PERFORM II

Publieke samenvatting / Public summary

Aanleiding

The major operational challenges for geothermal plants are scaling, corrosion and associated Naturally Occurring Radioactive Materials (NORM): These processes negatively affect the geothermal operations: corrosion results in a risk of system integrity failure, scaling causes a loss of efficiency of the heat exchangers and an increased risk of clogging well completions or the near wellbore, or loss of production capacity or injectivity. The presence of NORM increases disposal costs of the waste stream associated with scaling. Currently, scaling and corrosion issues are mitigated by inhibitor injection with an undesirable environmental impact and increased operational costs for geothermal operators. In a prior project GEOTHERMICA PERFORM, a study of potential solutions to inhibit scaling and corrosion led to the new concept of cation filtering/adsorption to reduce the concentration of scale-forming metal ions achieving a proof-of-concept at TRL4. Moving this technology forwards by piloting and demonstrating the effectiveness of the filtration method in an operational environment is the subject of PERFORM II.

Doelstelling

The objective of PERFORM II is the development of a new filter technology aimed at cost-effective and climate-neutral operation of geothermal heat production. The current operational challenges of scaling, corrosion and NORM in geothermal power plants could hinder the acceleration of geothermal energy use in the built environment for direct heating as well as other industrial applications.

Projectinformatie / Project information

Projectnummer / Project number
HER+21-02669039
Subsidiebedrag / Grant amount
€ 690.879,00

Algemene informatie / General information

Penvoerder / Secretariat
Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek TNO

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Thus, there is an urgent need to address these commonly occurring operational issues. In the Netherlands, multiple installations suffer from corrosion and (related) scales that are high on NORM, resulting in increased operational expense. PERFORM II aims to reduce the environmental impact and operational expenses, compared to the current method of mitigation through inhibitor injection whilst supporting reliable and sustainable geothermal energy production. This new filter technology may be able to create added value by the extraction valuable metals. The Dutch focus in PERFORM II is the design of a filter-unit and the demonstration of the filtration method in an operational environment under real chemical and flow conditions, to come up with a business case and a roadmap to commercial maturity.

Korte omschrijving

The focus of the Dutch partners is to investigate operational practices and how those would affect filter design and usage. The performance of the filter material under operational conditions is tested in the TNO Open Innovation Centre Well Technology with support of BÈTA, and provides input for the design of a mobile pilot filter-unit (mini-plant). This mini-plant will demonstrate the performance of this filtering technology on-site at three geothermal sites, two Dutch sites (and one in Germany): ECW Geomanagement (high concentration in Pb2+) and Ammerlaan Geothermie B.V. (low concentration in Pb2+). The test activities include a full adsorption and desorption cycle with continuous monitoring and fluid sampling at regular intervals. NRG will analyse the filter material at the end of the cycle to examine the effectiveness of a full process cycle and examine the evolution of NORM in the waste stream. Test results combined with numerical modelling, will be used to assess element adsorption effectivity and its feasibility for scaling and corrosion prevention. A life-cycle assessment of the new filter technology, a business case study and integration of results into a product roadmap.

Resultaat

The ultimate result of PERFORM II is to demonstrate

a new filter technology with the following results (R): - R1: Compilation of data (geothermal plant characteristics, operational practices) and requirement for filters from Dutch, German and Danish industry - R2: Experimental data on absorption and desorption process (input for models and upscaling) R1 and R2 serve as input for the design of a filter-unit for TNO and of a mini-plant (Germany). - R3: Experimental data on NORM waste and extraction of valuable metals - R4: Experimental facilities and protocols for piloting filters - R5: A mobile mini-plant to conduct on-site demonstrations in the Netherlands with detailed monitoring - R6: Data on pilot tests at TNO and on-site demonstrations - R7: Roadmap describing pathways to take this technology to a commercial product including business case and economic considerations R4 and R5 are new infrastructure. The integration of R1, R2, R3 and R6 will allow to evaluate pathways to commercial maturity to produce R7. All new infrastructure and data generated in this project is available to use for future modelling, research and development activities.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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