Case Studies

https://heatpumpingtechnologies.org/annex57/

Klokel, Sweden

New forms of cooperation in the energy market (#klok_el)

"We are convinced that demand-flexibility through aggregators will be a very important issue in our future energy"

KEY FACTS

RD&D Status:
Large-scale demonstration

Type of heat pump:
Decentralized heat pumps and electric boilers

Building description:
Swedish single-family homes

Energy distribution system:
Hydronic system in buildings

Power supply:
Electric grid

Energy Storage:
Building thermal inertia

Control for the flexible heat pump operation:
Remote control via the heat pump outdoor temperature sensor

Heat source heat pump:
Mainly geothermal and exhaust air, some air-to-water heat pumps

Picture: Sustainable Innovation

Summary of the project:

In 2014, Sustainable Innovation AB and Ngenic AB, along with the local energy company Uppsala Energi AB and heat pump manufacturer Enertech AB, started a project co-financed by the Swedish Energy Agency. The project, titled "New Forms of Cooperation in the Energy Market," aimed to engage customers and electricity grid companies in reducing energy consumption for heating during times of grid strain. This would also reduce power peaks in the grid.

In the project, control of the customers' hydronic heating systems (various types of heat pumps and electric boilers) was installed to be able to reduce usage of the heating system when the power grid was strained. It was proved that by controlling 250 systems, it is possible to achieve a 1.5 MW demand response through morning and evening stops. By aggregating larger groups of heat pump systems and circulating the external control of the heat pumps, longer time spans and larger powers can be covered. This minimizes the impact on individual end users

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ANNEX 57

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

Summary:

The indoor climate and comfort of customers were not affected. In fact, it became more stable. The new control also helps regulate indoor temperature using three devices that measure indoor and outdoor temperatures as well as solar radiation. This has led to energy savings of up to 10% for heat pumps. The main reason is that solar radiation is utilized more efficiently in combination with weather forecasts, resulting in a more consistent temperature.

Another aspect that played a role in the project was customer participation. Initially, it was thought that it would be difficult to entice people to participate in the project, even though it was not privately financed. However, after a certain period, it was seen that not only were the systems and installation free of charge, but customers also experienced better indoor climate conditions and improved energy efficiency. This project creates the conditions for bringing 100% renewable energy into the electricity grid.

Results:

- The system has been stabilized and improved control has contributed to energy efficiency.
- By controlling the systems, energy savings of around 10% have been achieved.
- The project has substantially contributed to increased knowledge of how demand response can simplify renewable energy production.
- Participating customers in the project have given positive feedback.
- The project was able to reduce power peaks in the grid by 1.5 MW using demand response from 250 single-family houses with hydronic heating systems

FACTS ABOUT THE PROJECT

Place:
Sweden / Uppsala

Time Frame:
2014-2018

Project owner/leader:
Sustainable Innovation AB

Project participants:
Ngenic AB
Enertech AB
Upplands Energi AB

Contact Information/Links

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Published articles:

Lindborg et al, (2018). Nya samverkansmodeller på energimarknaden, Eskilstuna (In Swedish)