Donnerstag, 2. März 2023, 14.00 Uhr
Panorama Saal EDEKA-Arena Kongress 1 - Tiefe Geothermie

Thursday, 2 March 2023, 2.00 pm
Panorama Hall EDEKA-Arena congress 1 - Deep Geothermal Energy

HT-ATES: maximiser of geothermal energy use

HT-ATES: Maximierung der Erdwärmenutzung

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In order to move to a sustainable European heating system with low fossil contributions, the use of installed (future) geothermal capacity needs to be optimized. Large-scale storage of surplus geothermal heat is essential in achieving this. High Temperature Aquifer Thermal Energy Storage (HT-ATES) is obtaining increased attention in the geothermal sector, as the first full-scale pilots prove that this technology is capable of storing heat and buffering heating networks at a large and seasonal scale.

In this paper, we will show in more detail how the recently realized full-scale HT-ATES system in Middenmeer was integrated into the existing heating system which is fed by geothermal doublets. We report on the specific operational and financial advantages of combining heat storage in a geothermal heat network.

At Agriport A7, a large-scale greenhouse area in Middenmeer, the Netherlands, an HT-ATES system has been built as seasonal heat buffer of geothermal wells. ECW Energy is one of the largest geothermal operator in the Netherlands (>250 GWh annually) and operates 3 geothermal doublets at the Agriport area. After production (>2km depth, 92 °C), the geothermal heat is distributed to greenhouses through a heating network. The geothermal plants have significant overcapacity in the summer period while in winter they can provide only ~25% of the heat demand. To better utilize the production capacity of the existing geothermal systems, a full-scale system facilitates the large-scale storage of surplus heat from the geothermal plants during summer (overcapacity), and its recovery in winter.
The HT-ATES doublet system facilitates the storage of heat (~85 °C) in an unconsolidated sand aquifer of 25 m thickness at nearly 360 m depth. With a maximum flow rate of 150 m^3/h, up to 28,000 MWh of thermal energy can be stored each summer with a maximum capacity of 12 MW.

Combining geothermal production wells with an HT-ATES system for large-scale storage will provide many advantages to the total heating system. This has mainly to do with a better performance of the geothermal system, more running hours of geothermal wells, reduction of investment costs (less capacity needed to provide the same annual yield), flexibility in heat production & use, reduction of maintenance costs of geothermal doublets (more constant operation of ESPs), flexibility in combining heat sources & users and new earning models related to net-congestion.

The operational HT-ATES system in Middenmeer proves that HT-ATES is a technology ripe for widespread implementation throughout Europe, and the lessons learned from this project will be instrumental to this end.