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Baden Arena Kongress 2 – Oberflächennahe Geothermie

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Baden Arena Congress 2 – Shallow Geothermal Energy

Digital Twin for Geothermal Assets Assisting the Production and Operational Decisions

Digitaler Zwilling für geothermische Anlagen zur Unterstützung von Produktions- und Betriebsentscheidungen

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An efficient production and operation of geothermal systems aiming at minimizing the total costs of ownership, emission and environmental footprint is essential to maximize the uptake of geothermal heat and power supply in the World. Operational challenges such as scaling, corrosion, filter clogging, equipment performance degradation, etc. have a significant impact on the OPEX of geothermal systems. Some of the potential mitigation measures have a negative impact on the environmental footprint of the geothermal systems. A proactive monitoring and mitigation of the unwanted processes by considering multiple operational and environmental objectives is of great importance for the performance and sustainability of geothermal assets. Digital twin technology has been demonstrated in other related industries (e.g. process and petroleum) for optimizing operation and minimizing emissions. This presentation aims at demonstrating the development of digital twin technologies for a proactive monitoring and optimization of geothermal assets which allows for standardizing data infrastructure and management, monitoring performance, critical processes and emission in real-time, automated analysis and generation of reports for well integrity and multi-objective process control and optimization. In the presentation, we discuss two large national initiatives in the Netherlands to deploy digital twin technology for the geothermal and aquifer thermal energy storage (ATES) assets. The project aims at demonstrating the digital twin technology in four geothermal and one ATES systems in the Netherlands. Case studies will be presented. One key feature of the technology is maximizing the utilization of open-source tools to provide a fully open-source digital twin framework to the sector as a deliverable of the project.

In this presentation, the architecture of the proposed digital twin will be presented and demonstrated. Several solvers and models to simulate the asset together with real-time data for monitoring, detection of events, forecasting and optimization will be shown. Some case studies of applying the digital twin modules on field applications will also be presented.