

## UK Geo-energy observatories: developing a visualisation for site appraisal, investigation, and communication

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Here, GeoVisionary is used to visualise and interpret data above and below ground in a digital twin replicating everything that exists in the real world in a virtual reality environment. This approach is being taken at three sites as part of the UK GeoEnergy Observatories project (<https://www.ukgeos.ac.uk/>): the Cheshire Energy Research Field Site (Thornton, Cheshire, England), the Glasgow Geothermal Energy Research Field Site (Scotland), and Cardiff Urban Geo Observatory (Wales). The Glasgow site will study geothermal energy from flooded mine-workings. The Cheshire site will study the geology around Ince Marshes for energy science research. The Cardiff site will improve our understanding of the way groundwater moves in a complex geological environment with an emphasis on shallow geothermal heat recovery and storage. All the field sites will have a network of deep and shallow boreholes containing state-of-the-art telemetric monitoring devices. These will act like stethoscopes to precisely measure the state of the underground environmental baseline and changes that may occur. GeoVisionary can visualise the live data from the monitoring along with maps and 3D models, highlighting changes in the subsurface that occur naturally but also from the experiments that are planned. Contextualising the data in 3D using GeoVisionary will help various groups to understand the data and possible explanations behind changes that may occur. As part this work, Virtualis and BGS are developing a cloud-based version of GeoVisionary as another channel to effectively communicate the science behind these borehole networks and the data that will be captured. The cloud version will have a specially designed Graphical User Interface (GUI) that will allow users of this system to easily zoom to bookmarked locations. Follow 'fly-throughs, alter the state of view by turning-off and on pre-loaded data, incorporate contextual data such as reports, presentations and videos, while also enabling the user to have the full raft of tools to fly freely around the surface and subsurface and interrogate the data.

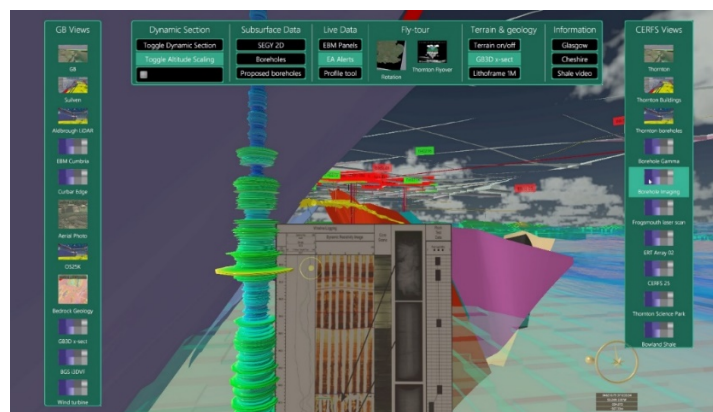


Figure 1. GeoVisionary enhanced GUI for site investigation and communication.