

GeoAtlantic: BOOSTING LOCAL ECOSYSTEMS FOR THE USE OF GEOTHERMAL ENERGY IN THE COMMUNITIES

Lars Johanning, Richard Cochrane, Robert Gurnett, Aleksandra Zawalna-Geer

(Renewable Energy Group, College of Engineering, Mathematics and Physical Sciences, University of Exeter)

1. Introduction

WHAT IS GEOATLANTIC? 36 months project (2017-2020) funded by the INTERREG Atlantic Area Program. Seeks to stimulate the use of geothermal energy in communities, through the joint development of tools and methodologies that enable the creation of favourable local ecosystems

Aims to improve knowledge and skills of different stakeholders, supporting innovation and technology transfer, as well as launching local policies and pilot demonstrations using geothermal energy

MOTIVATION:

- The heat sector accounts for nearly half of all energy consumed in the UK
- Majority of this heat is used for space heating & hot-water in buildings
- At present, most of this heating demand is met by the combustion of natural gas
- Burning fossil fuels for heat released about 160 million tonnes of carbon dioxide in 2015
- The UK must decarbonize heating for it to meet its commitments on emissions reduction
- Cornwall Council—no gas boilers by 2025

2. Geothermal Potential in Cornwall

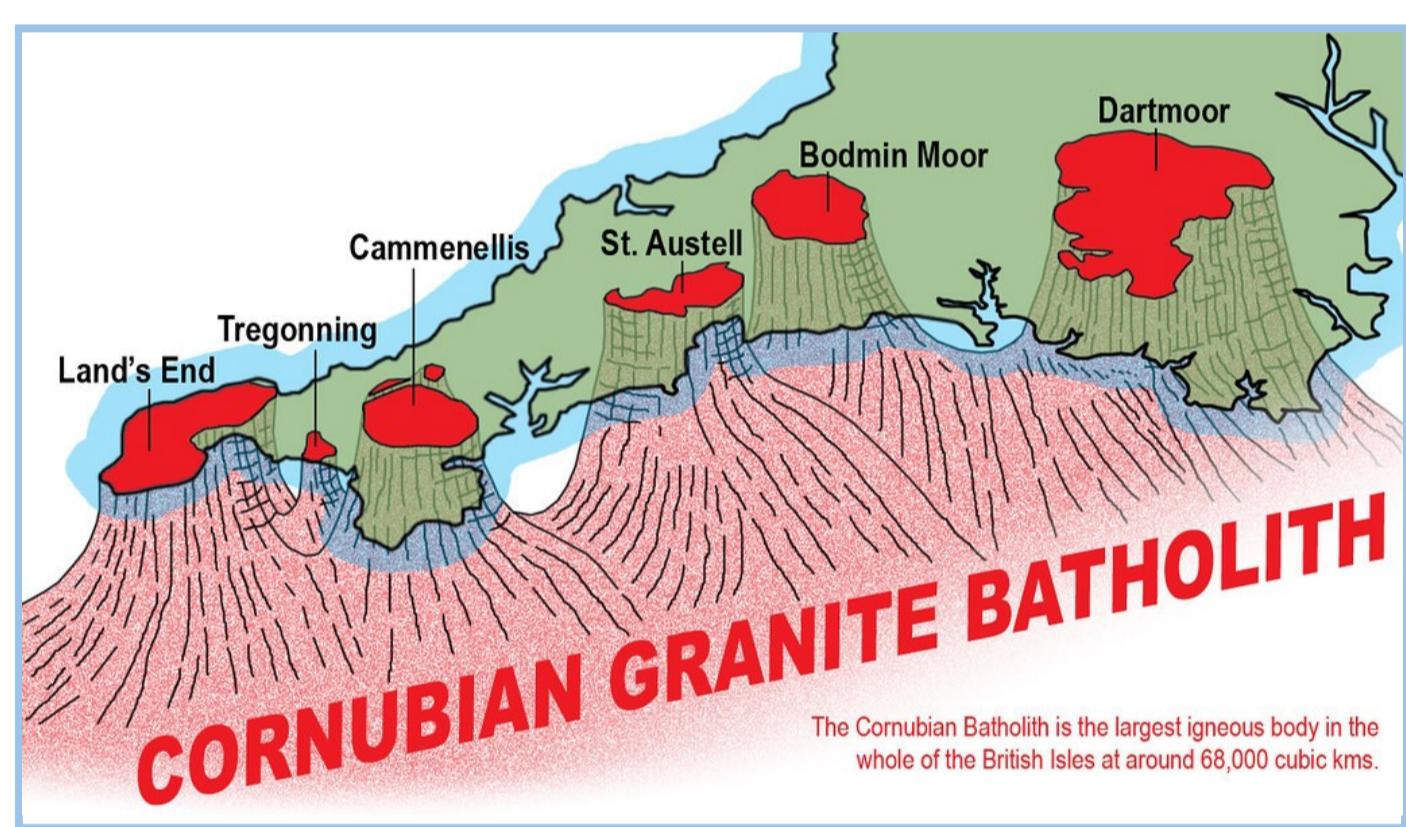


Fig. 1 Cornubian Granite Batholith

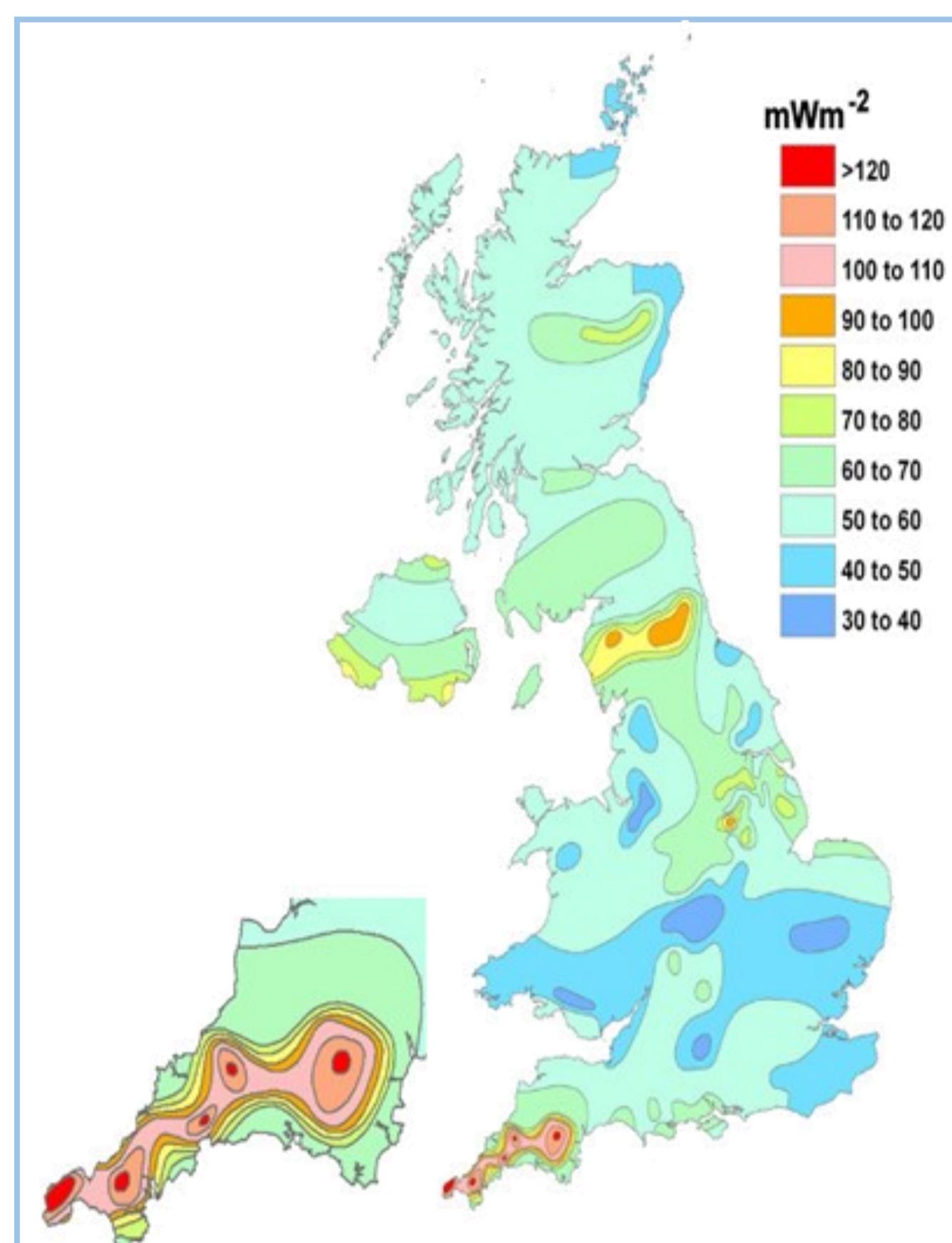


Fig. 2 Heat flow map of the UK (Busby 2010)

There are two main categories of geothermal system present in the UK:

- Hot Sedimentary Aquifer (HSA) - limited in Cornwall due to granite geology -> no naturally circulating water
- Engineered Geothermal Systems (EGS) - Cornubian Batholith -> a source of radiogenic heat

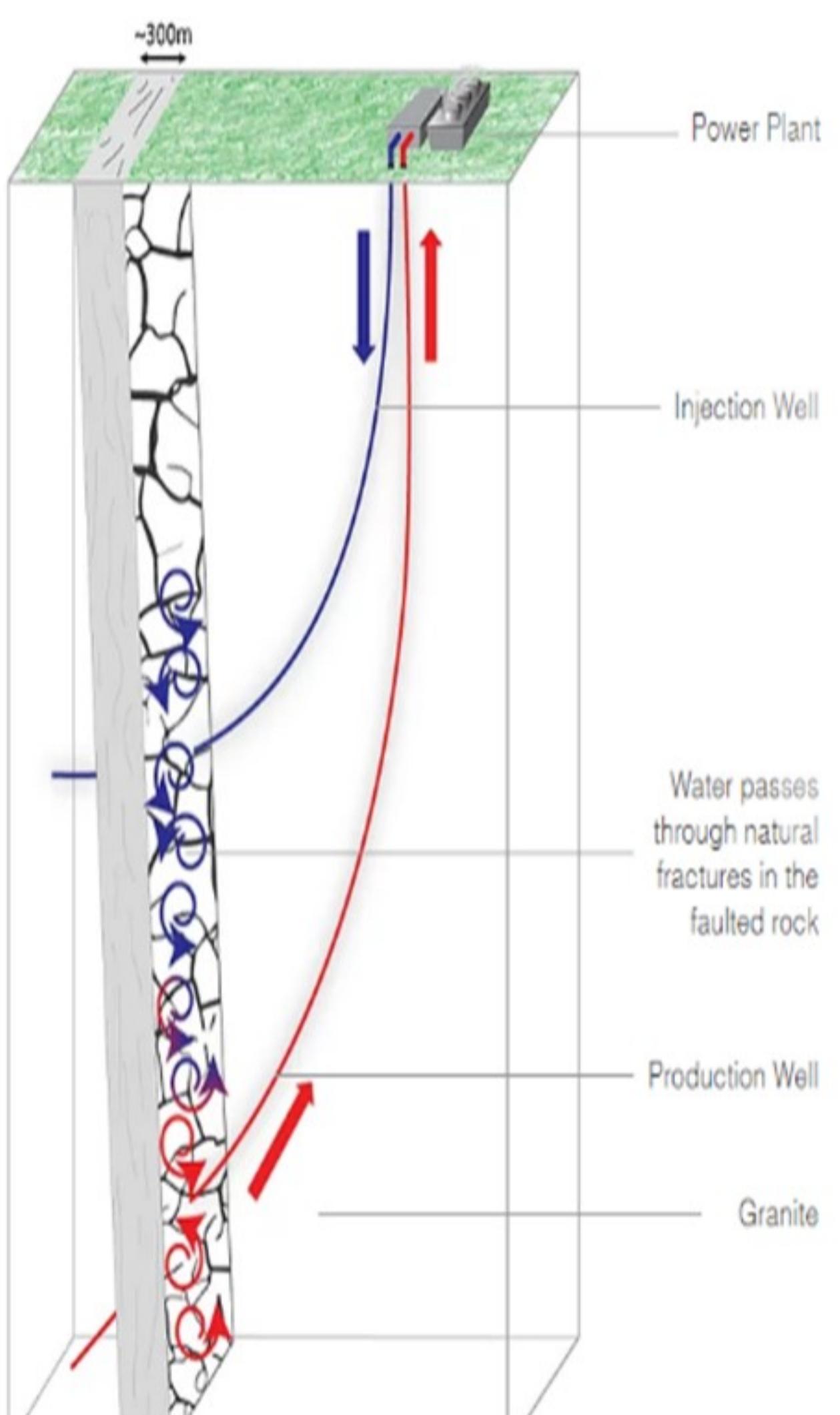


Fig. 4 United Downs Project Schematic
(Geothermal Engineering Ltd 2019)

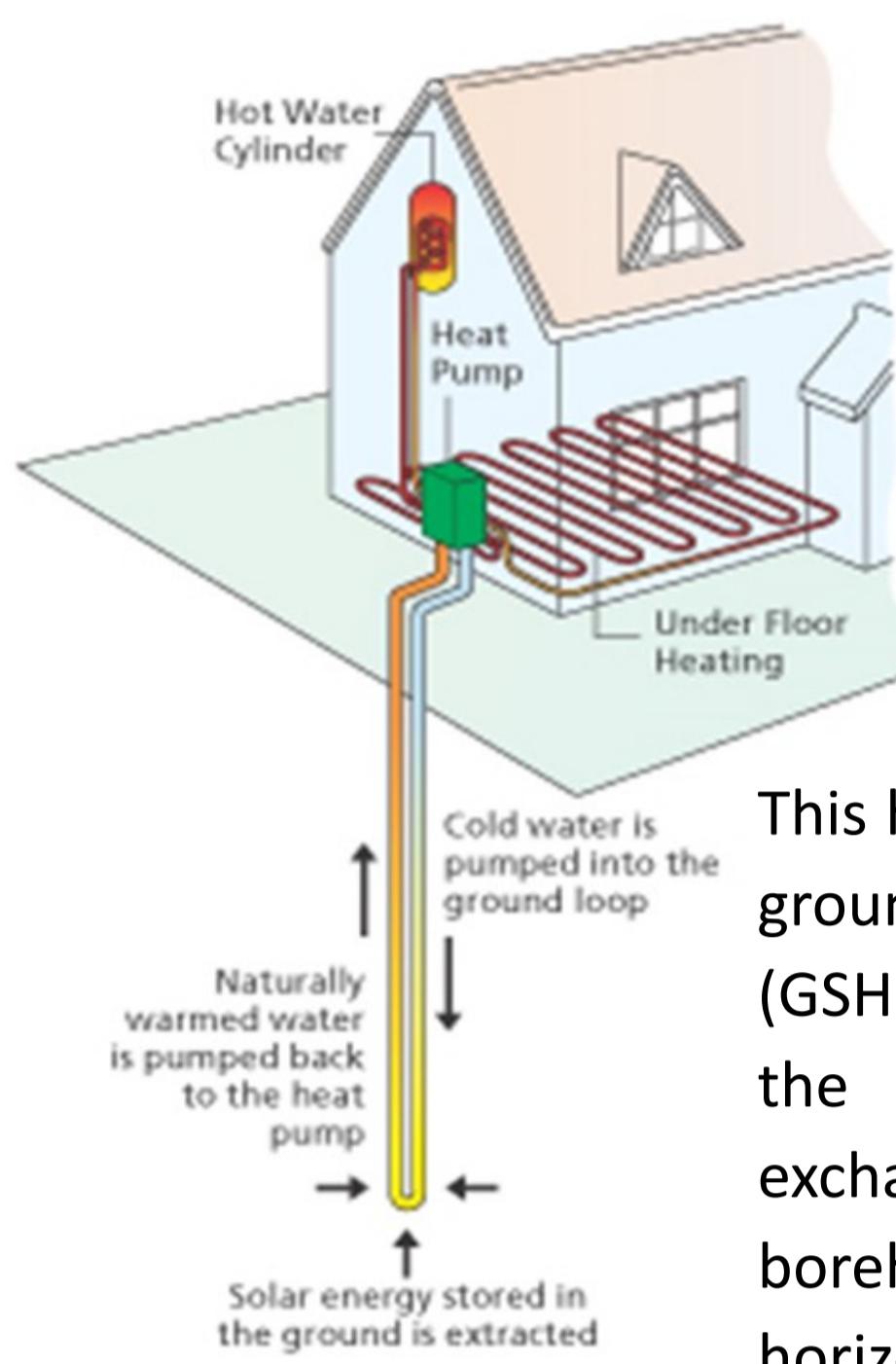
UDDGP plans to target a permeable geological structure called the Porthtowan Fault Zone (Fig. 3)

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3. Promoting the knowledge

Knowledge of initiatives, technologies and the latest developments, to boost local ecosystems in favour of the energy transition, and to promote the most suitable geothermal energy

GROUND SOURCE HEAT PUMPS (GSHP)

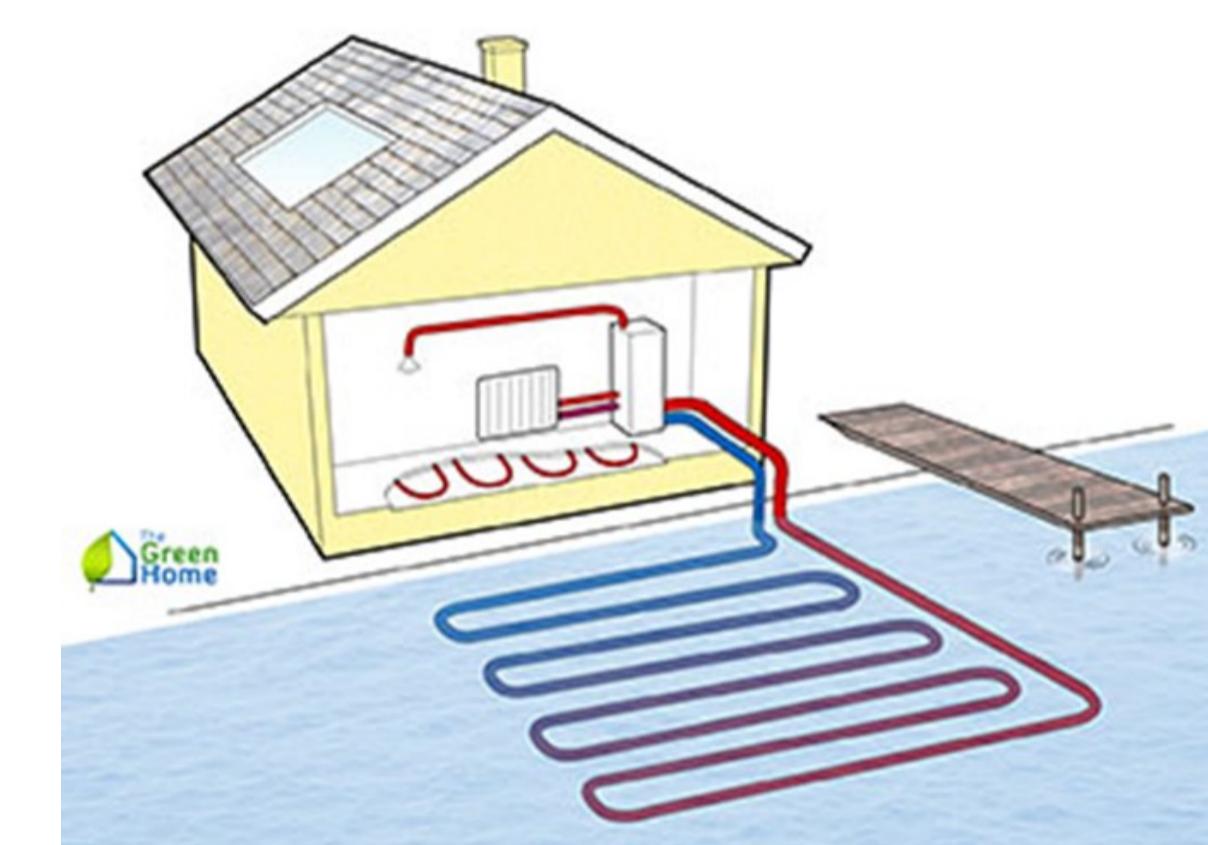


At ~15m the ground temperature is not influenced by seasonal air temperatures, and remains stable at ~9-13° C all year.

This heat can be exploited by a ground source heat pump (GSHP), which extracts it from the ground via heat exchangers, either in vertical boreholes or shallow horizontal trenches

The heat pump then raises the temperature to a level suitable for domestic heating. Current GSHP technology can produce up to 5 kW of heat for every 1 kW of electricity used.

WATER SOURCE HEAT PUMPS (WSHP)



WSHP -> can be more efficient than GSHPs, heat transfers better in water than in soil. Water temperatures more stable than shallow ground temperatures as well.

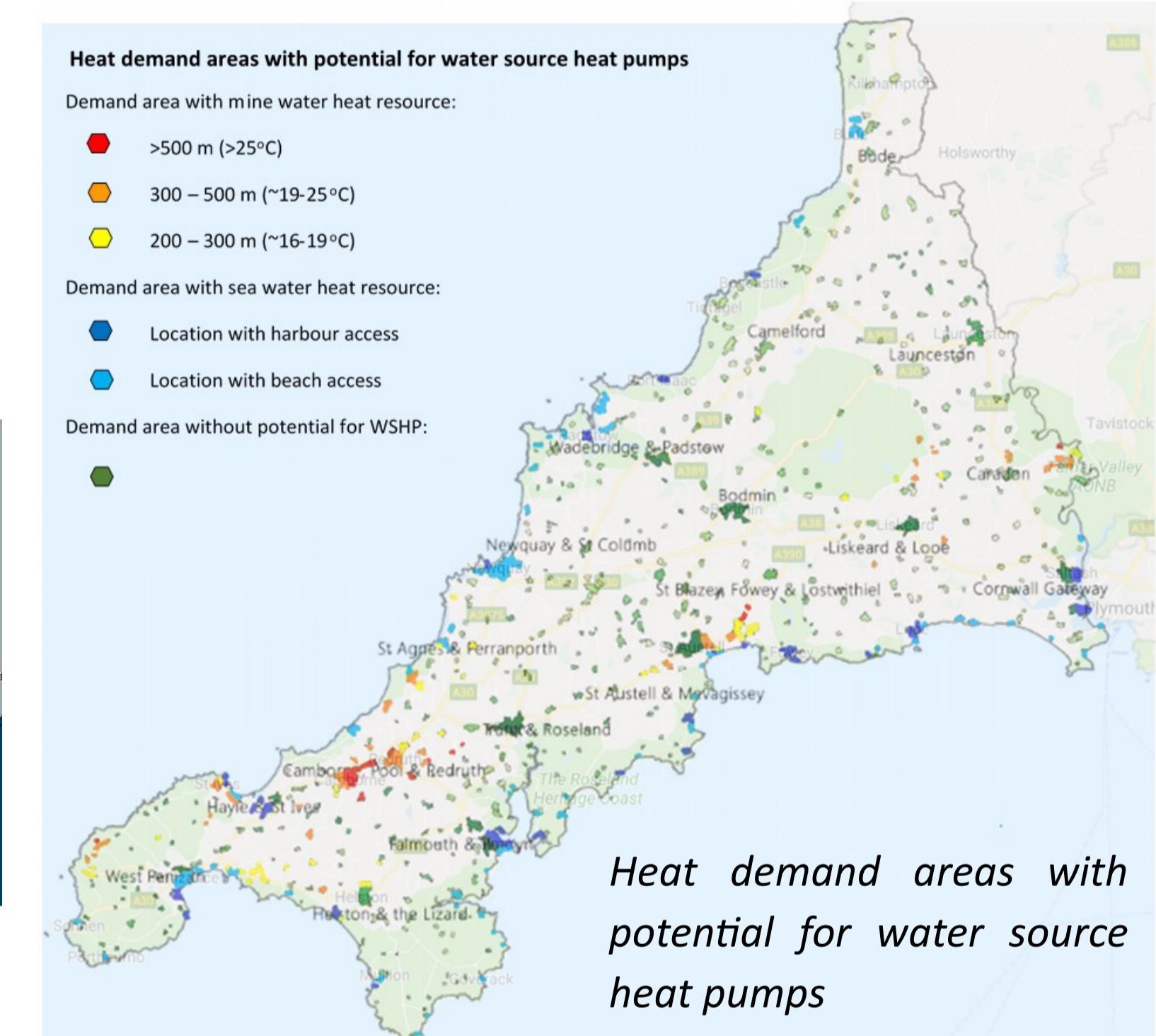
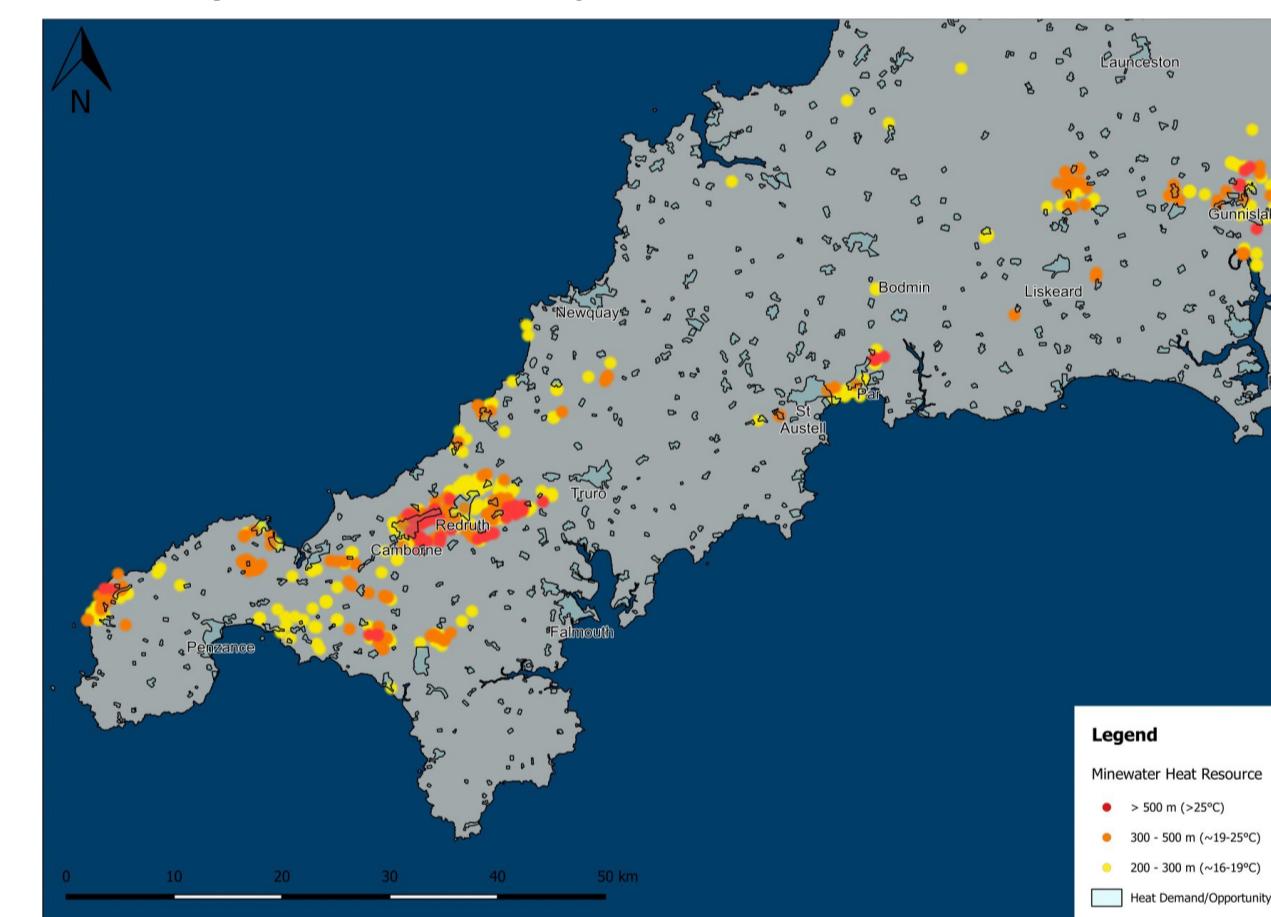
WSHP potential in Cornwall:

- sea water (7°C in a cold winter, 18°C in a warmer summer)
- mine water resources (16 – 25oC for mines >200m deep)

4. Supporting communities and local authorities

Training and advice at different levels, to give an effective response from an energy point of view to the threat posed by climate change

Minewater heat resources and heat demand areas (from REMIX by CSM)



5. Research and skills at local level

Strengthen the geothermal energy sector chain by using the present local knowledge potential, retraining and creating support tools



The Renewable Energy Engineering Facility,
University of Exeter (Cornwall Campus)

REEF facilities:

- ground source heat pump heating the space, fully instrumented to act as a teaching lab;
- water basin designed to test waves and tidal basins;
- understanding the electrical output of a solar panel under actual sunlight

Ground Recharge Analysis -> Investigation looking at linking solar thermal panels with the GSHP boreholes in order to test the effectiveness of summer ground recharge, which in theory should improve COP and reduce running costs. Aims to create a demonstration project that can promote the technology

6. Policy framework

Promote geothermal energy by engaging different agents and stakeholders in the Atlantic Area by:

- Creating joint support instruments
- Influencing local policy outlines
- Creating and promoting demonstration projects
- Raising awareness and increasing social acceptance

Acknowledgments:

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