

## Brødstrup Fjernvarme

### Media Summary

Brødstrup Fjernvarme (Brødstrup District Heating) is a consumer owned Danish district heating utility. The 1,482 consumers meet every year at the general assembly and decide all major changes.

About 10 years ago Brødstrup Fjernvarme decided

*“Brødstrup Fjernvarme will – by operating production utility and distribution facilities technically, economically and environmentally optimized – produce energy and distribute heat to the consumers to a total price among the cheapest 20 % in Denmark for similar types of utilities”.*

At that time the production facilities were two natural gas engines, gas boilers and an accumulation tank. Since then Brødstrup Fjernvarme has been a forerunner among Danish district heating utilities. They were the first to utilize the open electricity market, the first to introduce smart metering, the first to introduce regularly customer service, the first to introduce large scale solar thermal combined with gas fired CHP, and the first to test borehole storage technology, heat pumps and electric boiler in the same system.

The natural gas consumption is now reduced with 38 % and the heat price is still among the 20 % cheapest natural gas fired CHP plants in Denmark.

Brødstrup Fjernvarme has also been forerunner in sharing their knowledge about solar thermal district heating in Denmark, resulting in more than 500,000 m<sup>2</sup> now installed and to Europe through the EU supported projects SDH Take-off and SDH plus.



*Brødstrup Fjernvarme from the air*

## Description of Brødstrup Fjernvarme (Brødstrup District Heating)

Ten years ago Brødstrup Fjernvarme formed a policy for the future. Parts of it was *“Brødstrup Fjernvarme must by higher efficiency and engagement in new business areas and production methodologies go against the unfortunate consequences caused by higher prices for our only fuel – natural gas”*

and

*“Brødstrup Fjernvarme will – by operating production utility and distribution facilities technically, economically and environmentally optimized – produce energy and distribute heat to the consumers to a total price among the cheapest 20 % in Denmark for similar types of utilities”.*

Since then Brødstrup Fjernvarme has systematically worked to realize this policy:

- Brødstrup Fjernvarme was one of the very first Danish district heating utilities to see the new business areas, when the **Danish electricity market** was opened.
- Brødstrup changed as one of the first utilities their customer **heat meters** in 2006-2007 to a new type with wireless reading and leakage control making it possible to provide the customers with sms-service if there is a water leakage and thus save water and to constantly overview for instance return temperatures from house installations.
- In the TEAKS-project Brødstrup Fjernvarme **focused on the total “value chain”** from production to end users and analyzed where it was easiest to raise efficiency. The result was, that the most economically efficient activity was to check the house installation, including the central heating system. Brødstrup Fjernvarme therefore decided to check all house installations every second year to give economical support to improvement of installations in the house.

But the most impressive effort has been in **solar district heating (SDH)**. In 2005 no Danish natural gas fired CHP had solar district heating. Brødstrup Fjernvarme made design calculations showing that solar district heating combined with CHP in an open electricity market could be a feasible solution, because electricity prices in periods are so low, that the engine is stopped and the heat production takes place on natural gas boilers. That made the Danish government make an analysis during Winter 2005-2006. Danish electricity grid operator Energinet.dk carried out the calculations and the conclusion was that

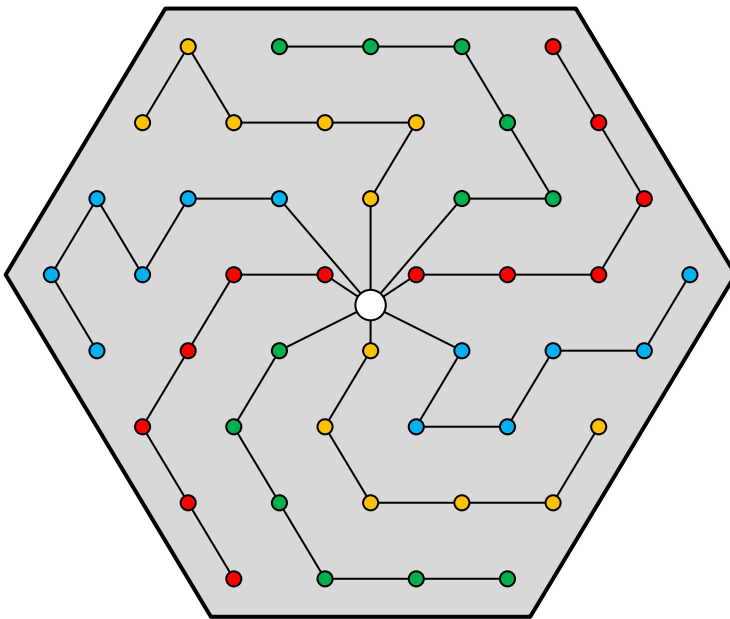
*“As well the heat users as the energy producers and the environment will benefit from solar thermal. In CHP areas with high percentage of electricity production from RES – especially wind power-solar thermal will contribute positively to an electricity market, where the success criteria is flexibility and ability to react on price signals.”*

Brødstrup Fjernvarme then implemented the worlds first solar thermal plant (8,000 m<sup>2</sup>) combined with natural gas fired CHP in 2007. Since then they have been followed by 50 Danish natural gas fired CHP plants, and the amount of installed m<sup>2</sup> passed 500,000 in 2014 and another 200,000 m<sup>2</sup> seems to be added in each of the years 2015 and 2016. This development in Denmark has been driven by the utilities, and Danish District Heating Association (DDHA). DDHA established in 2007 an experience exchange group for SDH. Brødstrup Fjernvarme (together with Marstal Fjernvarme) took care of the leadership in this group and was thus the main inspiratory for the colleagues.

Also new plants in other European countries are now being implemented, because Brædstrup has represented Danish District Heating association in the Intelligent Energy European projects SDH Take-off (2009-2012) and SDH Plus (2012-2015), supported by EU.

In 2008 Brædstrup Fjernvarme decided to take the Step 2 towards 100 % renewable energy. They decided to implement another 10,600 m<sup>2</sup> of solar panels, 5,500 m<sup>2</sup> buffer tank, 19,000 m<sup>3</sup> pilot borehole storage, 1.2 MW<sub>heat</sub> heat pump and a 10 MW electric boiler.

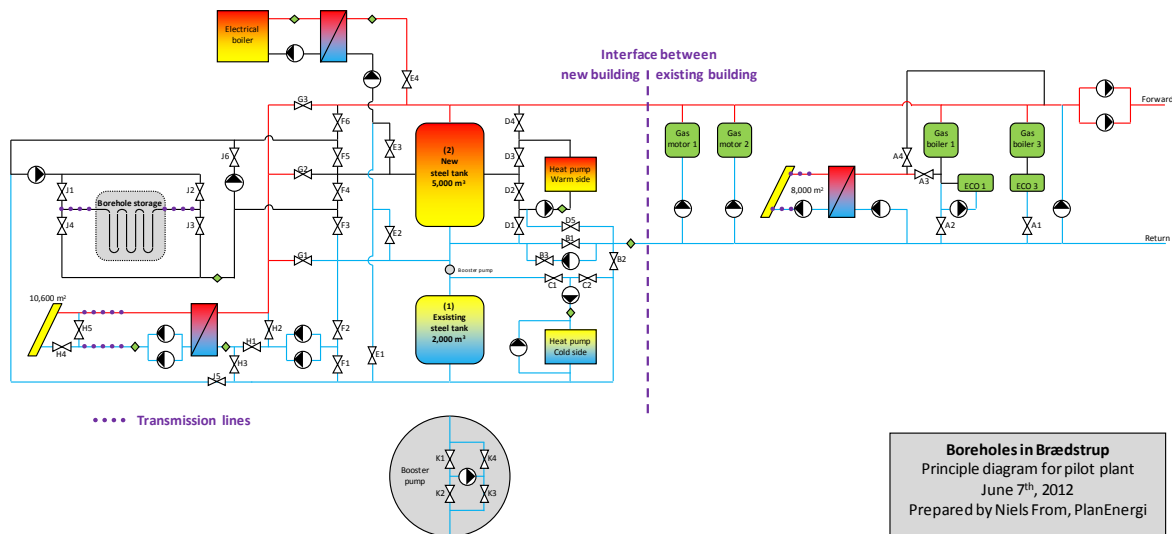
Step 2 was implemented in 2011 and 2012. The borehole storage was the first in Denmark and only 3 other where the storage is loaded with solar thermal heat have been implemented in the world. Brædstrup learned from German experiences, but made their own pipe layout for boreholes and insulated the storage with cockle shells.



**Figure 1:** Pipe layout Brædstrup



**Figure 2:** Cockle shells in place



**Boreholes in Brødstrup**  
 Principle diagram for pilot plant  
 June 7<sup>th</sup>, 2012  
 Prepared by Niels From, PlanEnergi

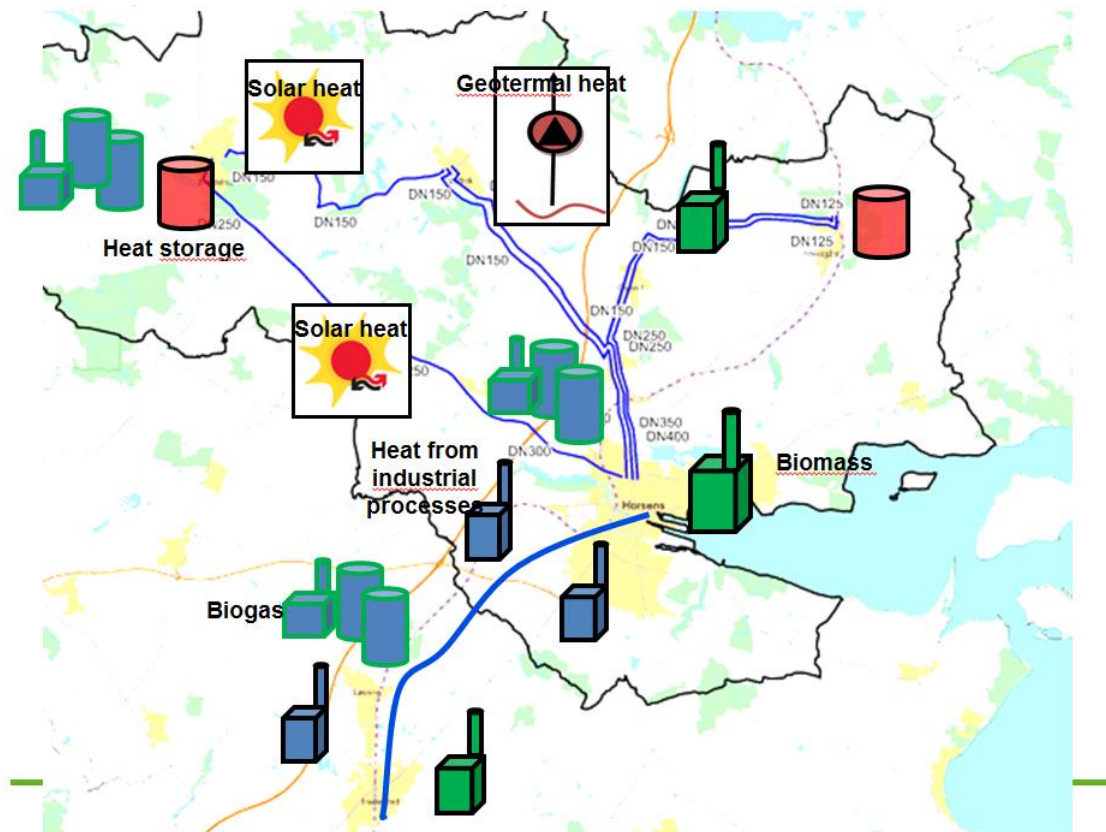
**Figure 3:** Principle diagram for step 2 in Brødstrup

Experiences and the first monitory results from the project can be found in the report “Boreholes in Brødstrup” from June 2013. The project was supported by the Danish programmes ForskEI, EUDP and by Region Central Denmark.

The next step towards 100 % RES is prepared in cooperation with 6 other district heating utilities in the municipalities Horsens and Hedensted. Brødstrup Fjernvarme took initiative to this co operation in 2011 and until now the co operation has resulted in a common design study called FlexCities how to convert to 100 % RES using combinations of:

- Excess heat from industries
- Large solar thermal plants connected to the transmission pipes
- Large scale heat storages
- Large scale heat pumps
- Biogas CHP
- Conversion of individual heated houses to district heat





**Figure 4:** Illustration of the FlexCities project

Brødstrup Fjernvarme has during all the years been among the 20 % cheapest natural gas fired CHP plants in Denmark. In some years even the cheapest.

The customers have been involved from the beginning since all large decisions have been taken by the general assembly, where all customers are invited and have a vote. The decision of implementation of the first solar plant was even taken after an extraordinary general assembly to be sure that the customers got ownership to the project.

Brødstrup Fjernvarme has also been frontrunner in the planning process in co operation with Horsens Municipality. The result is a SDH plant, integrated in the landscape and used as a recreational area with an information pavilion. And finally Brødstrup Fjernvarme has taken the initiative to the homepage [www.solvarmedata.dk](http://www.solvarmedata.dk), where real time monitoring results can be found for several Danish SDH plants.