Case Studies

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Demo No.: 31	**Location/City:** Gothenburg	**Country:** Sweden
Project name (short and full title): Smart Heat Backadalen		
Quotation: The purpose of Smart Heat was to combine district heating and geothermal heat pumps in order to optimize heat consumption and reduce heating costs. This means that the cheap heat that is available in the summer is stored as geothermal energy and used during the coldest part of the year with the help of heat pumps.		
Schedule of the demo project (research study): 2017-2019. (The drilling began October 2017 and was expected to be done in 2019).		**Year of realisation:** 2019
Leader organisation (owner, constructor, solution developer, research inst., etc.): General contractor for geothermal heat pump installation: Energiförbättring Väst AB		
Participating organisations – demonstration project part (involved other organisations): District heat supplier: Göteborg Energi AB Project client: HSB brf Backadalen		
Budget of the demo (invest/monitoring etc.): The project includes 146 boreholes and 31 ground source heat pumps (GSHP) delivering in total 1.9 MW heat. Total cost for the investment was around 48.5 million SEK (approximately 450 000 EUR) and the payoff-time is calculated to 15 years.		

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.

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.

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The GSHP system is owned by the housing cooperative but controlled by Göteborg Energi, who is the owner of 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.
- Saving around 4 million SEK per year for the housing cooperative (approximately 370 000 EUR/year).

Published articles (paper, article etc.):

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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Figure 1 Backadalen

Figure 2 Overview of Backadalen multifamily building complex including the location of the 146 boreholes in the Borehole Energy System