Can the canary tweet again?
The Geoenergy Observatory in Glasgow - A new research facility for mine water geothermal energy

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Carboniferous coal-bearing strata provided a key energy source in Scotland during the 1900s prior to the advent of the oil-shale and oil and gas era. Today, flooded mines in the same rock succession are starting to provide an alternative decarbonised energy source for space heating and cooling known as mine water geothermal or shallow geothermal.

This renewable energy source has a large resource potential but there are challenges to commercially viability for investors including technical risks and markets for long term supply of heat. There are geological uncertainties inhibiting the development of shallow geothermal energy ranging from a lack of understanding about the rock mass thermal and hydrogeological properties through to concerns about the sustainability of the resource. The need for the facility to be located in close proximity to the market often in highly urbanised areas and regulatory requirements further constrain the widespread development of this energy source.

In 2016 the Natural Environment Research Council provided UK Government funding to the British Geological Survey to construct the Glasgow Geothermal Energy Research Field site, part of the UK Geoenergy Observatories. This observatory consists 12 boreholes and surface environmental monitoring, and is located in the Eastern suburbs of Glasgow within the Cuningar Loop where coal mining and heavy industry was prevalent (Figure1). Six of the boreholes are used for environmental baseline monitoring and characterisation including a dedicated 199mOD deep seismic borehole with five seismometers installed. The remaining six boreholes target the abandoned and flooded mine workings at depth of 50-90m below ground level. These mine water boreholes are instrumented with electrical resistivity tomography sensor cables and fibre optic cables to measure changes in resistivity of the rock between the boreholes and the temperature along the length of the borehole.

During the drilling, a core was acquired from the seismic borehole and cuttings were taken every metre for the remaining eleven boreholes. Part of the core has been assigned to geomicrobiology researchers to advance the understanding of the role of microbes within the subsurface. Fluid samples were also collected during the drilling to gain information about the geochemistry of the minewaters. Sharing of open data is key to the UK Geoenergy Observatories concept and data packs are being made available on the project website (ukgeos.ac.uk)

This talk will provide a brief overview of the principles of shallow geothermal energy (Figure 2) with the main focus on the construction of the Observatory and initial results from some of the collected data. It will address the forward plan for the facility which is hoped to attract researchers from all fields to undertake their own experiments and assist in enabling shallow geothermal to become a plausible alternative energy source for some regions of the UK.

Figure 1: Location of boreholes within Cuningar Loop

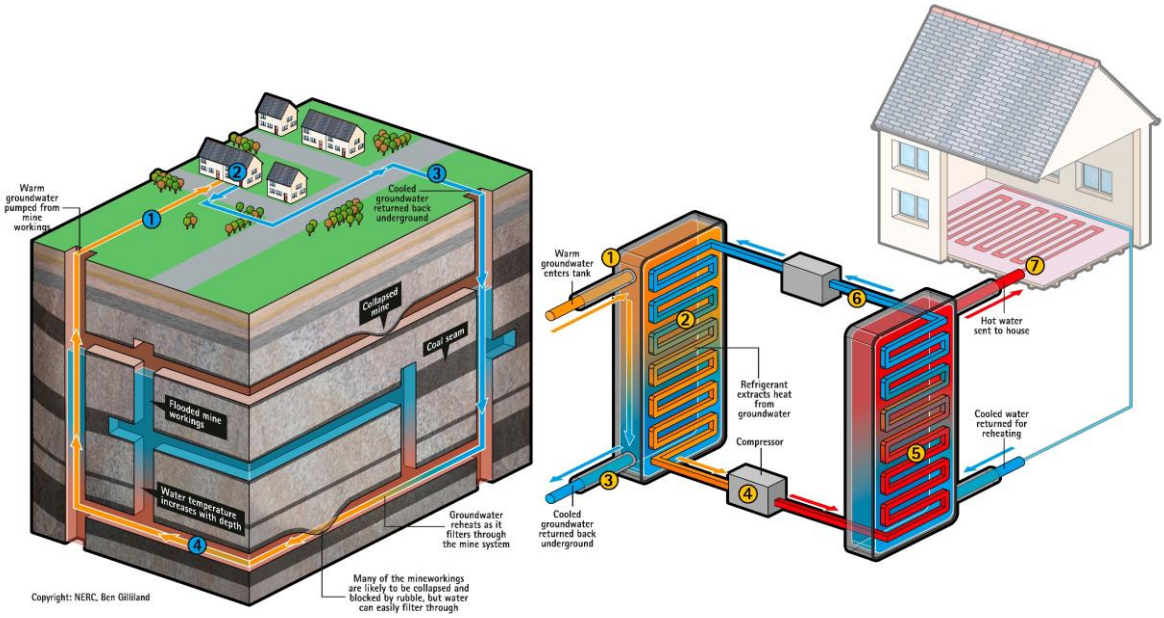

Figure 2: Principles of mine-water geothermal energy