

Marstal Fjernvarme – a solar district heating plant on the island of Ærø, Denmark



Picture of the solar district heating plant in Ærøskøbing, located on the island of Ærø.
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Highlights

- An old fossil fuel based heating systems has been replaced by renewables
- Collectively-owned district heating network provides hot water to nearly all of the 2200 inhabitants of the island town of Marstal
- Pit thermal energy storage to conserve solar heat throughout the winter
- Frequent changes to legislation make operations of the plant more difficult
- This innovative project attracted between 2000 and 4000 visitors over the years

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Background information

The coastal town of Marstal is located at the Eastern tip of the island of Ærø. With roughly 2.300 inhabitants, Marstal is the biggest settlement on the island. It is also the economic centre of the island. Marstal has a long-standing naval history. It is well known for its shipbuilding and its naval academy.

Brief description of what was done

Since 1994, Marstal Fjernvarme has gradually started transitioning to a renewable energy system. Nowadays, the company provides heat to the settlement of Marstal from 100% renewable energy sources. 50-55% comes directly from the solar heat collectors, 40% from wood chips, 2-3% from a heat pump. The heat pump takes advantage of the intermittenencies in wind power production and is preferably put to work when an abundance of cheap wind energy is available. The remaining energy comes from the combustion of bio-based oil. The boiler is a co-generation burner that provides both heat and electricity. Solar heat, which is abundant in the summer months, is stored in two pit storage systems: Sunstore2 (10,000 m³) and Sunstore4 (75,000 m³).

The case of Marstal Fjernvarme shows how different modes of energy production can be combined in a way which considers and taps into the potential of different technologies. Because of its innovative character, the project has won prizes and attracted significant media attention.

Project champions and motivations

Two local inhabitants set the project in motion in the 1960s when they went door to door in Marstal to gather support for a citizen-owned local district heating system. When oil prices kept rising in the early 1990s, the chair of the board, the manager of Marstal Fjernvarme, and one of EnergiPlans owners initiated the energy transition in Marstal. The first solar heating system was installed at the local swimming pool. After showing promising results, the three men introduced the solar heating system for the local grid and were thus able to provide energy to households at a lower price.

Decision making process

The company's board manages the day-to-day business activities. During the annual general assembly, the members of the cooperative elect the members of the board. The general assembly has the last word in big decisions such as the installation of the solar heating system.

Ownership model adopted

Marstal Fjernvarme started as a consumer-owned co-operative with the installation of the initial district heating network in the 1960s. Since then, the company is still owned by the inhabitants of Marstal. Homeowners buy a share in the network when buying a house in Marstal that is connected to the network.

Financing and economic viability

The inhabitants of Marstal financed the original district heating network in the 1960s. Subsequently, the company financed the transition by tapping into available subsidies and funding programmes. 35% of the costs were covered by subsidies from an EU fund (40 Mio DKK). The remaining money (90 Mio DKK) was raised through so-called Kommune Credit, which is a Danish funding programme that allows borrowing money at favourable rates. The company uses a not-for-profit business model, which means that all potential profits return to the members in the form of lower energy prices.

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Project implementation

The project was implemented in several steps. Each step meant a further expansion of the collector field. Technically, the implementation of the project was unproblematic as several steps were outsourced to contractors. The general assembly had to approve of all different steps of the development of the project. The success of the first steps helped convince people in the community to trust in later expansion.

Project benefits

The most apparent benefit provided by the project is the supply of sustainable energy to most of the 2000 Marstal inhabitants. This means that the environmental performance of the energy system improved considerably. At the same time, the inhabitants saved a lot of money due to the comparatively lower energy prices even though the current prices of Marstal Fjernvarme are slightly above the national average. This is quite an achievement considering that Marstal is located on an island which makes the transport of fuels more expensive. An additional economic benefit for the local community comes from the visitors that come to Ærø to learn more about the project. Annually, between two and four thousand people visit Marstal Fjernvarme, examples including members of the Ukrainian government.

Barriers

Like every innovative project, Marstal Fjernvarme met some technical difficulties. Being the first project of its kind in Denmark, there was not substantial external experience the company could draw on. However, contractors planned and executed most of the actual set up of the solar collectors and Marstal Fjernvarme received a functional turnkey project. A great majority of Marstal inhabitants supported the project and no resistance in form of NIMBY (“not in my backyard”) occurred. Once the first step of the project was running smoothly, there were less discussion questions regarding expansions and fewer people attended the general assembly for each of the different steps of the project.

The biggest challenge for Marstal Fjernvarme is changing legislation. For example, in 2017 the Danish government slashed the feed-in tariff for electricity from renewable sources. Consequently, the company lost 2 Mio DKK overnight as they now had to sell the electricity produced by the boiler at market price. These changes of legislation make it challenging for a company, especially when working with a long-term planning horizon of thirty years.

Main lessons learned

- A step-wise development of CE projects can help build trust in a technology.
- Economic arguments are great in convincing local population.
- Spearheading projects can attract a lot of attention and policy tourism.

Project champions' recommendation to policy makers

- It is important to keep the legal framework stable for a longer time. Regular changes such as available subsidies, make it very hard for actors to implement innovative projects.

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