

How to calculate geotechnical energy storage

What is borehole thermal energy storage (BTES)?

Borehole thermal energy storage (BTES), where a field of borehole heat exchangers (BHE) exchanges heat with the surrounding rock or sediment mass, predominantly by processes of conduction. In typical cases, the surplus heat stored during the summer months is extracted for space heating usage in winter (and/or vice versa in the case of "coolth").

Should thermal energy storage be confined to the ground surface?

Thus, depending on the time perspective of thermal energy storage, modelling suggests that particular attention should be paid to the ground surface above the BTES array and that, in some cases, it may be desirable to minimise the area of the surface footprint through which heat can be lost, or to insulate the surface footprint.

Why do we need a thermal energy storage system?

ATES has become popular for storing and retrieving thermal energy in both small and large quantities and also for providing a reliable source of thermal energy due to the stable temperature of aquifers (Possemiers et al. 2014). However, a major limitation faced by ATES systems is unfavorable hydrogeological conditions (Shi et al. 2023).

How much heat does a borehole transfer per metre?

The average heat transfer per metre of borehole has thus dropped from 30.8 W m⁻¹ to 8.6 W m⁻¹.

Are there discrepancies between geothermal software tools?

Overall, the discrepancies between both software tools are acceptable (approximately 5 - 10 %), especially when considering that the uncertainty of input parameters in the early planning phase of a geothermal system is significantly greater.

What is underground thermal energy storage (UTES)?

Because the ground beneath a development site has a huge volume and thermal capacity, and because accessing it requires capital-intensive drilling and geoengineering, underground thermal energy storage (UTES) is typically used for the large-scale seasonal storage of heat that is difficult to achieve using conventional surface technologies.

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The Role of Geotechnical Engineering Geotechnical engineering focuses on the behavior of earth materials. In the context of renewable energy storage, it plays a critical role in ...

Abstract. This paper examines numerical approaches to model operation of gas storage in salt caverns. The emphasis is on taking into account the thermal exchanges between the well, the ...

The GGES system shows positive degradation effects, which distinguishes it from most existing energy storage systems. The results provide a simple design formula for a GGES and depict ...

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