

Case study : Allinge - An innovative heat plant configuration

Name of the project: Solar heat, biomass and heat pumps - combined DH supply
(Solvarme, biomasse, varmepumper – Kombineret fjernvarmeforsyning i Allinge og omegn)

Address of the project: New DH plant site at Allinge, Bornholm, Denmark

Name and type of the owner: District Heating plant owned by the utility company Bornholms Forsyning A/S

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Context of the study

There has been set up goals to reduce fossil fuel use in the heating sector on the island Bornholm. Besides these goals, a heat plan for the island has been carried out. This heat plan estimated that biomass and solar based district heating would be feasible in a list of towns and that it would be beneficial for the island to be able to even out the fluctuating electricity production/demand by means of large scale heat pumps. Therefore the DH utility are expanding their business in the town of Allinge and the area around that town and need to know how these areas can be supplied in the most feasible way. In the case study a combination with both an absorption heat pump and an electrical heat pump has been included.

SDH plant

SDH system concept

The idea is to use low temperature heat from a waste water treatment plant by means of an electrical heat pump. In order to achieve a high COP for this heat pump, the supply temperature from it is not set very high. An absorption heat pump, which is driven by a high temperature hot water (HTHW) boiler will then raise the temperature from the medium level temperature supplied by the electric heat pump, to the DH network supply temperature. This is all connected with a solar collector field and a storage tank.

SDH technical data

Typical, large Danish flat plate collector used for DH. 10000-12000 m² collector area suggested. Storage tank: 2000 m³.

SDH energy balance (MWh)

Annual heat load: Around 28000 MWh/year. Solar heat production: 4600-5500 MWh/year. Solar fraction: 17-20 %.

SDH economics

The total plant investment consist of a biomass boiler (incl. economizer), 10000 m² of solar collectors, storage tank of 2000 m³, heat pumps coupled in series as described above, purchase of land, a building and an electric boiler. Investment cost: 7.83 M€. No subsidies are available. The average heat price is calculated to be around 54 €/MWh.

SDH plant opportunities & threats, benefits & limits

This type of combination of heat pumps seems to be an interesting concept. However the location of the plant might in the end make it impossible (unfeasible to connect it to the waste water treatment plant. This means that this type of system configuration will probably not be carried out in the specific case after all (though this was thought to be an option earlier in the planning phase), but another suitable plant which has wastewater available nearby can be contacted instead, so the results of the case study is by no means wasted.

Authors

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