Annex 45

Hybrid Heat Pumps

With hybrid heat pumps, an immediate partial transition of the heating system towards 100% renewable energy is possible, even in non-renovated buildings. Since policy goals for the use of hybrid heat pumps strongly differ between countries, national or regional plans should be made to support their deployment.

Key Findings

1 Hybrid heat pumps can be applied in existing buildings; they provide a potential for significant CO_2-savings that can be tapped into immediately and on a large scale. This also allows for markets and users to get used to heat pumps, preparing for large-scale electrification of domestic heating within the next decades. In addition, it may allow to smoothly adapt/improve the electricity grid to welcome a higher share of HPs in buildings.

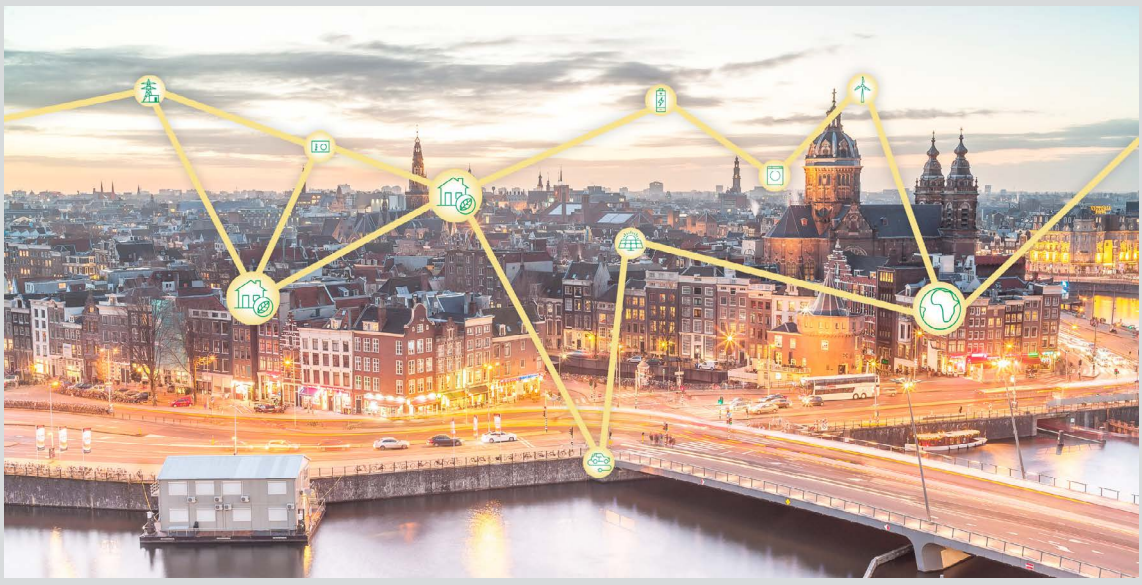
2 Hybrid heat pumps provide flexibility beyond time-shifting electricity loads. Because it is possible to switch from electricity to gas or oil, the HP electricity demand can be completely decoupled from the heating demand at any time, providing a structural solution for local grid congestion.

3 Basic control strategy is a key factor in determining the operating regime for hybrid heat pumps. Hybrid systems may be used to optimize heating for an individual house but can also be used to support grid load management, renewable production profile matching and other smart grid applications.

4 Energy prices form a major influence on market realization potential for hybrid heat pumps. Compared with standard boilers, hybrid systems may face strong competition on both investment and operation costs. Compared to all-electric systems, hybrid heat pumps tend to be more favourable in both respects, albeit not universally so.

5 There is a wide variety of hybrid setups and use cases across participating countries. Each country has a couple of appropriate use cases, while no single use case is relevant for all countries. This is clearly shown in a scheme available at the Annex website.

6 Hybrid heat pumps may serve as a gateway to low-carbon heating, as they provide a partial step away from fossil-fuel use. Once the user gets used to the heat pump functionality, it should be easier to take the step to all-electric heating with a standard heat pump.



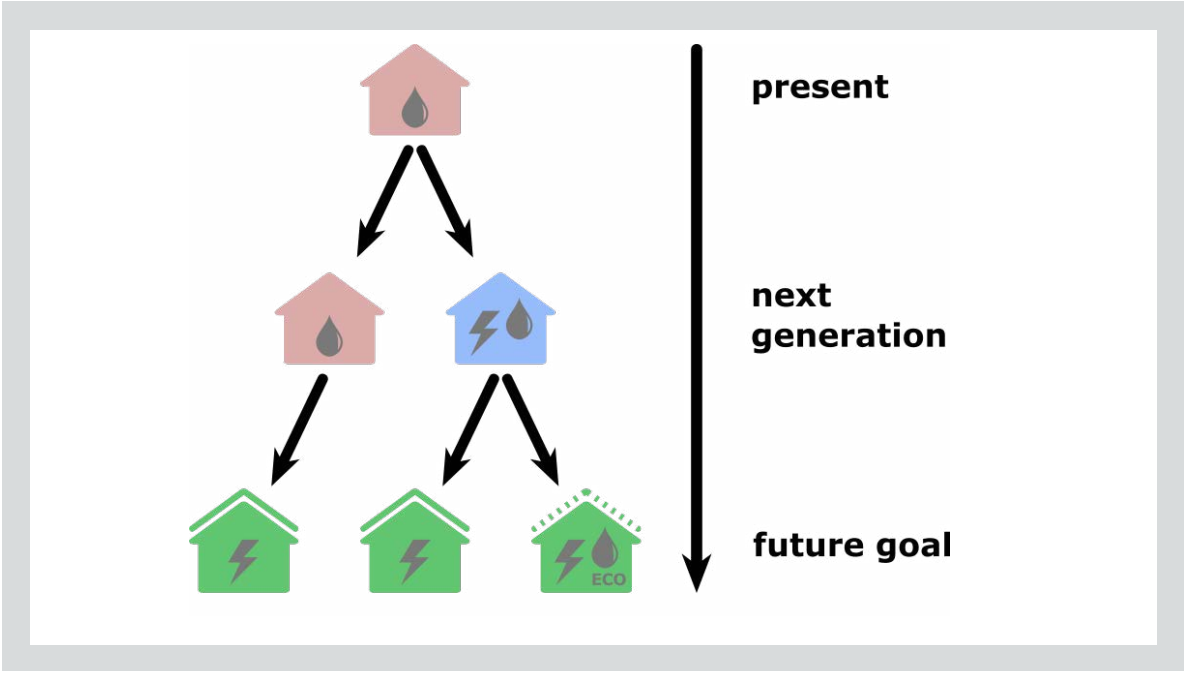


Figure 2: Route to renewable heating

Background

A hybrid heat pump is the combination of a heat pump with a traditional fossil-fuelled heater (boiler or furnace). By combining two heating technologies within a single control strategy, it is possible to flexibly choose the use of the heat pump or boiler/furnace part of the heating installation. This flexibility allows to optimize heat production according to local considerations, for instance regarding CO_2 emissions, running costs, primary energy use, grid congestion or load balancing. Additionally, a hybrid heating system may have lower investment costs than an all-electric heat pump and will often fit within a comparably tight space. Because a fossil-fuelled heater is always available as a back-up, hybrid systems are an enabler for the use of heat pumps in retrofit situations.

The main components of a hybrid system, heat pump and boiler, are well known and have already been developed into mature market products. The novelty of the hybrid concept lies in the optimized and integrated control strategy that can be used to maximize performance of both components. Depending on the real-time circumstances, there is a choice to use either the heat pump, the boiler or even both components simultaneously.

Objectives

The overarching objective of the Annex was to develop knowledge on the technical development and market opportunities for hybrid heat pumps, with a focus on

- Overview of the market opportunities for hybrid HPs;
- Overview of demonstration projects in the participating countries;
- Modelling and discussion on control strategies;
- The role of hybrid HPs in the transition towards 100% renewable/carbon neutral heating.

Further information

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Participating countries:	Canada, France, Germany, the Netherlands, the United Kingdom
Publications:	Final report of Annex45 and Executive Summary of Annex 45, available at https://heatpumpingtechnologies.org/publications/
Internet:	https://heatpumpingtechnologies.org/annex45/