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Common Weal Policy

# RE-BOOTING THE NATIONAL ENERGY COMPANY FOR SCOTLAND WITH GEOTHERMAL ENERGY

# COMMON WEAL



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## INTRODUCTION

In an uncertain global environment, Scotland more than ever needs accelerated action on the energy and the climate crisis, and yet one significant and proven source of renewable energy remains untapped since the turn of the century. We need to get geothermal energy back on the policy table.

Geothermal sources of energy come in three general forms: hot rocks; hot aquifers; and abandoned mineworkings. Scotland doesn't have many hot rocks or aquifers, but it does have plenty of abandoned mineworkings, two proven examples where homes are using that energy, and a specialist research and testing centre. Also, conveniently, our mineworkings tend to be in the sorts of post-industrial areas that are crying out for jobs and regeneration. Does this sound like a wasted opportunity to you?

And one more thing. With Wales now pushing ahead with plans for a public energy company, based in no small part on proposals developed here in Scotland, we could be taking a safe bet on energy from mineworkings as a way to address these twin emergencies as part of a pragmatic and comprehensive reboot of our own National Energy Company.

## ACTION AND DELIVERY – IT'S TIME TO GET THE NATIONAL ENERGY COMPANY BACK ON THE TABLE

Climate change still dwarfs the myriad crises we've had to contend with these past few years – now, after a difficult winter with a fuel crisis on top, it's more important than ever that Scotland makes the most of her natural resources to provide energy at a fair cost to her citizens and at no more cost to the environment. Geothermal potential in Scotland has been explored at length with projects at Shettleston in Glasgow and Lumphinnans in Fife developed around the turn of the century<sup>1</sup>. These

were followed by substantial new work undertaken in the early 2010s<sup>2,3</sup>. Yet despite having its own special research facility<sup>4</sup> and wealth of support from all those who would be needed to design, develop, and construct new projects, this work has, so far, been unsuccessful in spurring new developments and Scotland now risks falling behind with developing this valuable resource.

However, these more recent studies show that, across the central belt and beyond, there is significant untapped potential to source heat from water in abandoned coal mines as an innovative and practical solution to one of the many big challenges facing our economy and our climate future – decarbonising heat supplies. In this paper, we're arguing that this heat source could be a focus to re-boot our ambitions for a National Energy Company<sup>5</sup>, a policy strongly supported by the SNP membership and also popular with the general public, where Scots are stakeholders in their own natural energy sources. This local supply of heat could provide a short-to medium-term solution to the current energy crisis and ever-increasing levels of fuel poverty, provide energy security and resilience for local coalfield communities still recovering from the pit closures of the last century and make great strides forward on our journey to net zero.

Once established, we envisage scaling up this approach right across the country in consultation with communities on the best local renewable energy fit for their homes and businesses. With a range of renewable options in the mix, from wind, solar, wave and tidal, through to hydro, hydrogen and geothermal, bespoke solutions can be sought depending on availability, accessibility, geography and local engagement. We feel its apt to re-boot our National Energy Company ambitions with an energy plan focussed on social justice as well as sustainability, one that reflects our values as a nation and our ambitious climate targets. One that puts all of us first.

Now more than ever its vital we deliver on these values and ambitions with an impact driven action plan for domestic resilience and fairness for all Scots.

## WHY GEOTHERMAL?

At present the Coal Authority manages abandoned mineworkings for environmental and operational reasons. They estimate that around a quarter of the UK's population live above abandoned coal mines and that flooded shafts contain around 7,920 petajoules of heat, with the potential to store more. For comparison, natural gas supplied 1,080 petajoules for domestic heating in 2020<sup>6</sup>.

The Coal Authority is already in talks with a number of local authorities on projects at Seaham, Hebburn, and Nottingham, with Seaham having the potential to become the largest-scale mine energy district heating scheme in the UK<sup>7</sup>. The current leader is Gateshead, where a scheme developed by the publicly-owned Gateshead Energy Company began supplying Gateshead College, the Baltic Arts Centre, several offices, and 350 council owned homes in March 2023<sup>8</sup>. Scotland was initially a pioneer in the UK, the technology is proven, and we have everything we need to re-take that lead. All we need is to kickstart our thinking and get boots on the ground.

In Scotland, the main source of mine water heat lies right across the central belt, where the greatest proportion of the population reside. Given the emergency we face in terms of climate change and energy price hikes, we need to think strategically and practically on short term, midterm and longer-term energy strategies that create resilience and fairness on sustainable access to decarbonised heat for Scottish citizens. Geothermal hits the short-term mark in terms of a relatively quick turnaround to get mine water heat schemes up and running for the greatest proportion of the population in Scotland in this respect, creating a blueprint for local energy success that can be scaled up nationwide according to communities' bespoke needs. Outside the central belt, research conducted for the Scottish Government around the same time as the mineworkings feasibility studies found that a combination of standard retrofit measures and individual ground source heat pumps (GSHPs) hit the sweet spot for decarbonising many of the timber-framed homes found in rural areas<sup>9</sup>. And we can't ignore deep geothermal either, at least in East Grampian and to the north of Inverness.

Geothermal technologies, from ground source heat pumps to deep geothermal plants, can be connected to heat networks which have one of the lowest carbon footprints for space and water heating. In fact, taking shallow and deep geothermal resources together, the contained accessible heat in the UK is sufficient to deliver about 100 years of heat supply for the UK and meet nearly 10% of electricity demand at present consumption rates<sup>10</sup>. And did we mention that we already have our own specialist research facility to help ensure we get all this right? The UK Geo-energy Observatory in Glasgow is an at-scale, flexible research infrastructure designed to investigate shallow, low-temperature mine-water heat energy and potential heat storage resources. The observatory complements existing and planned mine-water heat supply schemes, offering a unique capability for understanding how to balance our need for energy resources with keeping people safe, and providing evidence for environmental protection. Their USP is data - providing valuable information on this potential. And if that wasn't enough, many of our universities, including Glasgow Caledonian, Strathclyde, Glasgow, and Heriot-Watt, have long invested in research to support the deployment of shallow geothermal and heating and cooling networks in general; with GCU and Strathclyde already sharing a heat network and planning to expand it using water source heat pumps to sustainably extract energy from the River Clyde. Also in Glasgow, research by Glasgow Caledonian University has demonstrated the potential of harvesting heat from the city's subway system, which could provide another way of recovering waste heat whilst also helping to keep the subway cool in the summer<sup>11</sup>.

So, whether it's recovering heat from mine-workings, getting GSHPs under our homes, or exploiting hot rocks and aquifers where we can find them, making a concerted effort to develop our geothermal sector should be an easy win.

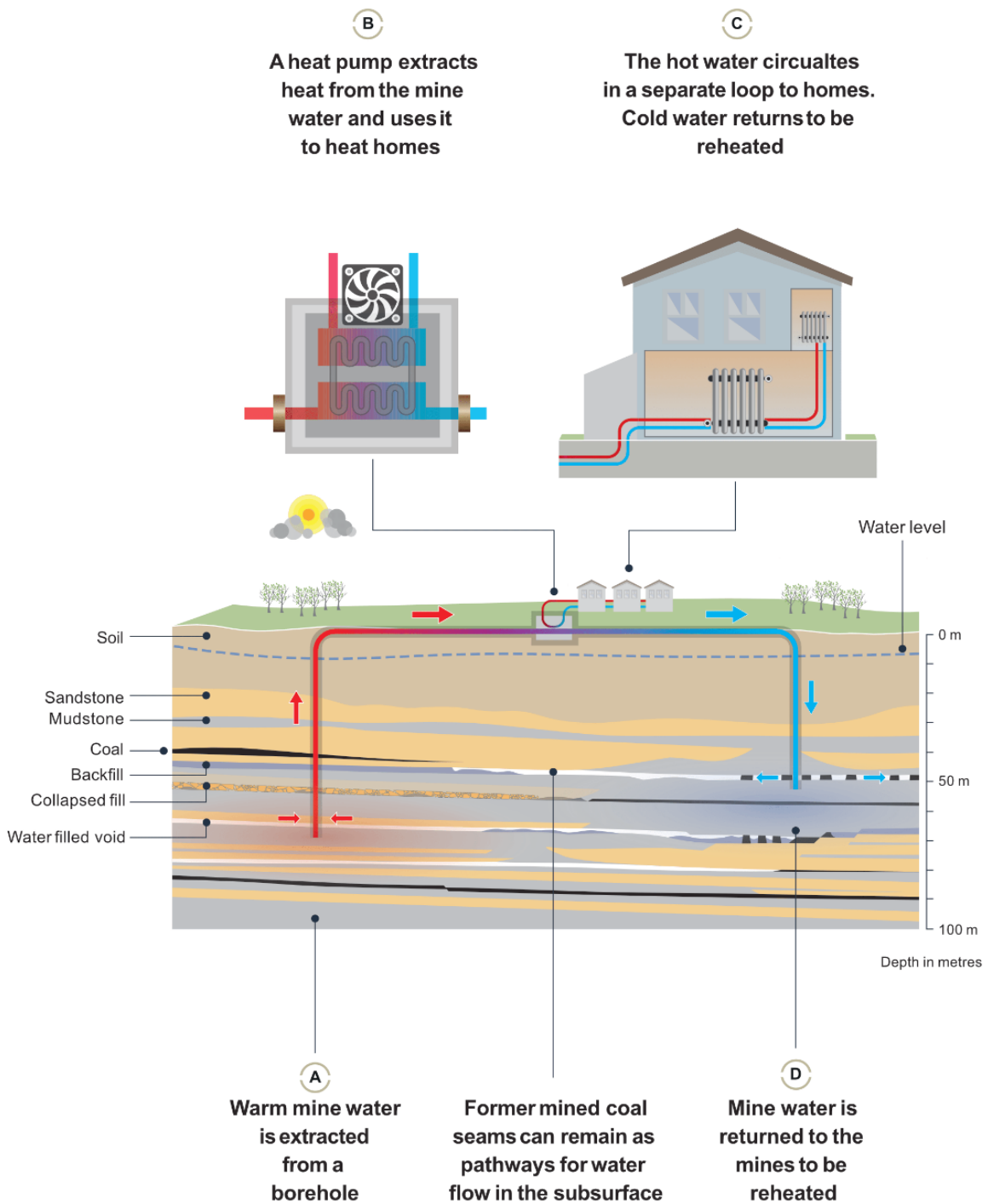
## HOW DOES SHALLOW GEOTHERMAL WORK?

Shallow geothermal systems use the low

temperature heat resource stored in shallow ground, groundwater and flooded mines. Ground source heat pumps are employed to transfer the heat for use in heating or cooling for homes and businesses. As a mature technology, GSHPs can be fitted to new and existing buildings and across almost all geological settings.

(Figure republished under the Open Government Licence. Contains NERC materials ©NERC 2023)

The water within disused flooded mine systems can be used for geothermal heating and underground thermal energy storage. At temperatures on around 10-25C, this is ideal for large scale open loop GSHP systems.



## LEARNING FROM OTHERS

We only need to look as far as the Netherlands to see the potential for investing in geothermal. In the municipality of Heerlen, a low-temperature district heating and cooling system was launched in 2005. The system currently supplies heating and cooling to more than 400 dwellings and 250,000m<sup>2</sup> of commercial buildings, with plans to connect 30,000 homes and offices by 2030<sup>12</sup>.<sup>13</sup> This network, developed by Mijwater B.V., is based on three basic principles: it is demand-driven; circular; and it can store energy. This innovative project has seen a 65% reduction in CO<sub>2</sub> emissions, providing the first urban pipeline network in Europe to supply both heat and cold to the connected customers.

The leading incentive for the municipality of Heerlen to initiate the Mijwater project was the rehabilitation of the region. After the coal mines had been closed and the industrial environment had been dismantled, the region faced a period of economic, social, and cultural decline. This context of factors is common in other former mining areas. The social historical context and approach was a key-factor for the social acceptance of the project. Old mine workers were actively involved in the project: during the planning stage, they were consulted to identify well's location.

Heerlen demonstrates that traditional mining regions can become champions of renewable energy. The city went from being a renowned coalmining area to being internationally awarded for its impressive efforts in the field of geothermal energy. The parallels with Scotland are obvious.

## LOCAL SOURCES, LOCAL BENEFITS

In an ideal world, Scotland would at least have fully devolved control of our own energy supplies, and the independence to make our own decisions on the most sustainable use of our natural resources for the benefit of our citizens

and the planet. One of these decisions would surely be to ensure that local resources reap local benefit, and don't repeat the endless profits to companies over communities and citizens that we've seen in oil and gas for instance. Here, again, geothermal makes sense because, with some minor limitations related to connecting to and exporting to the national electricity grid, there is nothing stopping us pushing ahead. We don't need permission from Westminster to get heat exchangers hooked up to mineworkings, to get GSHPs into the ground, to exploit waste heat from sub-surface sources (e.g., the Glasgow Subway), to find and exploit deep geothermal sources, or to build heat networks and connect all this kit to them.

We live in far from ideal times and could face another winter of staggeringly unfair energy prices, prevarication on green solutions, and mismanagement of existing resources from Westminster. Our devolved cousins in Wales have already taken matters into their own hands with a public energy company devised using Common Weal's original blueprint plan. Scotland needs to follow their lead and get this hugely popular policy back on the table as a matter of urgency.

## SCOTS AS STAKEHOLDERS

Just like Wales has focused on onshore wind, it makes sense for a Scottish public energy company to focus on developing one energy source initially, and there is a strong economic case for focussing on geothermal in this first instance. Although relatively few studies have been conducted on the energy return on investment (EROI – the key measure of economic viability) for geothermal, a key study from the USA found that the EROI to be between the same or up to ten times better than for exploiting oil and gas<sup>14</sup>. Even better, this study focussed on (more costly) deep geothermal and in an economic context more favourable to oil and gas than for the UK. Investing in geothermal might not be the cheapest option, but the returns are highly attractive, and that's before we even get to the benefits of tackling climate change, energy insecurity, and the cost-of-living crisis.



However, geothermal is still a lot cheaper than the eye-watering investments being discussed by the UK Government into nuclear power or small modular reactors, and a faster turnaround than nuclear power too in terms of getting low carbon energy at low cost into people's homes in the next few years as opposed to 12-year forecasts on nuclear. In addition, it's a stable local energy source which can't be taken away from the communities from where it's located (unlike the hidden pipelines for oil and gas that cross our borders), nor is it subject to seasonal variations or weather - so the 'no sun shining, no wind blowing' naysayers that have tried to hold back renewable growth so far can't use that argument on geothermal.

The co-benefits for communities match the ambitions and values of a National Energy Company managing this energy source where local communities are stakeholders in their own resources as active participants in this "energy democracy"<sup>15</sup>. Public engagement and participation will be a vital element of progress on geothermal, where communities are integral to the process and development of new sites, and can benefit from the social, economic and cultural impacts in terms of job creation, skills and training opportunities, refurbishment of homes, while also addressing fuel poverty issues with climate proof social and private housing.

In terms of economic rejuvenation, as well as job creation for local people and new openings for existing trades, expertise and skills from the fossil fuel industry will be required in line with the ambitions of a Just Transition on Scotland's renewable journey, with an opportunity to kick start domestic heat pumps manufacture and supply, and the exploration of vital energy storage capacity in these disused mines.

## GETTING WESTMINSTER ON BOARD

On a practical level, large investment will be needed initially and routes to funding via the UK Government's 'Levelling Up' agenda and green growth ambitions should be explored fully. The

Environmental Audit Committee at Westminster has observed that the Government has been slow to exploit the potential of geothermal and has not integrated it fully into the net zero strategy, something also addressed in the recent Net Zero Review from Chris Skidmore MP. This appears to be holding back a sector which could be transformative for the UK's capacity to meet climate goals, use homegrown energy and grow the economy. The EAC believes that the current policy, funding and regulatory landscape does not appear to be conducive to optimising this potential and recommends that the UK Government reform this policy and regulatory system as well as addressing blocks within the current Contracts for Difference scheme. Reform of the electricity market which is still tied to gas prices is an increasingly urgent issue stalling progress on existing schemes and needs addressed from Westminster.

Dr Kieran Mullan, the MP for Crewe and Nantwich, was first commissioned by former Prime Minister, Boris Johnson and now Rishi Sunak to conduct a review of Deep Geothermal potential. His report, 'Dig Deep', has recently been published and as well as recognising that the UK lags far behind our European counterparts for geothermal development, both deep and shallow, Dr Mullan recommends the UK Government to re-examine mechanisms for financial support, planning and regulation to reduce risk and break through barriers to kickstart our own domestic geothermal sector<sup>16</sup>.

As Dr Mullan points out, we only need to look to Europe for successful models on progress on geothermal. Early development risks are one of the main reasons why so few geothermal energy projects have been implemented in the UK to date. Research shows that the renaissance of geothermal in Germany for instance is not only due to a stable regulatory framework, but also to the increasing ability to insure the associated economic risks. In Germany, insurance is offered by private insurers, but in the Netherlands and France it is funded by the state. Success then lies in both government support and essential regulations and codes of practice put in place (as in Germany).

Finally, a recent report published by the All-Party Parliamentary Group for the Coalfield

Communities, 'Next Steps in Levelling Up the Former Coalfields'<sup>17</sup>, also recommends that the UK and devolved governments investigate geothermal mine water energy as a sustainable heating source across former coalfield areas.

A head of steam, pardon the pun, is building at Westminster to take action on geothermal and Scotland must make the most of this important momentum.

## A NATIONAL ENERGY COMPANY FOR SCOTLAND

Wales has taken the lead for the devolved nations on establishing a not-for-profit energy company where the Welsh Government own both the means of energy production as well as the retail arm which sells on the energy to customers. They have done this through cross-party support, a situation that can be replicated in Holyrood with a commitment to geothermal as the ideal energy source to kickstart Scotland's ambitions on a National Energy Company. Issues with energy

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as a reserved matter can be negotiated around clever and strategic use of our devolved powers on heat and planning in liaison with Westminster in terms of investment opportunities, reform of energy policy, Levelling Up pledges and net zero ambitions and now the UK Government's own report into the benefits of geothermal.

Comprehensive public engagement and participation must be an integral part of this process, where decisions are guided by communities' bespoke needs, using this approach as a blueprint to scale up across the country to find the best renewable fit for local areas where geothermal does not apply.

We believe a National Energy Company for Scotland is the best model to ensure the economic, climate and social benefits of local renewable energy stays local. Versions of this model are already in place with local authorities in the North of England collaborating with the Coal Authority and local business to establish Public Energy Companies, where profits are shared locally.

Scotland must seize the opportunity to replicate this success on a larger scale.

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