GEO4ALL

Publieke samenvatting / Public summary

Aanleiding

In the Netherlands, geothermal projects began 15 years ago. Horticultural areas saw numerous projects, providing sustainable heat. By 2022, 26 locations produced 6.8 Peta Joules of heat, saving 193 million cubic meters of gas and cutting CO2 emissions by 365,000 tons. Over these years, significant knowledge has been collected, highlighting fundamental differences from oil and gas extraction. This led to new research questions focusing on efficiency, reservoir optimization, supply-demand coordination, and safety. The sector aims to establish a wide-ranging innovation programme based on this knowledge, enhancing geothermal development at shallow (0-500m), medium-deep (500-1500m) and conventional depths (>1500m), system designs, reducing risks and project footprints. Collaboration with knowledge institutions, Geothermie Nederland and EBN will ensure broad dissemination of knowledge and build an active geothermal energy knowledge community in the Netherlands.

Doelstelling

The project aims to address key challenges identified by stakeholders in the geothermal sector through sessions and discussions held between 2022-2023. These challenges have been funnelled to key objectives for GEO4ALL, including: • Research on factors influencing operation for unlocking medium-deep geothermal systems, which will be made available through a database of lessons learned and the development of a technical roadmap. • Advancing design and engineering solutions for marginal reservoirs resulting in 100%

Projectinformatie / Project information

Projectnummer / Project number
TKITOETKI2024_GEO4ALL
Subsidiebedrag / Grant amount
€ 3.627.330,00

Algemene informatie / General information

Penvoerder / Secretariat
TNO

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or more increase in injectivity and productivity of wells • Promoting the business case and environmental robustness of Borehole Heat Exchangers at ~300 to 1500m depth, by field validation of technical and environmental performance. • Enlarged operational envelope (temperature, pressure) and lifetime by enhanced monitoring and (stress & induced seismicity) measurements for safe production and cold front tracking. • Efficiency improvement of geothermal installations through utilisation and advanced analysis of operational data, standards, and complementary monitoring

Korte omschrijving

The TKI GEO4ALL programme comprises multiple work packages (WP) focusing on advancing geothermal energy in the Netherlands. WP1 targets unlocking medium deep geothermal reservoirs (500-1500m) for cost-effective urban heat and greenhouse applications, addressing challenges in well designs and rock strength uncertainties. WP2 aims to enhance heat production from marginal reservoirs like the Slochteren Formation through advanced well concepts. WP3 focuses on optimizing closed geothermal systems (300-1500m) via enhanced monitoring, crucial for ground-source heat pump expansion. WP4 addresses reservoir cooling effects and induced seismicity monitoring for safety. WP5 emphasizes advanced data analysis to reduce operating costs. Through extensive communication and knowledge sharing in within the consortium, the programme aims to drive innovation and sustainable geothermal energy utilisation.

Resultaat

• Inventory of relevant lessons learned for medium–depth open systems (500-1500m), and a research agenda and roadmap to deal with most urgent knowledge gaps • Report on case studies on well concept select for marginal reservoir conditions for geographically diverse and varied development stages, addressing specific challenges and engineering solutions related to different reservoir settings, well geometries and technologies enhancing productivity and injectivity by 100% or

more. • Confirmation of positive effects of increasing soil conductivities and thermal gradient with depth from advanced monitoring, promoting business case and environmental robustness of Borehole Heat Exchangers at ~300 to 1500m depth. • Reduced uncertainties for cold front evolution and doublet lifetime and allowable operational bounds (injection temperatures and pressures), seismic hazard and caprock integrity. • Investigation into the efficiency improvement of geothermal installations (enhancing lifetime of components, minimizing footprint, energy consumption, inhibitors, waste etc.) through utilisation/analysis of operational data and by improved monitoring, and standards.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
Voor meer informatie over de Topsector Energie, ga naar **www.topsectorenergie.nl**.

Voor meer informatie over de TSE / Energie-Innovatie regelingen die RVO aanbiedt, ga naar **www.rvo.nl/tse**.