



# Annex 56

## Digitalization and IoT for Heat Pumps

**IoT enabled heat pumps are equipped with sensors, actuators, network connectivity and software to collect and exchange data. They enable optimization of operation to reduce energy consumption, lower CO2 emissions, achieve economic benefits and increase comfort. They also enable grid services through the targeted provision of flexibility, which will be an important asset in the future energy system based on renewable sources.**

### Key Findings

The IEA HPT Annex 56 project analyses the opportunities and challenges of IoT-enabled heat pumps for use in buildings and industrial applications.

1. 44 application examples were analysed in the participating countries, which clearly show that IoT-enabled heat pumps and products based on them are already available on the market. Factsheets for the application examples are available on the Annex website.
2. Five main categories are assigned to the application examples: Heat pump operation optimization, Predictive Maintenance, Heat pump operation commissioning, Provision of flexibility and Heat as a service.
3. Relevant interfaces, data analysis methods and business models for IoT-enabled heat pumps were analyzed. The results show that the use of IoT technology and connectivity can enable or significantly improve data exchange, analysis and the services based on it.
4. For the users, IoT heat pumps enable operating cost and energy savings and increased operational reliability.
5. For the heat pump value chain (component manufacturers, heat pump manufacturers, dealers, installers), digitalization leads to new products and services that make heat pumps more attractive and future-proof. Compared to traditional business models, they have more responsibility for the efficiency of IoT-enabled heat pump systems.
6. For the energy system, the provision of flexibility is of particular importance, as it allows for better integration of the fluctuating generation of renewable energy. The exchange and use of data play an essential role.



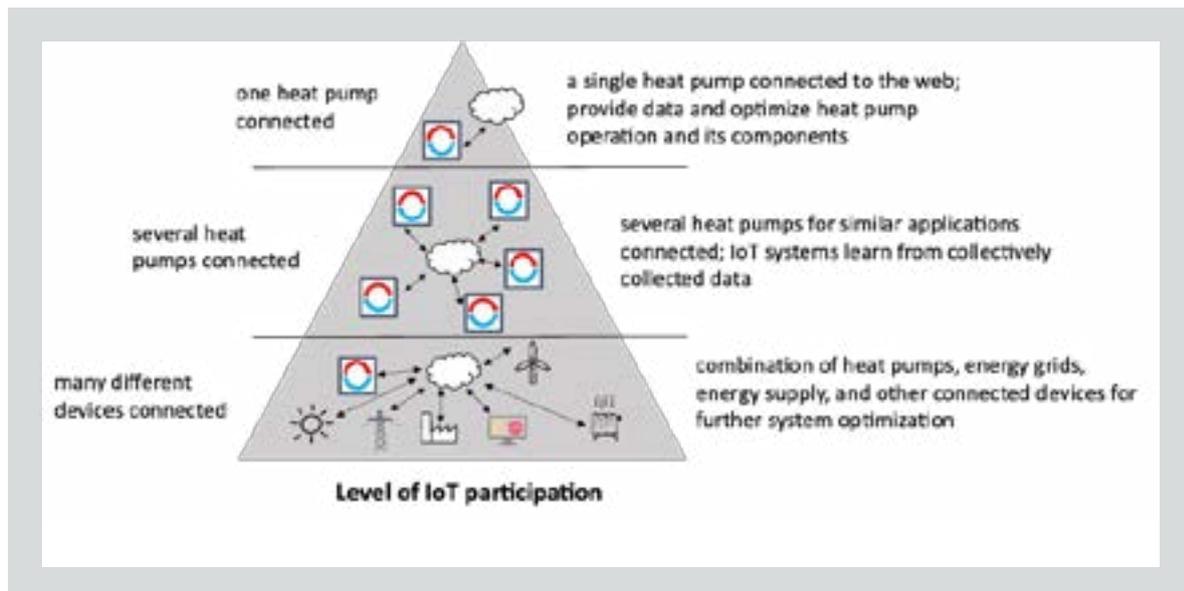


Figure 2: IoT participation for heat pumps.

## Background

Intelligent, digital solutions are increasingly in demand to efficiently use various flexibility options such as power-based heat generation, the use of storage or e-mobility as well as to safely control the electricity grid. Heat pumps are a versatile technology for the provision of space and process heat, for water heating and for cooling of buildings and processes.

According to the IEA's Net Zero by 2050 report, a total of 1800 million heat pumps have to be installed in buildings world-wide to provide more than half of the heating needs. It is a tenfold increase compared with the level of 2020. Digitalization is a significant lever for emission reduction. It is expected that emissions from the building sector will be reduced by 350 Mt CO<sub>2</sub> by 2050 due to digitalization and smart controls, as advances in technology, e.g. smart thermostats or other smart appliances reduce the necessity for people to play an active role in energy savings. Heat pump and component manufacturers have also been offering IoT-enabled products for several years. These include, for example, smart valves

and thermostats, integration into a cloud for data analysis and operational optimization, smart home systems with heat pumps, or solutions for controlling and monitoring HVAC systems.

## Objectives

The aim of the project is to provide a structured overview on IoT-enabled heat pumps:

- » Industrial Internet of Things, communication technologies and knowledge engineering in automation
- » Information security, data protection and privacy
- » Factsheets on IoT enabled heat pumps (research projects, products and services)
- » Market review, manufacturer survey, expert interviews
- » Communication architecture, interfaces and protocols
- » Data pretreatment
- » Data models, meta data and building information modelling (BIM)
- » Data analysis

## Further information

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Publications:	Final report of Annex 56, detailed task reports and webinar available at <a href="https://heatpumpingtechnologies.org/publications/">https://heatpumpingtechnologies.org/publications/</a>
Internet:	<a href="https://heatpumpingtechnologies.org/annex56/">https://heatpumpingtechnologies.org/annex56/</a>