



SEASON THERMAL ENERGY STORAGE

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What is season thermal energy storage?

- Season thermal energy storage, or STES, is the storage of heat or cold for periods of up to several months
- These storages are always available and can be used whenever needed
- For example: the heat from solar collectors and the waste heat of air conditioners (during the hot months) can be stored and saved for heating for the colder weathers or winter, also the waste heat from industrial process can be used for this
- With these storages we can also collect the cold air in the winters and use in the summers to cool off our houses
- Most of the times the heat is collected from the ground or waters that the sun has warmed up
- STES system can be used for only single houses or buildings but also for larger districts such as neighborhoods or even small towns

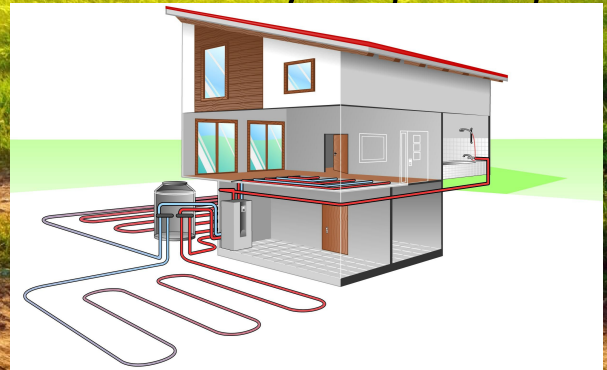
STES technologies

- There are a few different ways to collect the heat from nature
 - Underground thermal energy storage (UTES)
 - Aquifer thermal energy storage (ATES)
 - Borehole thermal energy storage (BTES)
 - Cavern or mine thermal energy storage (CTES)
- We can collect the heat from the ground, rock or water



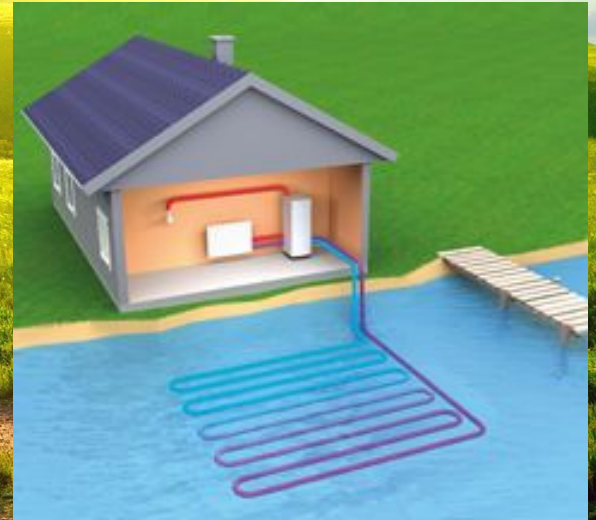
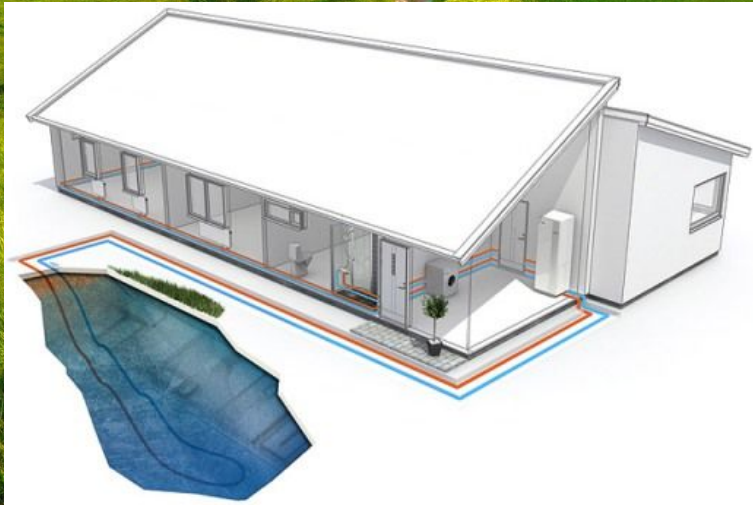
Underground thermal energy storage (UTES)

- One of the most common ways to collect the heat from the ground is to install pipes under the ground, this is an excellent choice for big yards
- The idea is to pump liquid that is a mix of bio-ethanol and water into the pipes that then collects the heat from the ground
- The liquid brings the heat to the heat pump which measures the temperature and the need of the heat in the house and then saves it for the storage or puts it right to the use in the house to warm up the water, floor or in some cases to the radiators to heat the house inside
- The most important thing on installing the pipes is to know where there is the best place to collect much heat in your yard
- Even though the pipes are installed into your own yard they won't affect on your gardening or limit the ways how you want your garden to look like



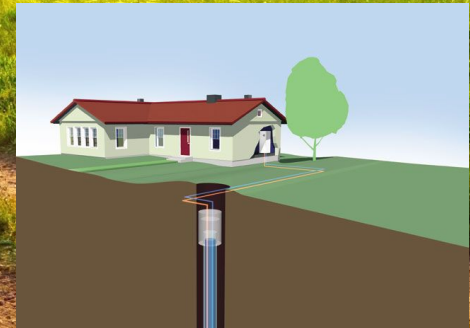
Aquifer thermal energy storage (ATES)

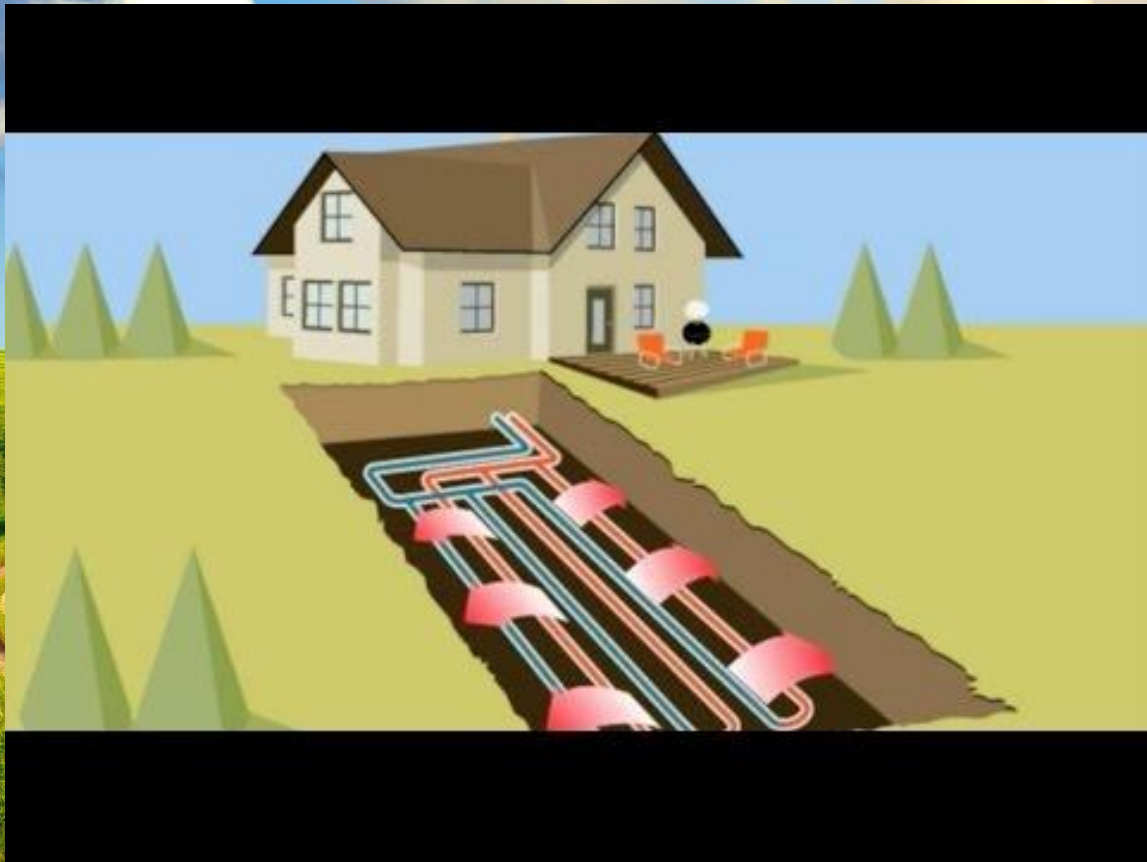
- ATES works basically the same way as the previous UTES but this time the pipes are installed in the nearby waters to collect the heat from there
- As in the UTES the liquid that is a mix between bio-ethanol and water is pumped in the pipes to collect the heat and to bring it to the heat pump
- The waters where to collect the heat doesn't have to be open waters, we can also use the groundwaters to collect the heat



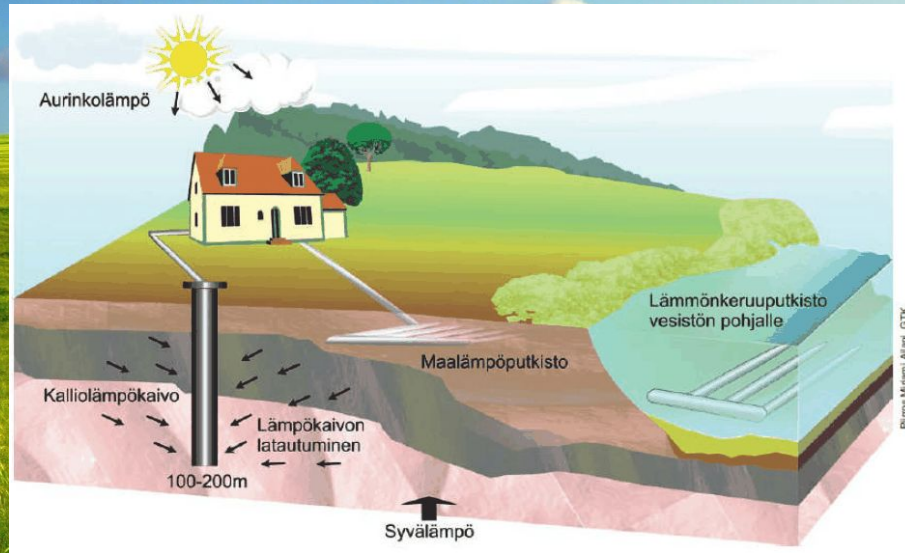
Borehole thermal energy storage (BTES)

- In BTES a deep hole is drilled in the ground and the pipes are installed in the hole to collect the heat deep from inside the ground, then, as before, the liquid brings the heat to the heat pump
- BTES is a little more expensive than the previous options but it is the most powerful way to collect the heat, and also it doesn't need so much space
- The size of the hole is drilled as big as needed, a bigger hole means more energy and a smaller hole means less energy, the length of the hole can be from 50 to 300 meters
- Usually one medium hole (100-200m) is enough for normal houses but with bigger buildings and factories a larger hole or many little holes are needed
- BTES is a good way to compound UTES and ATES as the hole can be drilled through normal ground and also through a groundwater deposit, this way we can collect heat both from the ground and waters





Before moving to the last option it is important to tell that these three ways (UTES, ATEs and BTES) can also be compound together to create a bigger system to collect the heat from the ground. In that system all these three ways are used. Usually it is not needed for normal houses but sometimes if the need of energy is huge or there is not enough space to manage only with one way, by combining these ways it is possible to create enough energy.



We can also compound these ways to other heating systems, like wood or oil, to create a working system that fills our needs. In some houses these STES systems are used only to warm up the water and floors but the house itself is still warmed with oil or wood.

An example on how to compound the ways

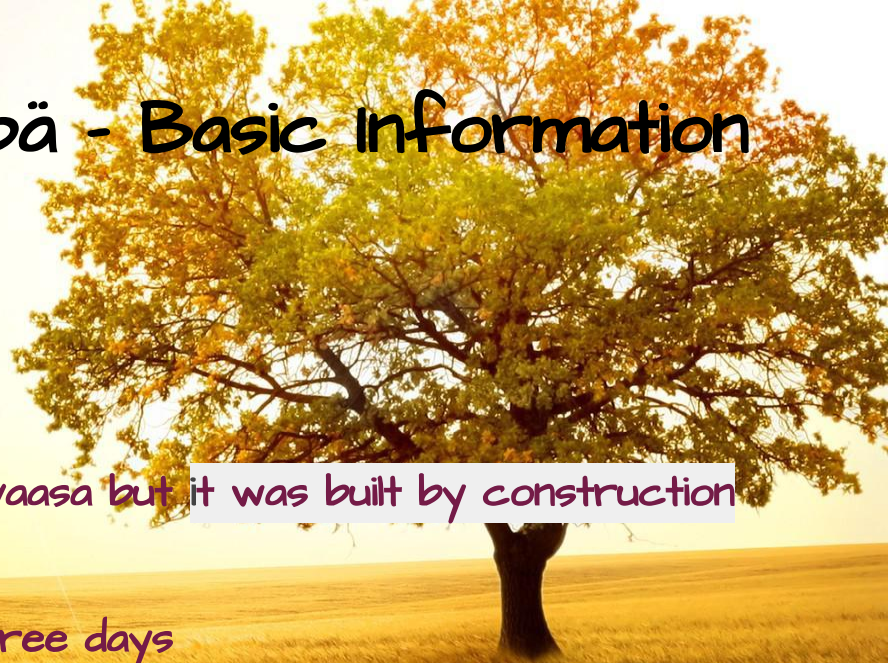
Cavern or mine thermal energy storage (CTES)

- CTES is not a common way to collect the heat from the ground but it is still an option that might be good for large mine companies or to those areas where there is enough caves
- As we already know, the sun's heat is stored in the ground and as with mines and caves they're usually deep inside the ground which makes it easy to collect the heat from there
- This is the most cheapest and easiest ways to collect the heat from the ground but unfortunately there are only a few caves and mines that are good for this use
- Some mines and caves are still capable for us to use and there we install those pipes in the caves or in the mining corridor to collect the heat
- With bigger mines it is possible to collect the heat and use it for the houses nearby and with smaller mines the heat can be used for the mine's buildings



Example of UTES in Hyyppä - Basic Information

- Was constructed in march 2012
- It cost about 15 000€
- Manufacturer is Lämpöässä, company from vaasa but it was built by construction company called Putki-könnö from Kauhajoki :)
- Installing pipes and compressor took about three days
- There are two pipes 400 meters each, installed about 1,5 meters into the ground
- It has been with us three and half years
- We chose it because it's ecological, easy to use, effortless and it keeps our house warm no matter what's the weather outside.



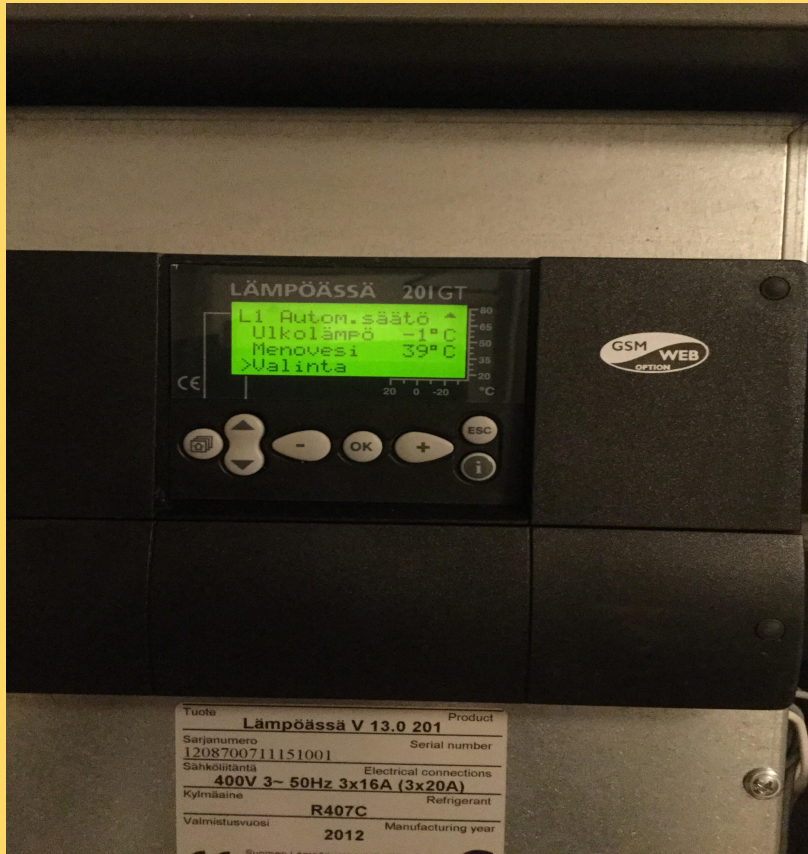
Example of UTES in Hyyppä - Benefits

- Our heating before UTES was oil and compared to oil heating, UTES spares us 1800€ in year.
- in three and half years we have saved about 6300€
- it pays itself back in about 8 years
- Our household contains three persons and we have 490m² of space
- We have own meter for heat consumption so we know exactly how much the compressor takes electricity.
- from 21.11.2012 to 3.4.2016 (from first day to yesterday) it has took 29 222kW.

Benefits, Part two

- Compressor is located in our laundry room and it just quietly humming.
- Compressor is super-easy to use, you can set temperature for water coming from tap and also the temperature of water flowing in radiators.
- It also goes well with basic settings so don't even have to change the settings if you don't want.
- We have changed the settings only once when there was really freezing outside and our old house windows cannot keep all of the cold away.
- It has been very good acquisition and we really recommend it to everyone!

the Compressor with all of it's might ->



you can change settings with this monitor ↑



SOURCES

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