



Energy Conservation through Energy Storage

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Underground Thermal Energy Storage

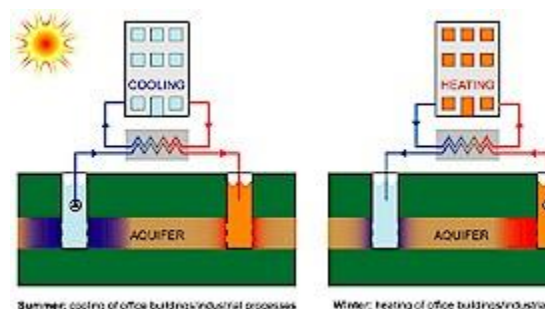
The most frequently used storage technology, which makes use of the underground, is Aquifer Thermal Energy Storage. This technology uses a natural underground layer (e.g. a sand, sandstone, or chalk layer) as a storage medium for the temporary storage of heat or cold (see schematic). The transfer of thermal energy is realized by extracting groundwater from the layer and by re-injecting it at the modified temperature level at a separate location nearby.

Meanwhile, several hundreds of aquifer thermal energy storage projects have been realized in the participating countries (see frame). Most applications are about the storage of winter cold to be used for the cooling of large office buildings and industrial processes. It can easily be explained that aquifer cold storage is gaining more and more interest: Savings on electricity bills for chillers are approx. 75 %, and in many cases, the payback time for additional investments is shorter than five years. A major condition for the application of this technology is the availability of a suitable geologic formation.

Other technologies for underground thermal energy storage are borehole storage, cavern storage and pit storage. Which of these technologies is selected, strongly depends on the local geologic conditions.

With borehole storage, vertical heat exchangers are inserted into the underground, which ensure the transfer of thermal energy towards and from the ground (clay, sand, rock, etc.). Meanwhile about a dozen of projects has been completed in the participating countries. Many of these projects are about the storage of solar heat in summer for space heating of houses or offices. Ground heat exchangers are also frequently used in combination with heat pumps, where the ground heat exchanger extracts low-temperature heat from the soil.

With cavern storage and pit storage, large underground water reservoirs are created in the subsoil to as thermal energy storage systems. These storage technologies are technically feasible, but the actual application is still limited because of the high level of investment.



Cooling system with aquifer storage: KBC Bank Leu (Belgium)



Construction phase borehole heat storage project Neckarsulm (Germany)

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