

Mine water heat and heat storage the UK



The Coal
Authority



Dr Charlotte Adams
Commercial Manager Mine Energy

UK
RI



Natural
Environment
Research Council



British
Geological
Survey

Dr Alison Monaghan
UK Geoenery Observatories
Glasgow Science Lead

The Coal Authority



responsible for
£2.4bn
Of coal legacy
liabilities



Over 400km rivers cleaned or protected – over £30million/annum aquifers protected

The Coal Authority

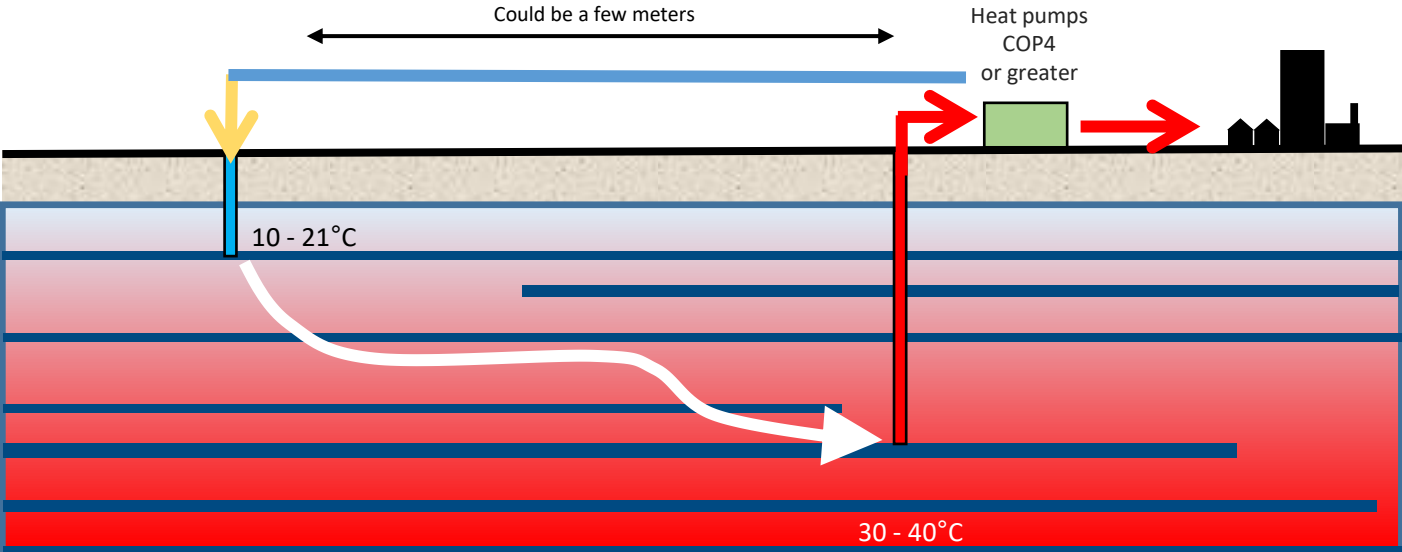
- Non-departmental Government Body
- Created by 1994 Coal Act
- Coal Authority own and manage UK coal mines



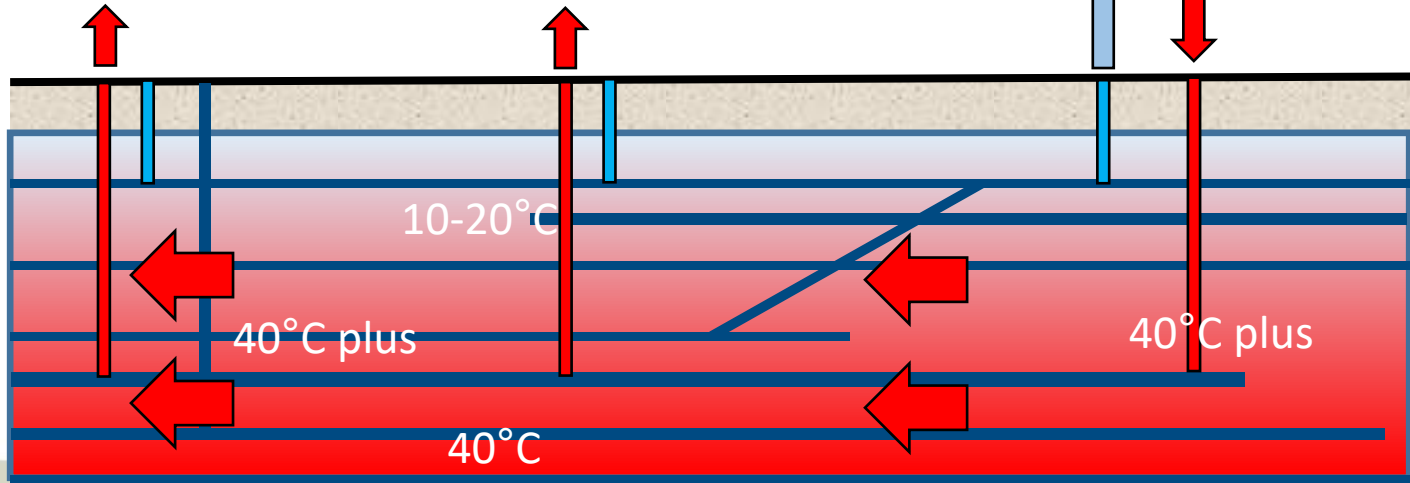
- 25% homes and business in coalfields
- 9:10 largest urban areas (geographical size)



Mine Energy Deployment



Mine energy potential

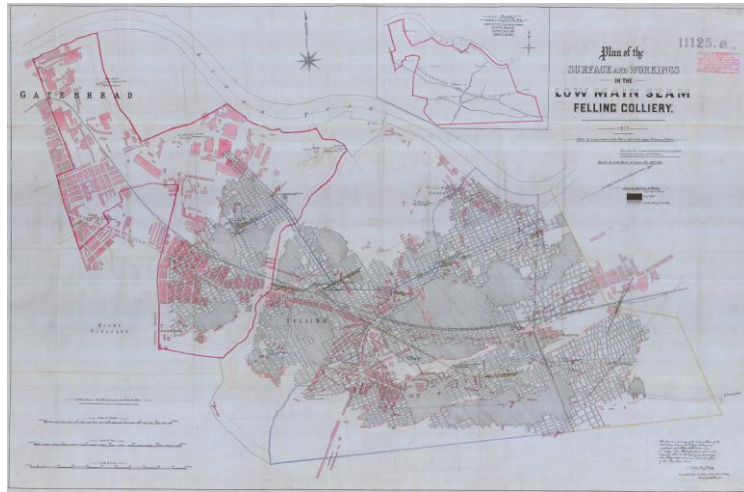


Seaham Garden Village



Dawdon MWTS

Gateshead



NEWS TECHNOLOGY

Gateshead to heat over 1,000 new homes with expanded heat network

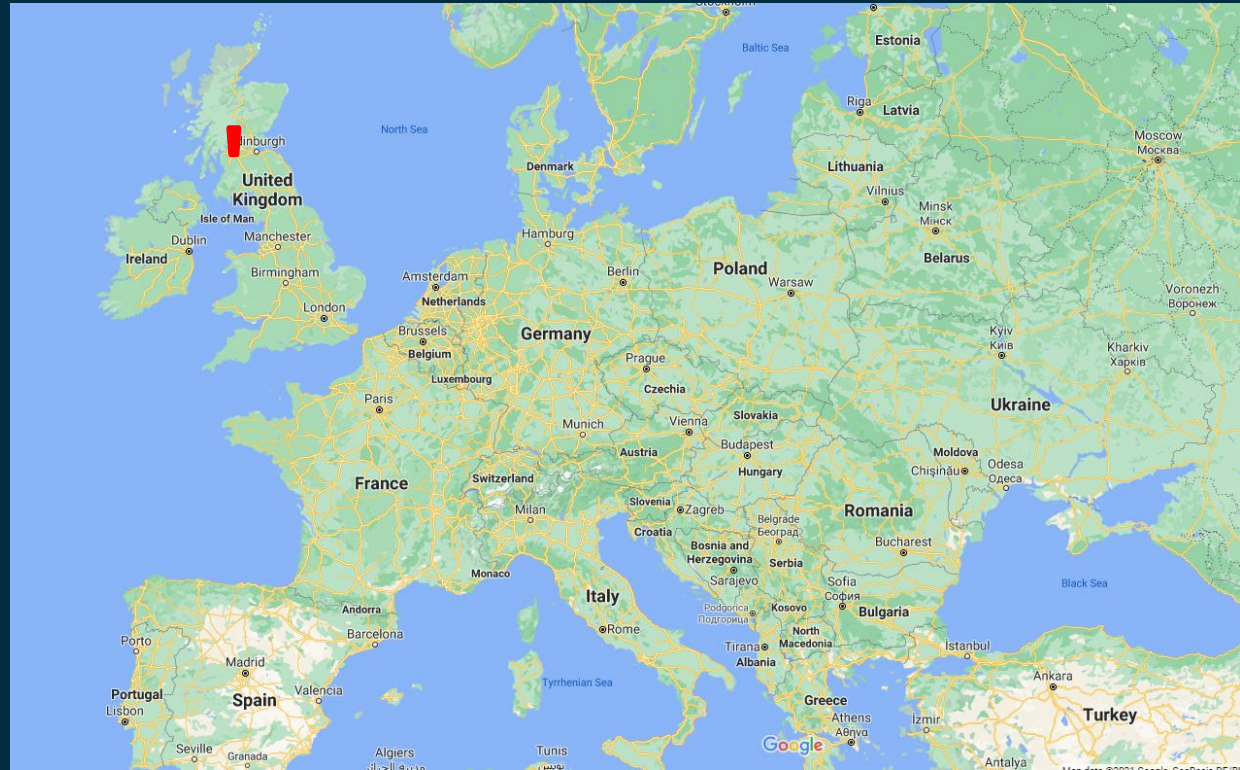
📅 20th May 2020 👤 Chris Ogden 👁 582 Views 📍 district energy scheme, Gateshead, Gateshead Council

Gateshead Council has been awarded a £5.9m grant to double the size of its town centre heat network, potentially benefiting over a thousand new homes.

The Heat Networks Investment Project (HNIP) grant will allow the council-owned Gateshead Energy Company to install up to 5.5km of new heating pipes to the east of Gateshead town centre.

UK Geoenergy Observatory

Glasgow



An underground observatory for mine water heat

1. Evidence base - how to transfer heat sustainably and economically
2. Monitoring and managing any wider impacts of subsurface change
3. Technology innovation

Reduce uncertainties, costs, inform policy and regulation, raise awareness, improve engagement etc.



Glasgow Observatory Site 1 July 2020. Photo courtesy BAM Nuttall

Borehole locations

Site 10 - seismic monitoring borehole

City centre

Site 5 environmental baseline boreholes

Site 2

Site 3

Site 1

Mine water & baseline boreholes

Cuningar Loop

River Clyde

Eastern Glasgow and Rutherglen are typical of many former coalfield communities

An industrial legacy and urban regeneration

Glasgow Observatory

Boreholes
and research
compounds



BGS@UKRI



Photo courtesy BAM Nuttall

Open data

- Geological platform & models
- Static data packs
- Continuous (time-series data)

Observatory	Data Type	14.05
Glasgow	GGA01 borehole information pack	14.05
Glasgow	GGA02 borehole information pack	14.05
Glasgow	GGA03r borehole information pack	14.05
Glasgow	GGA04 borehole information pack	14.05
Glasgow	GGA05 borehole information pack	14.05
Glasgow	GGA06r borehole information pack	14.05
Glasgow	GGA07 borehole information pack	14.05

ukgeos.ac.uk

Glasgow
Observatory

Sensors
Samples
Monitoring



BGS@UKRI

Stakeholder
& public
engagement

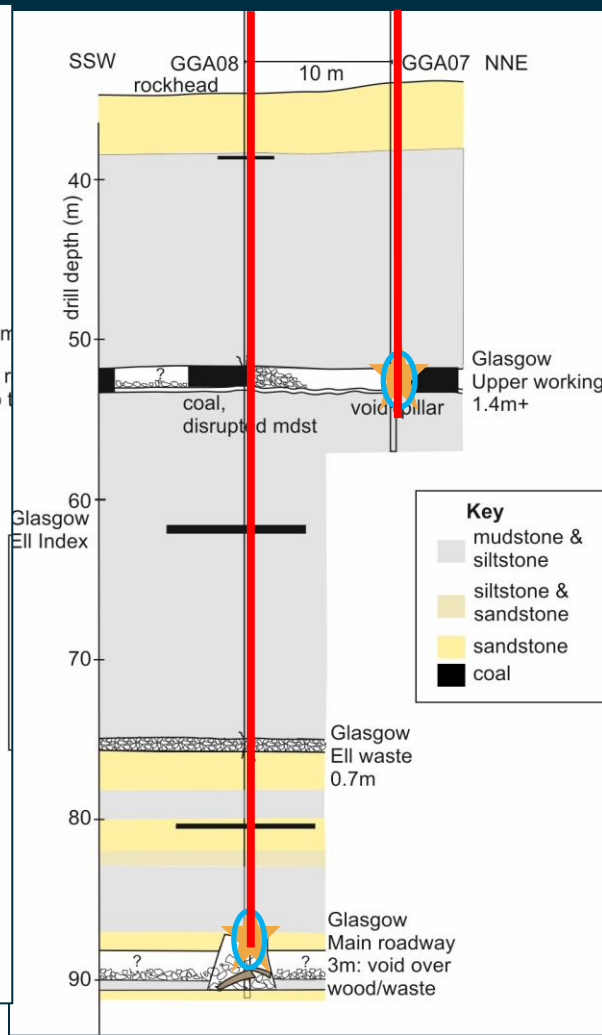
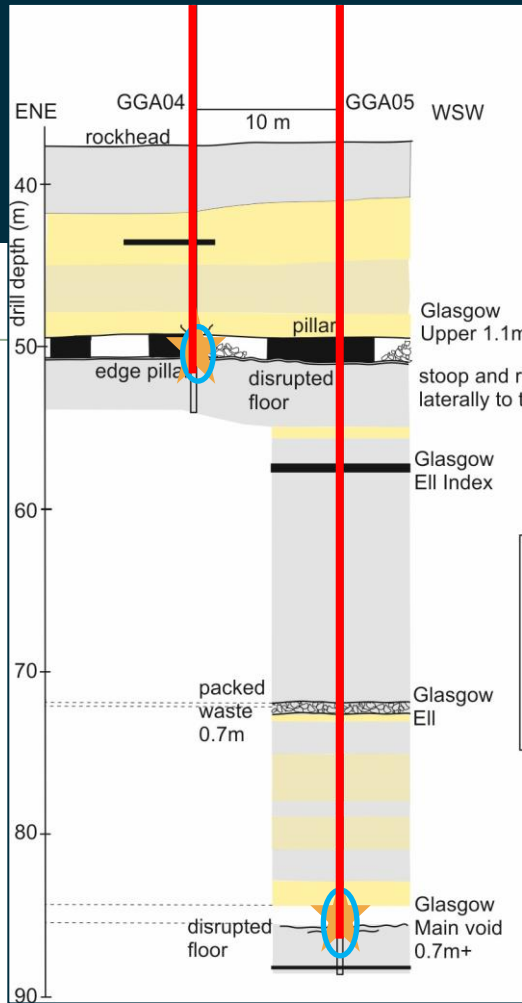
Environmental
baseline

- Surface water
- Groundwater
- Soil chemistry
- Ground gas
- Seismic monitoring
- Ground motion



Surface water sampling BGS@UKRI





Borehole infrastructure

Different types legacy workings for heat abstraction/ storage

 Screened interval

 Sensor cables

 Data loggers

4 of the mine water boreholes, 246 mm ID

Subsurface &
resource
characterisation

SIZE, FLOW RATES,
CONNECTIVITY,
RECHARGE,
CHEMISTRY ETC

Example

Quantifying the resource



Thermal breakthrough



Regulation & licensing :
Interactions between multiple
schemes



*Groundwater sampling of a mine water borehole at the UK
Geoenergy Observatory in Glasgow, BGS©UKRI*

Innovation

NEW TOOLS AND METHODS

At-scale observatory:
a stepping stone to commercialisation

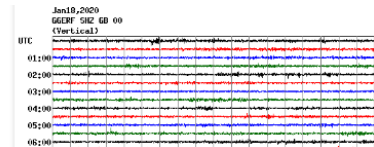
Access boreholes, compounds, samples, data

Water treatment technologies



David Banks/TCA. Effect of oxygenation of mine water on a heat exchanger

Continuous sensor data – analytics



Live seismic data

Sensor testing



Energy system, energy transfer and storage technologies



Ground source heat pump, Cardiff nursery school ©BGS

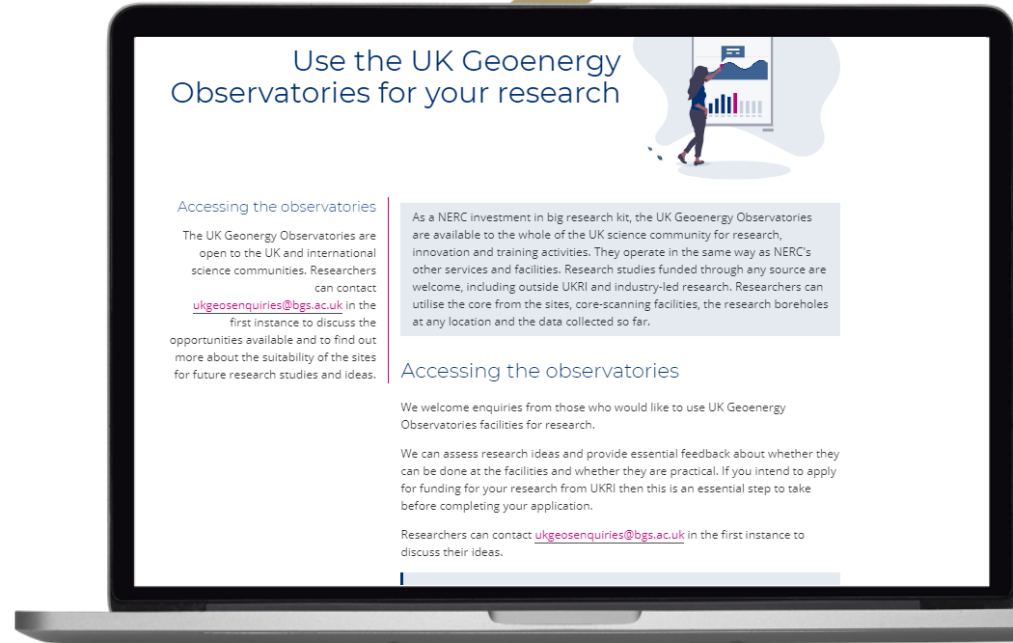


Using the Observatory and open data

Contact us

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Summary: mine water energy in the UK

From liability to green recovery

Using legacy mines for decarbonised heat for buildings
Integrated heating/cooling networks with heat storage

- Developing mine water energy schemes across the UK
- An underground laboratory in Glasgow for research and innovation

Major policy shifts to meet net-zero carbon emissions targets - decarbonisation of heating and cooling using legacy coal mines offers a **significant opportunity**

