

# Thermal energy storage: essential for renewables

THEMAL ENERGY STORAGE INCREASES THE EFFECTIVENESS OF VIRTUALLY ALL RENEWABLE HEATING AND COOLING SYSTEMS

## Collective effort leads to large benefits

Thermal energy storage is an enabling technology for renewable heating and cooling: from solar collectors to biomass boilers, from micro-cogeneration to heat pumps. Although storage itself is often rather invisible, its impact on the performance of renewable energy generated in a house, a city, or a country is very large.

By improving the effectiveness of thermal storage, the effectiveness of all renewable heating and cooling systems can be improved.

However, due to the large diversity in storage technologies and applications, the markets for storage are also very diverse. Until now, this has led to a relatively fragmented approach to the development of storage technology.

For an effective development and market introduction of advanced thermal storage technologies, a strong international collaboration between industry, research, and policy makers is required.



*“By improving the effectiveness of thermal storage, the effectiveness of all renewable heating and cooling systems can be improved.”*

## Thermal storage technology

Thermal energy can be stored using different technologies. With sensible heat storage, heat is stored by increasing the temperature of a medium. Common examples include hot water boilers, solar combi systems, ground heat exchangers, and aquifer storage.

Up to three times more energy can be stored with latent heat storage, where heat is stored in a phase change, e.g. by melting paraffin or organic salts. Because latent heat storage is very effective over a small temperature range, it is an excellent material to stabilise an indoor climate, for example.

Thermochemical storage has the highest energy density. By storing heat in a chemical reaction, reversibly changing the storage material structure, up to 10 times more energy can be stored compared to a hot water tank of the same volume. In addition, thermochemical storage has virtually no heat losses, making it very suitable for seasonal storage.

## Why storage?

### Supply-demand matching

In most renewable heating and cooling applications, supply and demand do not occur simultaneously, and thermal storage is needed to bridge the intermediate time interval. A well-known example is solar thermal heating, where daytime heat is stored for nighttime use.

### Peak shaving

With a thermal storage as peak shaver, the size of heating or cooling installations can be reduced. For example, in (solar) cooling, the storage and cooler can be used simultaneously to cool the building, reducing the peak load on the cooler. The storage can be recharged when demand is low.

### Thermal inertia

Through integration of thermal storage in the walls and floors of a building, the thermal building mass can be enlarged. This stabilises the indoor temperature and enhances indoor comfort.



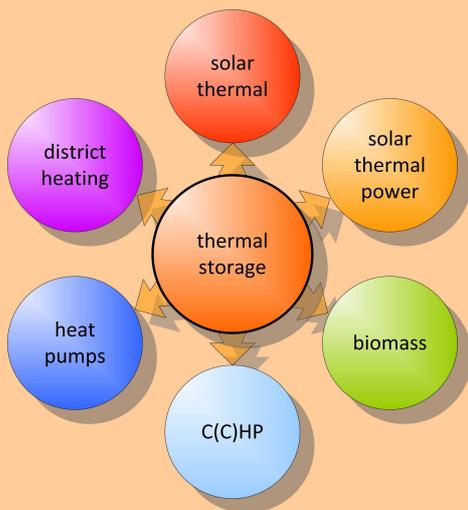
SOURCE: DÖRKEN

## Did you know..?

... 49% of European energy consumption is used for heating? This is as much as the combined use for transport and electricity!

...thermal storage is part of almost all renewable heating and cooling systems ?

...up to ten times more energy can be stored in a given volume using advanced storage materials?



## Find out more

For more information on thermal energy storage, visit the PREHEAT website at [www.preheat.org](http://www.preheat.org).

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“... storage has an important role in solar thermal, biomass, cogeneration, heat pumps, and district heating”

SOURCE: VELUX/ESTIF

## The storage market

By far the largest market for thermal storage is the classical production of heating and hot water. In 2006, nearly 40 million hot water storage devices have been sold worldwide, representing a value of over 6 billion euros.

Although this market is large, it is also very diverse. Different European regions have different traditions, market structures, end-user characteristics, building regulations, etc.. In Europe, over 350 brands exist, which are all mainly distributed locally.

In comparison, the storage market for renewable heating and cooling is relatively small: in 2006, worldwide turnover for renewable

heating and cooling systems was around 3.4 billion euros; storage makes up only a fraction of this.

So far, the strong growth of the renewable market has led to strong consolidations: almost all large manufacturers of heating components now have a renewable division.

The most important renewable application for storage is solar heating and cooling, where storage is used to bridge the time between supply (day/summer) and demand (night/winter). Besides this, storage also has an important role in biomass, cogeneration, heat pumps, geothermal, and district heating.

*This publication was created within PREHEAT, a European project within the Intelligent Energy-Europe framework. PREHEAT has increased the visibility of heat storage and the attention for development and implementation of improved heat storage technologies. On the long term, PREHEAT has aimed to initiate a coherent European promotion program with a collective approach by the industry, R&D institutions and other market actors.*

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