



## **BASIMO - Borehole Heat Exchanger Array Simulation and Optimization Tool**

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Arrays of borehole heat exchangers are an increasingly popular source for renewable energy. Furthermore, they can serve as borehole thermal energy storage (BTES) systems for seasonally fluctuating heat sources like solar thermal energy or district heating grids. The high temperature level of these heat sources prohibits the use of the shallow subsurface for environmental reasons. Therefore, deeper reservoirs have to be accessed instead. The increased depth of the systems results in high investment costs and has hindered the implementation of this technology until now. Therefore, research of medium deep BTES systems relies on numerical simulation models. Current simulation tools cannot – or only to some extent – describe key features like partly insulated boreholes unless they run fully discretized models of the borehole heat exchangers. However, fully discretized models often come at a high computational cost, especially for large arrays of borehole heat exchangers. We give an update on the development of BASIMO: a tool, which uses one dimensional thermal resistance and capacity models for the borehole heat exchangers coupled with a numerical finite element model for the subsurface heat transport in a dual-continuum approach. An unstructured tetrahedral mesh bypasses the limitations of structured grids for borehole path geometries, while the thermal resistance and capacity model is improved to account for borehole heat exchanger properties changing with depth. Thereby, partly insulated boreholes can be considered in the model.

Furthermore, BASIMO can be used to improve the design of BTES systems: the tool allows for automated parameter variations and is readily coupled to other code like mathematical optimization algorithms. Optimization can be used to determine the required minimum system size or to increase the system performance.