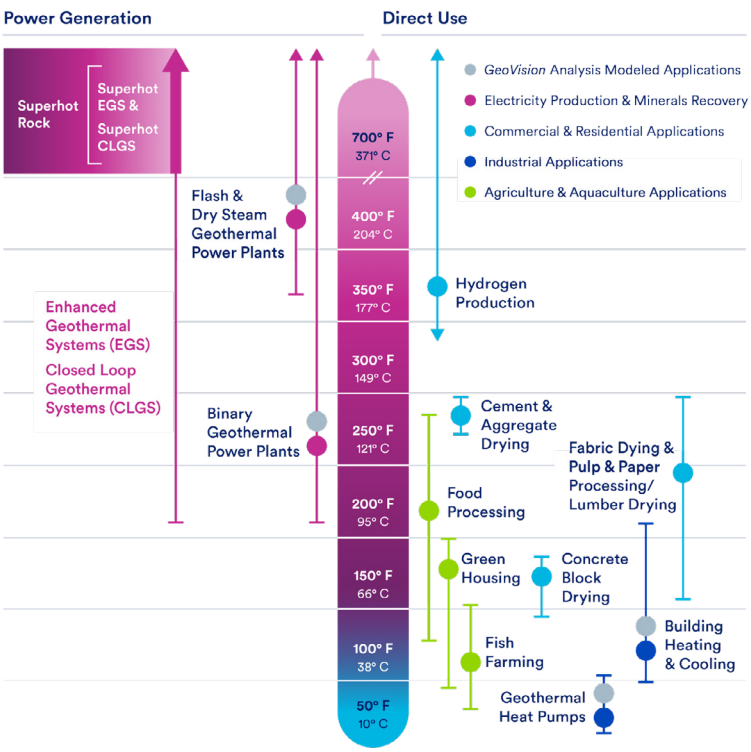
CLEAN AIR TASK FORCE

Investing in innovation: Unlocking the full potential of geothermal energy in Central and Eastern Europe

Geothermal energy – domestic, abundant, and low-carbon – offers Central and Eastern Europe (CEE) a critical opportunity to strengthen energy security, enhance competitiveness, and meet climate targets. With advances in drilling, next-generation geothermal systems can be deployed nearly anywhere. Investment in innovation will be essential to scale up this potential across CEE.

Understanding geothermal innovation

- **Next-generation geothermal:** Circulating water through hot dry rock through fractures (enhanced geothermal systems - EGS) or closed boreholes (closed-loop geothermal systems or advanced geothermal systems - AGS) to access stored heat, making access to geothermal possible nearly anywhere.
- **Superhot rock (SHR) geothermal:** A high-temperature resource (≥374°C – hotter than a pizza oven) tapped via next-generation (EGS or AGS) methods. SHR can potentially deliver 5-10x more power output per well and support ultra-efficient turbines, ultimately reducing the cost of 24/7 carbon-free electricity.

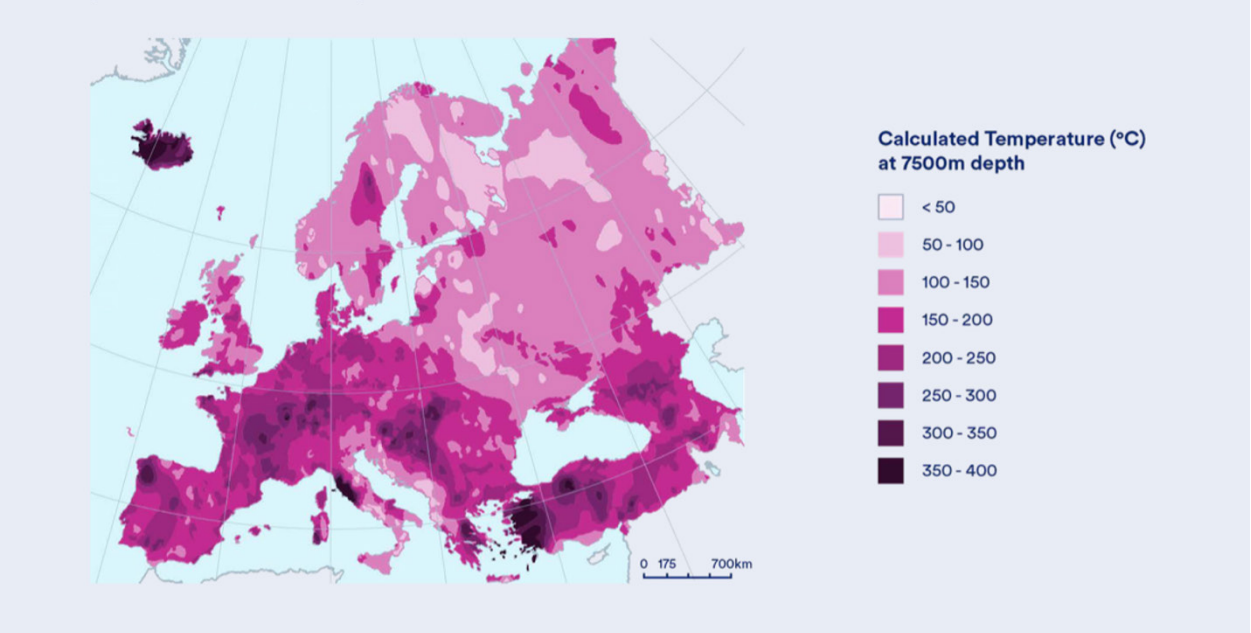


- **Cascading uses:** High-temperature geothermal projects can optimize resource use by directing high-temperature heat first to electricity production, then cascading to lower-temperature heat for industrial processes, district heating, cooling, and agriculture.

Why invest in geothermal innovation?

- **Unlock vast domestic energy:** Just 1% of Europe's superhot geothermal resources could provide ~18,000 TWh of electricity – enough to power over 1,400 cities the size of Berlin.
- **Deploy anywhere:** Innovation enables geothermal development even outside traditional geothermal regions.
- **Baseload power:** Geothermal offers 24/7, on-demand clean energy critical to a balanced energy mix.
- **Decarbonize heat and industry:** High-temperature geothermal resources, like SHR, can cascade heat to multiple uses after producing electricity – industrial processes, district heating, cooling, and agriculture – maximizing system efficiency.
- **Reduce costs:** Technology advancements are projected to cut project costs by 80% over the next decade.
- **Create jobs and expertise:** Scaling geothermal would create a new generation of technical jobs aligned with the energy transition.
- **Emissions reductions:** Geothermal plants release 99% less CO_2 compared to same-size fossil fuel plants.
- **Entrepreneurship and funding:** The geothermal sector is seeing growing opportunities for start-ups, private initiatives, and other innovative technologies. With the right conditions, geothermal start-ups can attract significant venture capital funding to advance sustainable energy solutions.

Geothermal heat reservoirs in Europe at depth of 9,5 km



Source: Chamorro et al. 2013

Immediate actions for Central and Eastern Europe

1. **Call for a comprehensive EU Geothermal Action Plan:** CEE member states should encourage the EU to release a Comprehensive Geothermal Action Plan, as promised by the European commission, in Q1 2026. That Action Plan should prioritize geothermal innovation, including superhot rock geothermal energy.

2. **Boost geothermal research and development and innovation funding:** CEE member states should support an ambitious and targeted research agenda for geothermal energy, backed by strong public funding and collaboration with other EU countries. This includes advocating for the EU to expand financial incentives for next-generation geothermal demonstration and pilot projects in CEE and beyond, as well as increasing national and regional innovation and R&D funds. NGOs, policy organizations, academia, and private businesses all have a role to play in advancing policymaking efforts toward this goal.

3. **Promote high-temperature heat and power projects:** CEE countries should support planning measures that incentivize combined high-temperature heat and power plants. Combining geothermal electricity and cascading heat uses to maximize economic and climate benefits. Countries like Romania, Poland, Slovakia, Croatia, and Hungary are well-positioned to benefit from this.

Why act now?

Other global leaders are rapidly advancing geothermal innovation. The U.S., Japan, New Zealand, and Iceland have launched superhot rock pilot projects and countless others have launched other enhanced geothermal pilot projects. China is the largest user of geothermal energy worldwide.

Momentum is building – joint initiatives like the EU COMPASS project, and others are examples of how to move this technology forward globally. By investing in innovation today, the EU can reclaim its global competitiveness in energy advancement and make geothermal a foundational piece of its clean energy future.

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