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Transforming ATES to HT-ATES,

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Aquifer Thermal Energy Storage (ATES) systems combined with a heat pump save energy for space heating and cooling of buildings. In most countries the temperature of the stored heat is limited to maximum 25-30°C for such systems. However, when heat is available at higher temperatures (e.g. waste heat, solar heat), it is more efficient to store higher temperatures because that improves heat pump performance or makes it unnecessary. Therefore, HT-ATES development receives a lot of attention lately. Next to developing new HT-ATES projects, there is also a large potential for additional energy savings by transforming 'regular' low-temperature LT-ATES systems to a HT-ATES. Such a transformation is tested for a greenhouse in the Netherlands, this greenhouse has an LT-ATES system operational since 2012, and from 2015 onwards heat is stored in the warm well at temperatures up to 45°C. In this HT-ATES transformation pilot, water quality parameters are closely monitored as well as temperature distribution in the subsurface (using DTS). Together with the operators, the results from the ATES monitoring are used to continuously improve system performance. Numerical groundwater and heat flow simulations of actual and expected well pumping data are used to evaluate how well operation can be optimized. In this presentation, the optimization using monitoring results and simulations will be discussed as well as general and site specific lessons/conclusions for such transformations.