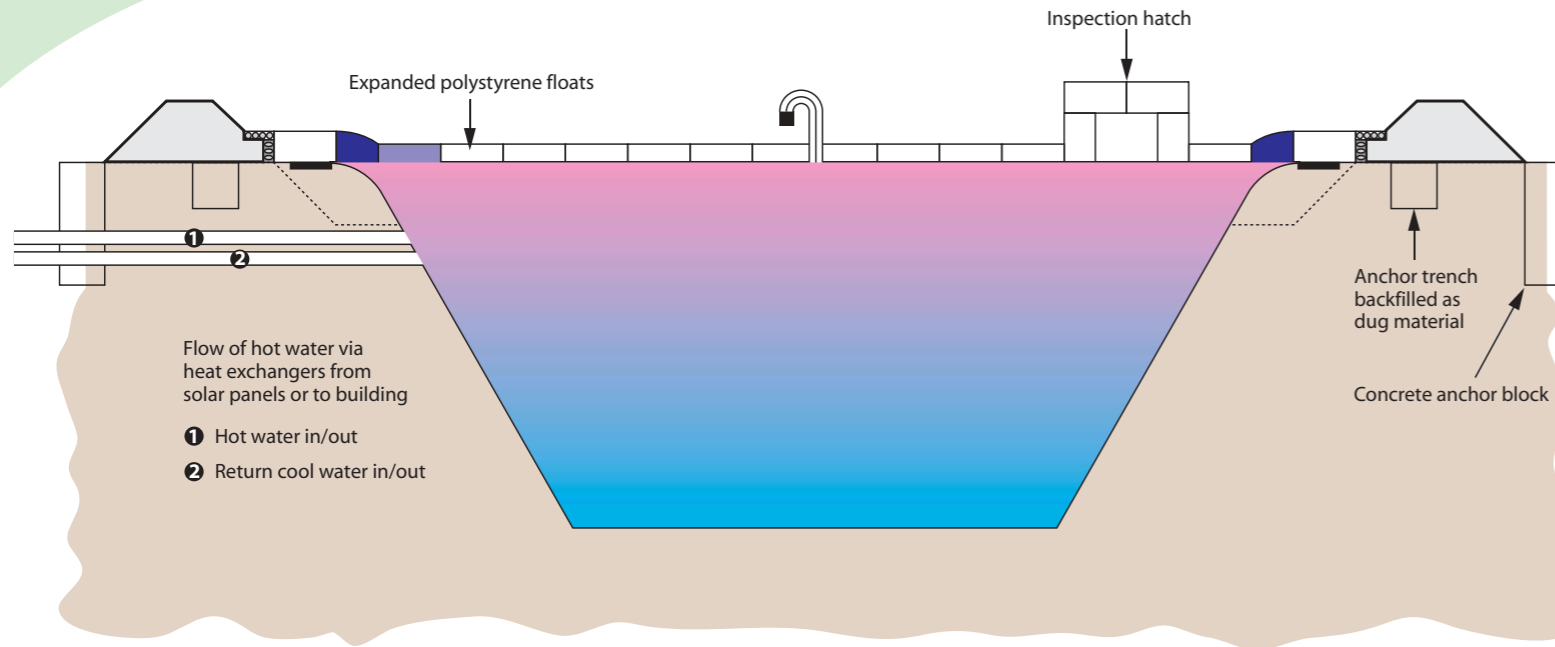


Underground heat store

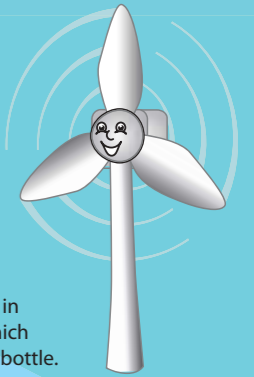
Buried under this cover is a huge underground body of water that stores the heat generated by the solar panels in the summer, for use in the buildings during the colder months. It is 6 metres deep, 12 metres wide at the bottom, over 20 metres wide at the top, and holds 1400 m³ of water.



A world first

This is the first time this particular design has been used anywhere in the world. It was designed and built by Portuguese company Jardim Vista and environmental consultants EPG. There are many different kinds of deep water storage, floating covers and water re-use schemes, but none where so many technologies have been incorporated into a single project.

BEAUFORT'S ENERGY TRAIL



Hidden under the ground just in front of you is a 'heat store', which acts just like a giant hot water bottle. It stores warm water that has been heated by the sun in the summer until it is needed in the office in the winter.

The heat store holds as much water as two municipal swimming pools. It took two weeks to fill it up.

- ⚡ How do you think the warm water gets from the heat store to the office buildings?
- ⚡ Do you think the water is the same temperature all the way down?
- ⚡ Why do you think we have to store the water from our solar panels?

Why is water used for heat storage?

The high heat capacity of water makes it a good choice for storing energy. The temperature of the water in the store will drop as the heat is extracted. Some heat will also be lost to the surroundings. This is estimated to be about 50% of the total heat put into the store during the summer. The relatively low-grade heat from the store can be used to preheat the incoming air to the building as the outside air will be at a lower temperature than the water.

The larger the store is, the smaller the ratio of surface area to volume and therefore the smaller the heat loss.

Heat stores the size of small lakes supply heat to whole villages in Scandinavia. The energy loss from these is much less as they are so much bigger.

What happens as the seasons change?

During the summer there will be little or no demand for heat in the building, so the heat generated by the PVT array will be stored in the heat store.



In the autumn, some of the solar heat generated will be used directly in the buildings and the excess will be added to the heat store. The temperature of the water in the store will gradually rise over the summer and early autumn.



During the winter the solar heat generated will be less than the building's heat load, and the heat will be extracted from the heat store to heat the incoming air to the building.



Design

The heat store is insulated with a 500mm thick floating polystyrene lid and one metre of polystyrene around the perimeter. The rest of the sides and base are lined but un-insulated. Provided the ground remains dry, it will not conduct heat very well and will gradually warm up over the year, reaching a steady state where it will act as additional storage capacity.

The temperature of the water inside is constantly monitored by the Building Management System and in the unlikely event that maintenance is needed, the interior can be inspected by the access hatch in the cover.

Net heat collected into storage every year: 12MWh



Photo: Peter Mackinnon