



Hefaistos – seasonal storage of heat

The Hefaistos* project has investigated technical and economic conditions for establishing solutions for large-scale seasonal storage of heat from waste incineration plants connected to the district heating network.

The purpose of this feasibility study has been to investigate how a high temperature thermal borehole storage (HT-BTES), charged with excess heat from a waste to energy process, would work as a seasonal storage for the purpose of district heating from a technical and economical perspective.

The study has focused on three topics:

- A process solution – how a HT-BTES may be introduced in the existing district heating system.
- Determination of the appropriate size of a storage, and modelling of its thermal response.
- Market survey of available borehole thermal probes for high temperatures

Modeling based on different parameters

For the process solution a known process consulting firm was hired that developed proposals for intervention points in the existing plant, sketched the likely locations of new process equipment, and made a proposal for the design and location of the pipe connections between the storage and the plant. Based on this, an investment calculation was made.

Furthermore, thermal modeling of the heat storage was procured. A basic construction of a heat storage model was carried out in a verified modeling tool. In this the number of boreholes, borehole depth, series connections of boreholes, borehole spacing and the thermal conductivity of the rock was varied. This was done in a systematic

way through factorial design in order to reveal the effects of the individual parameters and of their interaction with each other.

Find the right rock location

The thermal conductivity is not in itself possible to affect at a given location, it was examined to provide a basis for the choice of location in this regard, in case the rock will show different thermal conductivities between various possible locations of the storage. The next step will to perform thermal response tests in the areas available for a storage.

The market for borehole collectors for high temperature purposes was investigated with the help of an industry association that works with procurement of innovations. One supplier was found that could provide a promising material. Next step is to perform laboratory tests on this material.

Large storage can be competitive

The economic analysis shows that an investment in a storage is not profitable within the current system of Tekniska verken, where the peak load heat demand is supplied by the existing heat and power plant in central Linköping.

However, the municipality, also the company's owner, has issued long term plans for the city development that assumes this plant to be moved elsewhere. In this case the company will have to invest in new capacity for its district heating supply.

In such a scenario lies the success of this project, because this study shows that a heat storage solution on a magnitude way beyond what has ever been built before could be a competitive solution

for future district heating systems, possibly in combination with heat pumps that would increase the heat power available on demand from the storage.

* Hefaistos was a god of Greek mythology. He was a smith and wizard and ruled over the fire and the volcanoes.

Project facts

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