Case Studies

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ANNEX 57

Flexibility by implementation of heat pumps in multi-vector energy systems and thermal networks

Smart Heat Backadalen, Sweden

The purpose of Smart Heat was to combine district heating and geothermal heat pumps in order to optimize heat consumption and reduce heating costs.

KEY FACTS

RD&D Status:
Large-scale demonstration

Type of heat pump:
Centralized heat pump with local district heating system

Building description:
Residential housing cooperative with 1000 apartments, build 1969

Energy distribution system:
District heating / local distribution

System:
District heating

Energy Storage:
Centralized thermal (local)

Control for the flexible heat pump operation:
Heat driven control

General description:
Ground source heat pump

Source:
146 boreholes used as storage from summer to winter using excess heat from industry via district heating

Summary of the project:

Backadalen, located in Gothenburg, Sweden, is one of the biggest housing cooperatives in Sweden with almost 1000 apartments. The buildings are from 1969 and in 2019 a ground source heat pump system was finalized supplementing the already existing district heating system used for heating and domestic hot water (DHW). The buildings are now heated by the GSHP-system with the aid of the district heating system.

The purpose of the “Smart heat” project is to operate boreholes and heat pumps in the most cost-efficient way possible, this was done by combine the heat pumps with the already existing district heating and make it possible to store excess district heat in the boreholes during the summer, to use by the heat pumps during the heating season. Storing heat in the boreholes increases the heat source temperatures which gives the heat pumps higher COP. In Gothenburg a large share of the district heat comes from industrial excess heat from the oil refineries and from waste combustion running during the whole year and thereby gives a lot of available district heating during the summer period when the heat demand is low.

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Summary:

The heat pumps are not designed to cover the coldest hours and the district heating is used in parallel for heating from a few degrees below 0°C. The domestic hot water is heated entirely by the district heating.

The GSHP system is owned by the housing cooperative but controlled by Göteborg Energi, who is the owner of the district heating network and the electrical grid of Gothenburg. Göteborg Energi has an agreement with the housing cooperative, meaning that the cooperative buys a fixed indoor temperature of 22°C regardless of the heat source used. Thereby Göteborg Energi can decides when the heat pumps should be operating and when the district heating should take over.

Results:

- A flexible heating solution that gives low operating costs.
- Saves around 4 million SEK per year in heating costs for the housing cooperative (approximately 370 000 EUR/year).

FACTS ABOUT THE PROJECT

Place:
Sweden / Gothenburg

Time Frame:
2017-2019

Project owner/leader:
HSB brf Backadalen /
Energiförbättring Väst AB

Project participants:

Published articles:

Josefsson, M. (2020). Optimering och utvärdering av bergvärme kombinerat med fjärrvärme, Master thesis, http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1477453&dswid=3035 (In Swedish)

Walfridson, T. (2022). Case study report for Backadalen, Göteborg, Sweden. IEA HPT Annex 52 – Long-term performance monitoring of GSHP systems serving commercial, institutional and multi-family buildings. https://doi.org/10.23697/r7zd-s388

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