# Hot rocks fire up energy from the depths

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(PhysOrg.com) -- Scientists at Newcastle University have completed the first phase of a giant central heating system that will harness heat from deep underground.

A team of scientists and engineers today (23 June 2010) pumped out the first hot water from the depths of Weardale as part of a landmark project to investigate the potential of geothermal energy as a source of renewable heat.

The twin borehole system is the first of its kind in the UK and will allow warm groundwater - heated by the hot granite rocks hundreds of metres below ground - to be continually cycled through a 1,000m underground heating system.

Led by Newcastle University, the geothermal borehole is one of five forms of land-based renewable energy sources being considered for the

proposed Eastgate eco-village in Weardale.

The University team believe it could not only provide renewable, clean energy for homes and businesses, but also some of the natural hot water could be used in a spa - the first such development in the UK since the Romans tapped the hot springs at Bath.

Project lead Professor Paul Younger, of Newcastle University, says that using a twin set of boreholes solves problems which have hindered other attempts to use deep-seated hot water.

“Once you find hot groundwater then pumping it to the surface through a single borehole isn’t the problem - it’s what you do with the water afterwards that has held back geothermal energy,” he explains.

“Water from such depths is twice as salty as seawater, so unless you happen to be on the coast, you can’t let the spent water simply flow away at surface but cleaning the water is both energy intensive and costly.

“In this system we are re-injecting the water using a second borehole. This means we are able to maintain the natural water pressures in the rocks and allow pumping to continue for many decades to come.

“So, by recycling the hot water through what is essentially a huge central heating system deep underground, we can produce an almost carbon-neutral source of energy.”

Following a grant from the Department of Energy and Climate Change earlier this year, the team has drilled a second - or ‘reinjection’ - borehole to complement the 995m deep exploration borehole which was originally drilled three years ago.

Water at a temperature of around 30-40ºC is brought up to the surface

where it passes through a heat exchanger before being sent back underground to be re-heated.

Used water is reintroduced to the granite at about 420m deep, and heated up again as it flows through a complicated maze of fractures on its way back to the pumping borehole.

Newcastle University's Professor David Manning said the Eastgate borehole was a 'geothermal prototype' that could be used at other 'hotspots' across the UK.

He explained: "Water deep underground gets heated by the naturally-occurring low-level radiation that is found in all rocks.

"Some rocks are far better at producing heat than others - especially granite of the kind we have drilled into at Eastgate. This makes it one of the country's 'hotspots' - where water starts warming up quite close to the surface."

A spokesman for Durham County Council said the findings by Newcastle University were of real interest and the use of geothermal as a potential energy resource for Eastgate would be considered in due course.

Lloyd McInally, Lafarge Cement UK's rating and regeneration manager, said the borehole was an exciting first step for the former cement works site.

"The plans for the former Lafarge cement works at Eastgate have been developed to provide future generations with real opportunities at the same time as creating a genuine sustainable 'green' legacy for the Dale," he explained. "The twin borehole system is an important and exciting first step."

Professor Younger said the next step was to go even deeper. “There is every reason to suppose that if we drill even deeper here in future we will find water at boiling point, which is hot enough to generate electricity.”

Provided by Newcastle University