experimental facility where natural and anthropogenic perturbations can be undertaken and monitored.

UKGEOs will create a long-term experimental facility open for all scientists for experiments and testing of new subsurface technology. All materials recovered will be available for sampling with derived data and published research made available to create an ever-growing archive of data to facilitate future understanding.

An immediate priority research question is the capacity for faults to act as conduits or barriers to subsurface fluid flow. This is a major concern to the public around hydrocarbon developments but is of critical relevance to any development of deep geothermal heat, subsurface storage of energy and gas or Carbon Capture and Storage. CERFS will provide the facilities to deliver such research and new insights.