Underground heat storage

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The GEOTHERMICA HEATSTORE project aligns with these research and ...

STES stores can serve district heating systems, as well as single buildings or complexes. Among seasonal storages used for heating, the design peak annual temperatures generally are in the range of 27 to 80 ?C (81 to 180 ?F), and the temperature difference occurring in the storage over the course of a year can be several tens of degrees. Some systems use a heat pump to help charge and discharge the storage during part or all of the cycle. For cooling applications, often only circulation pumps are used.

Sorption and thermochemical heat storage are considered the most suitable for seasonal storage due to the theoretical absence of heat loss between charging and discharging.[5] However, studies have shown that actual heat losses currently are usually significant.[6]

Examples for district heating include Drake Landing Solar Community where ground storage provides 97% of yearly consumption without heat pumps,[7]and Danish pond storage with boosting.[8]

There are several types of STES technology, covering a range of applications from single small buildings to community district heating networks. Generally, efficiency increases and the specific construction cost decreases with size.

UTES (underground thermal energy storage), in which the storage medium may be geological strata ranging from earth or sand to solid bedrock, or aquifers.UTES technologies include:

The IEA-ECES programme continues the work of the earlier International Council for Thermal Energy Storage which from 1978 to 1990 had a quarterly newsletter and was initially sponsored by the U.S. Department of Energy. The newsletter was initially called ATES Newsletter, and after BTES became a feasible technology it was changed to STES Newsletter.[36][37]

The other method, "annualized geothermal solar" (AGS) uses a separate solar collector to capture heat. The collected heat is delivered to a storage device (soil, gravel bed or water tank) either passively by the convection of the heat transfer medium (e.g. air or water) or actively by pumping it. This method is usually implemented with a capacity designed for six months of heating.

Architect Matyas Gutai[42] obtained an EU grant to construct a house in Hungary[43] which uses extensive water filled wall panels as heat collectors and reservoirs with underground heat storage water tanks. The design uses microprocessor control.

A number of homes and small apartment buildings have demonstrated combining a large internal water tank for heat storage with roof-mounted solar-thermal collectors. Storage temperatures of 90 ?C (194 ?F) are sufficient to supply both domestic hot water and space heating. The first such house was MIT Solar House #1, in 1939. An eight-unit apartment building in Oberburg, Switzerland was built in 1989, with three tanks storing a total of 118 m3 (4,167 cubic feet) that store more heat than the building requires. Since 2011, that design is now being replicated in new buildings.[44]

In Berlin, the "Zero Heating Energy House", was built in 1997 in as part of the IEA Task 13 low energy housing demonstration project. It stores water at temperatures up to 90 ?C (194 ?F) inside a 20 m3 (706 cubic feet) tank in the basement.[45]

A similar example was built in Ireland in 2009, as a prototype. The solar seasonal store[46] consists of a 23 m3 (812 cu ft) tank, filled with water,[47] which was installed in the ground, heavily insulated all around, to store heat from evacuated solar tubes during the year. The system was installed as an experiment to heat the world"s first standardized pre-fabricated passive house[48] in Galway, Ireland. The aim was to find out if this heat would be sufficient to eliminate the need for any electricity in the already highly efficient home during the winter months.

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