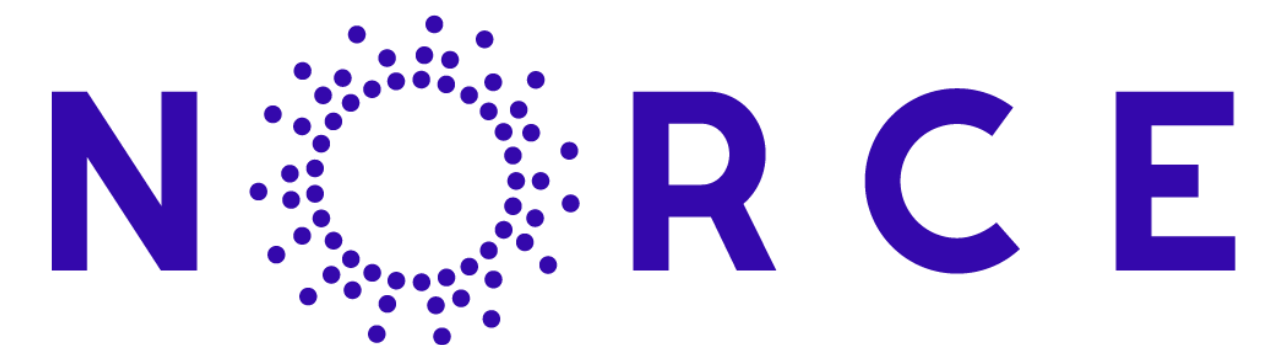


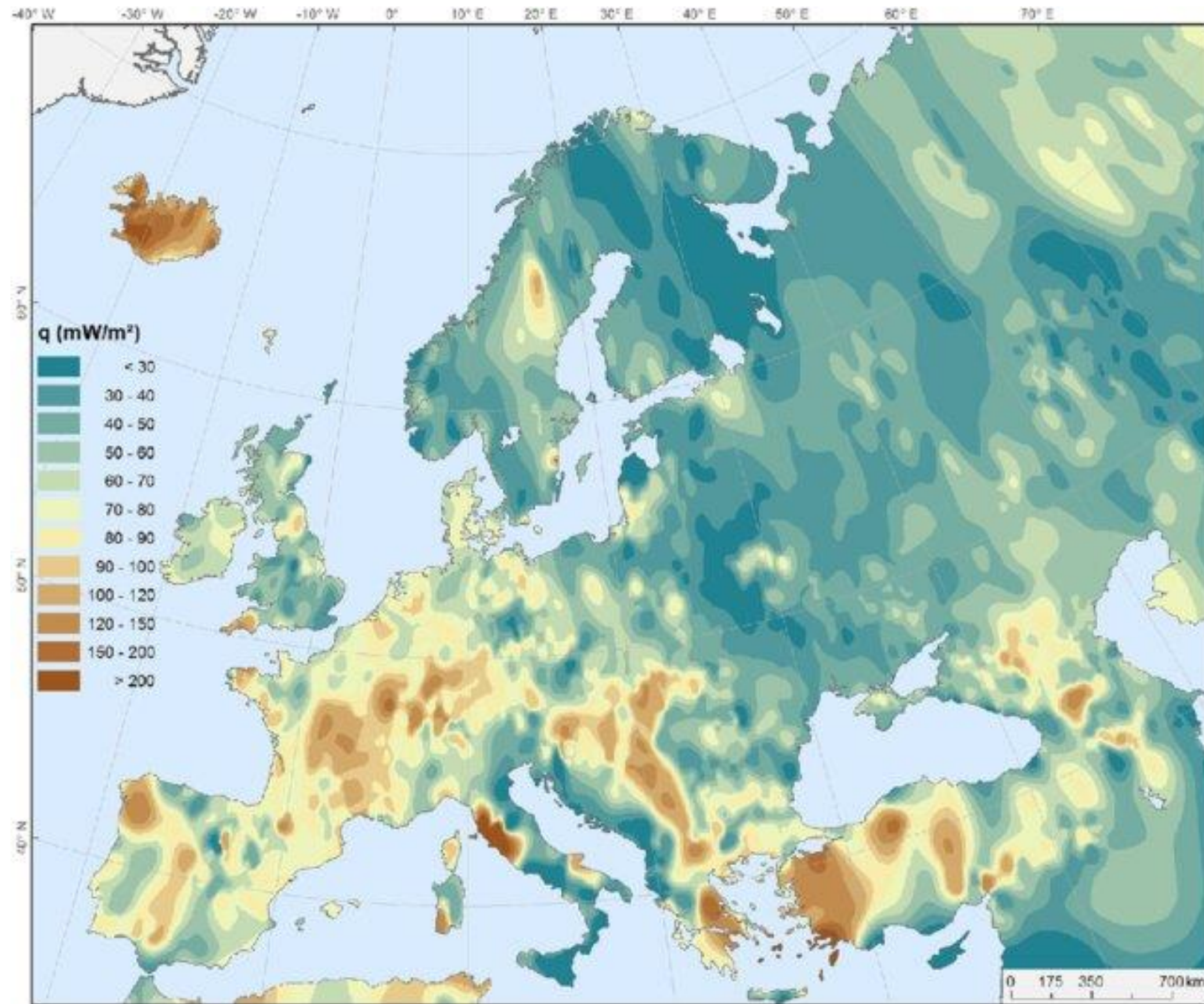
Possibilities of practical results' implementation, bottle necks in Norway

User4GeoEnergy

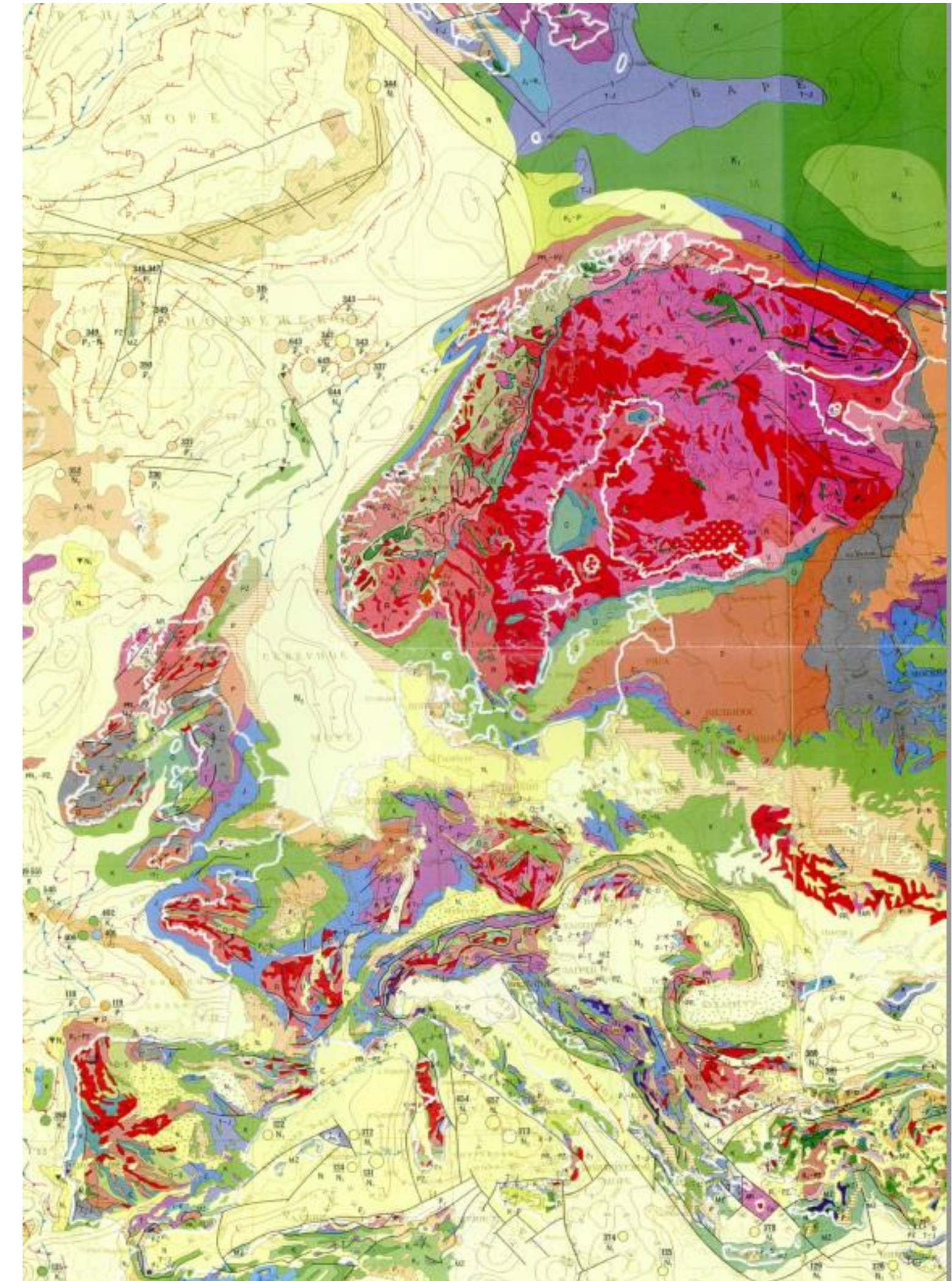


Kirsti Midttømme and
Ellen Nordgård-Hansen

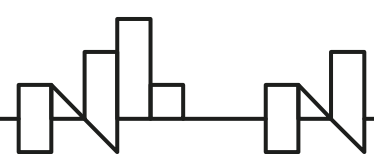
Geothermal energy, Baltic Shield



Hurter S, Haenel R. Atlas of geothermal resources in Europe; 2002 ■



Geological map of the world, Jatskevich, 2000



Geothermal market report Europe, 2022

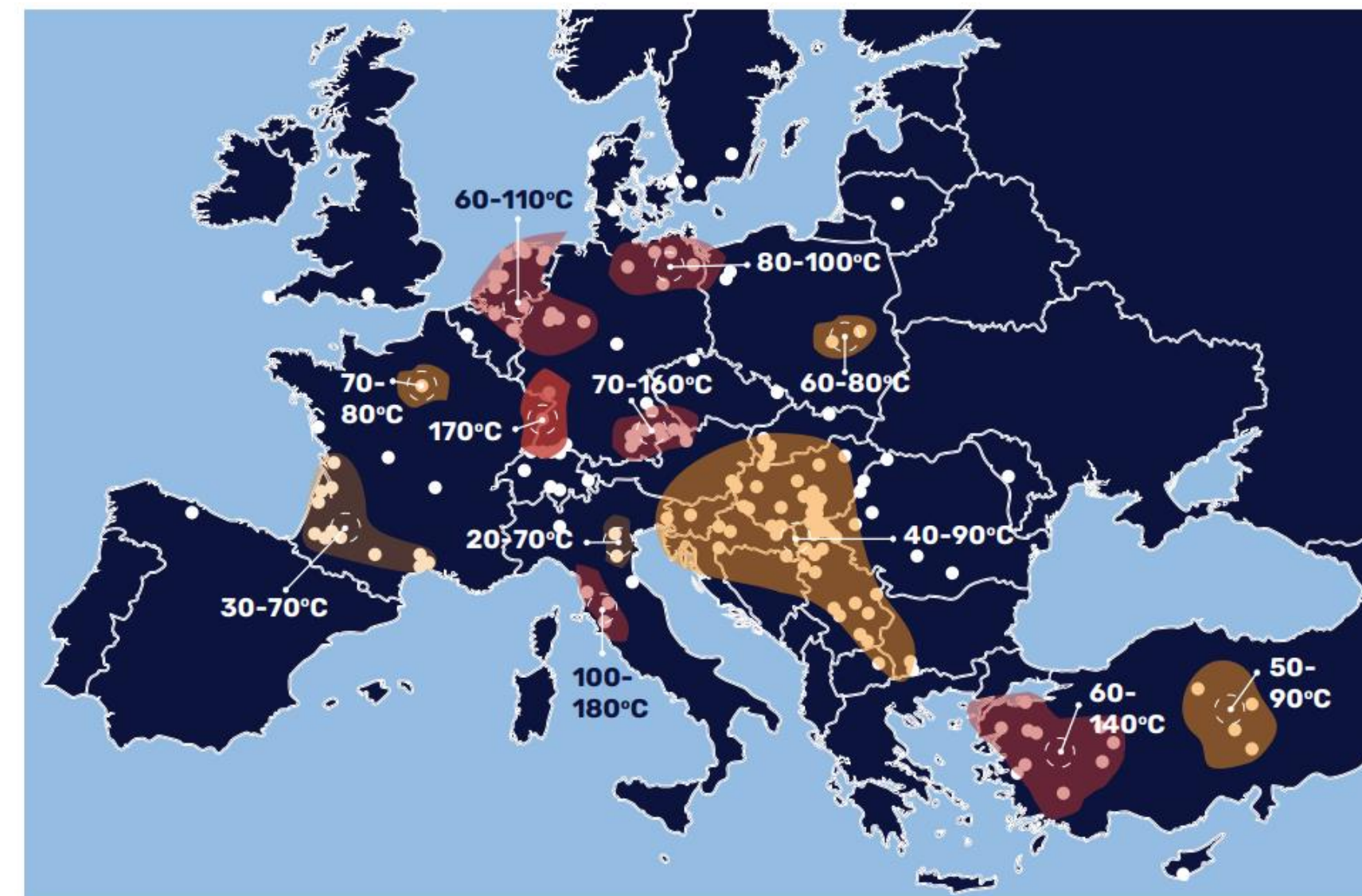
Geothermal heat pumps:

- 2,19 million GSHP
- 78 TWh
- 141300 new installations in 2022 (17% increase)

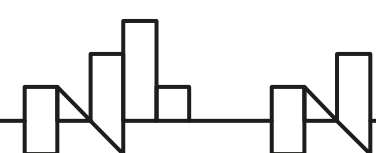
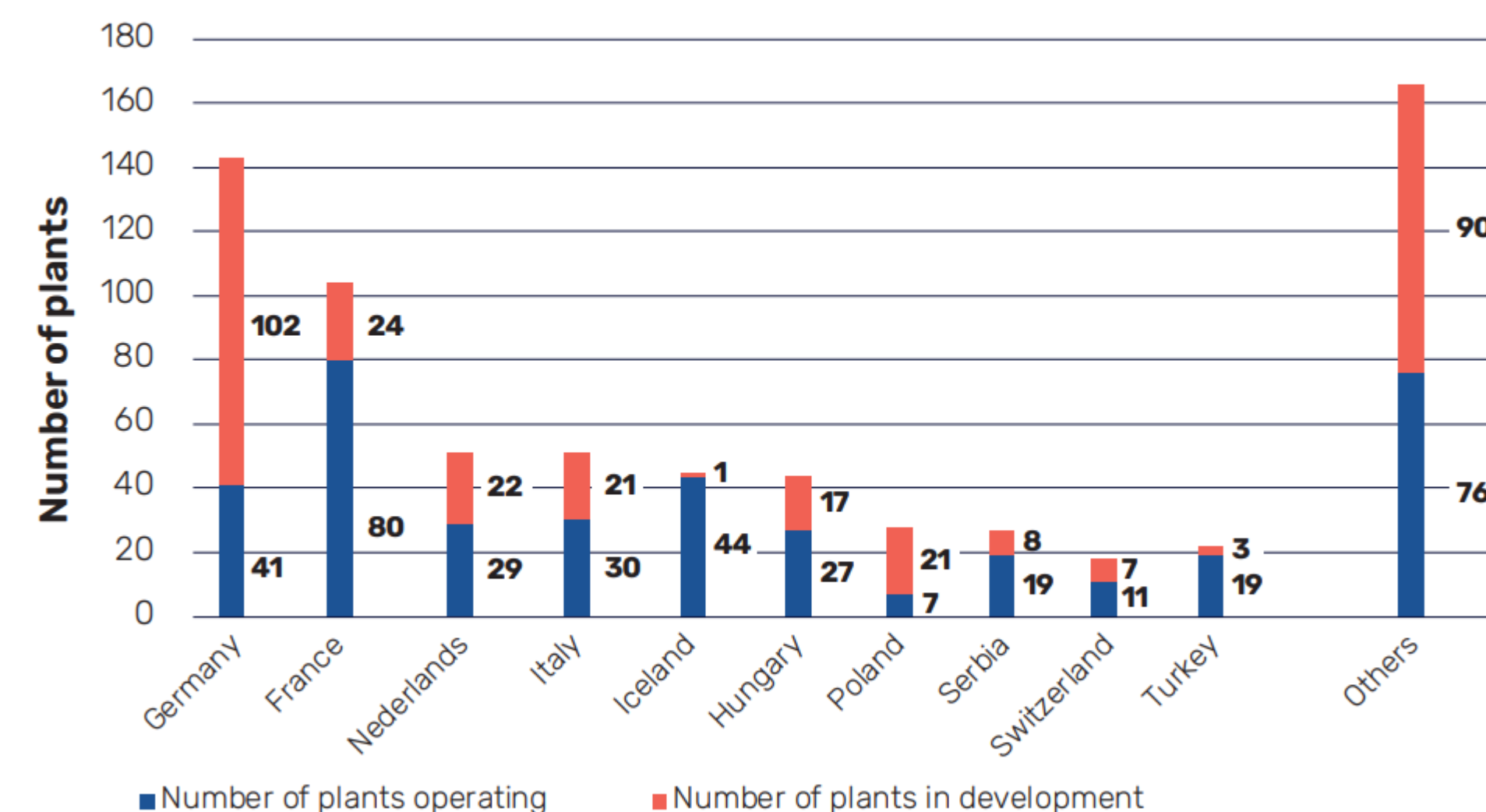


Geothermal district heating and cooling systems:

- 395 system in operation by end 2022 in 29 countries
- Installed capacity 5,6 GW_{th}
- 14 new installations in 2022



Largest European Geothermal district heating and cooling markets in 2022: number of systems operating and in development



Deeper drilling in the Scandinavian countries

➤ Borehole depth in Norway

- 100 -600m: standard for some drilling companies
- 600-1500m: demonstrated, but considered too risky.

• Finland Qheats solution

- 3 geothermal heating projects
- Borehole depths 600 – 1600 m
- Drilling rig Qmatec (Norwegian)

• Sweden

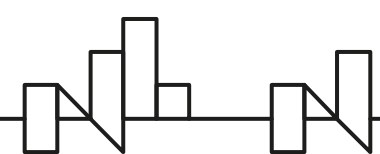
- Increasing interest after deeper drilling has been a non-topic after several failed projects (1980-2010)
- Some new trial and scientific drilling.

• Norway off-shore drilling

- Several offshore drilling companies are interested in geothermal drilling.
- So far no successful collaboration between offshore and onshore drillers



Ref: Båsum Boring

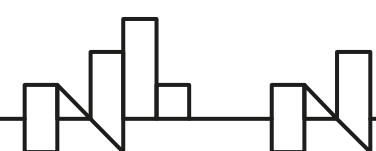
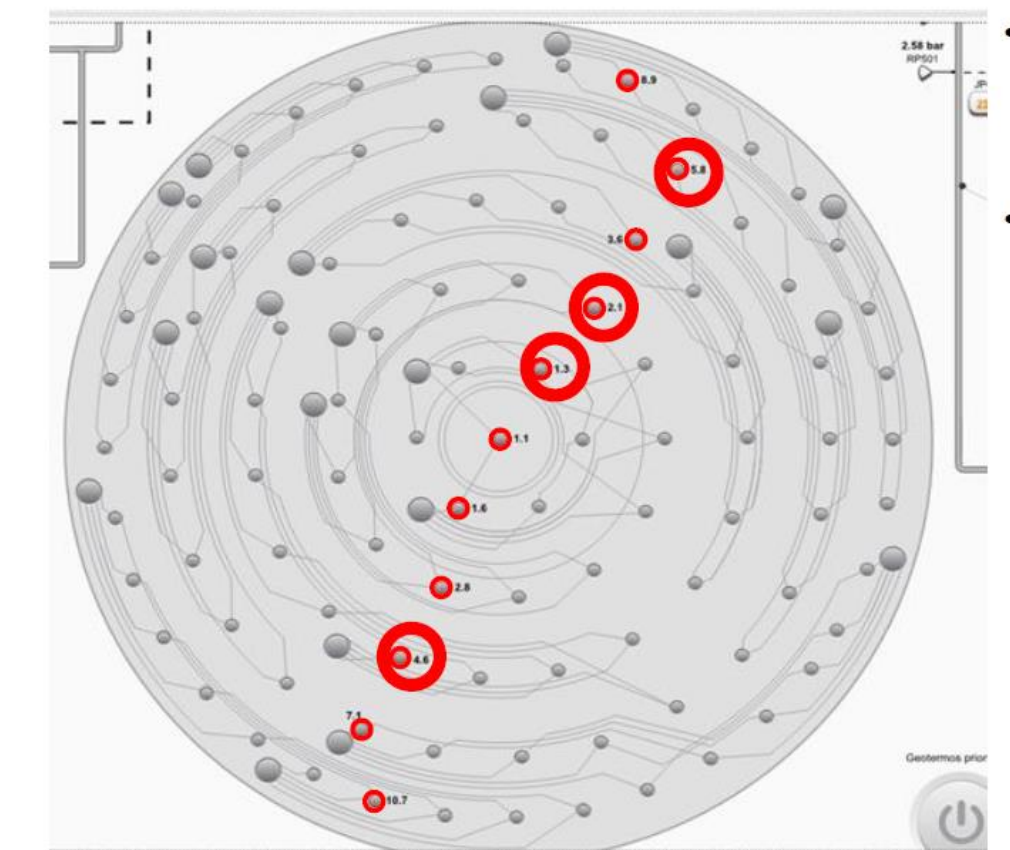
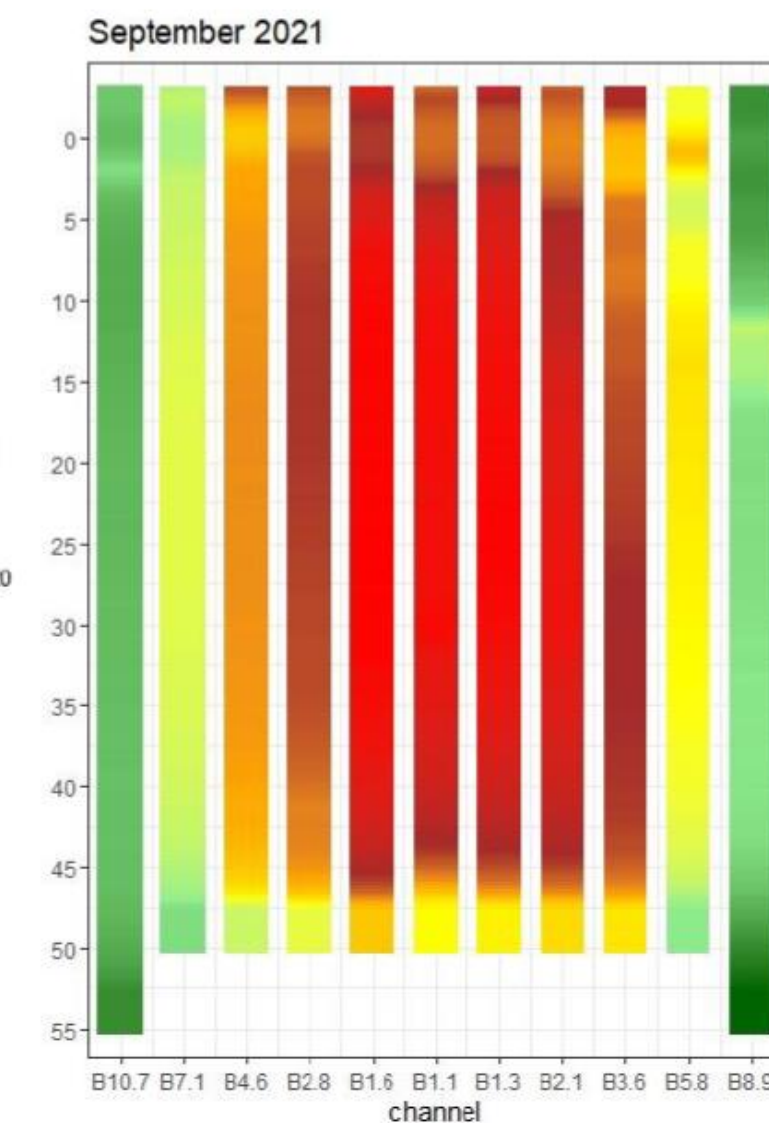
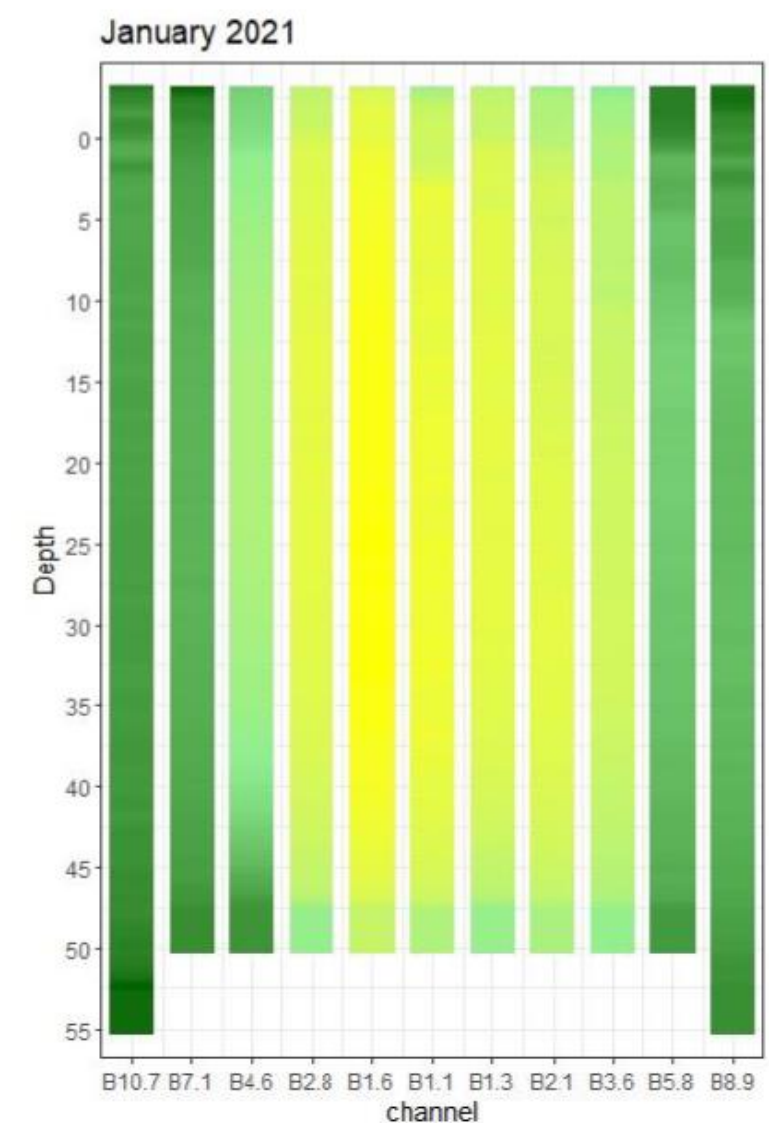
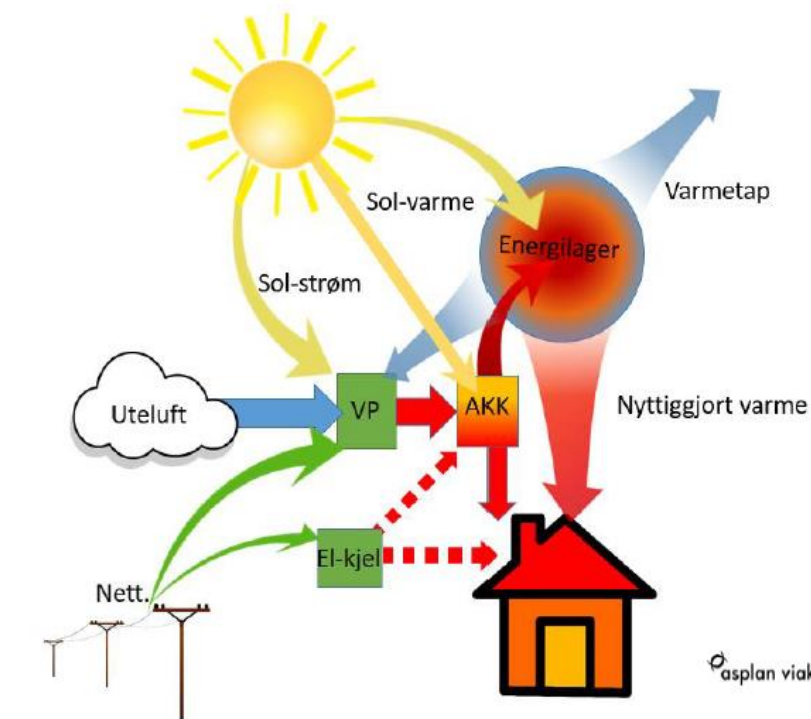


Low temperature DH – High Temperature BTES

HT-BTES, Geotermos, Fjell 2020, Norway

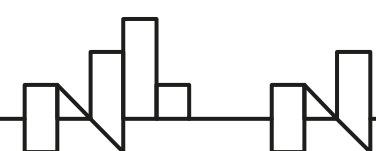
- Injection of solar energy by use of air source heat pump
- Direct heating of the school, by 30°C water-based underfloor heating system
- 100 BHEs a 50 m in a circle configuration.
- Fiber for distributed temperature sensing installed in 11 of the BHEs
- Granite, no/low groundwater flow
- Injection of heat started April 2020
- Temperature Sept 2021 12-46 C

HT-BTES enables reuse of waste heat and potential of geothermal spin off Industry



EEA & Norway Grants projects

- **GeoHeatPol**, Geothermal energy: a basis for low-emission space heating, improving living conditions and sustainable development – pre-feasibility studies for selected areas in Poland, 2017, Polish Academy of Science, Orkustofnun, AGH University, Wroclaw University,
- **Geothermal4PL**, Support for Sustainable Development and Use of Shallow Geothermal Energy within the Areas of the Governmental Housing Programme in Poland, 2017, Polish Geological Institute
- **User4GeoEnergy** Improving the energy efficiency of geothermal energy utilisation by adjusting the user characteristics, EEA and Norway Grants Fund for Regional Cooperation, 2020-2023, Polish Academy of Science, Orkustofnun, Sloveoterm, InnoGeo
- **OptiSGE** Optimization of Shallow Geothermal Energy Resources for Green Transition (OptiSGE) 2023-2024, Polish Geological Institute
- **Thermal modernization of schools in Poland and Bulgaria 2023-2024**
 - Gorzyce Municipality, Poland,
 - Koszyce Municipality, Poland,
 - Dobrodzien Municipality Poland,
 - Bochnia Municipality, Poland,
 - Vidin, Bulgaria



International network and friends

