Annex 57

Enhancing Electrical Grid Flexibility Through Heat

As global electricity demand rises, driven by a shift from fossil fuels to electrification, heat pumps are becoming crucial in enhancing grid flexibility. These technologies effectively manage the variability of renewable energy sources, ensuring a resilient energy infrastructure that can adapt to fluctuating demands.

Key Findings

Heat pumps significantly enhance grid management and energy efficiency, playing a transformative role in the energy sector.

1. Potential Coverage in District Heating: Heat pumps are projected to provide about 25% of Europe's district heating by 2050, underscoring their importance in sustainable heating solutions.
2. Flexibility Services: Heat pumps are key in delivering ancillary services, such as frequency regulation, which contributes to the stability of the electrical grid.
3. Versatility Across Applications: Whether in individual installations, hybrid systems, or large-scale district heating setups, heat pumps show remarkable adaptability to various environments and needs.
4. Ancillary Service Market Participation: Heat pumps engage in diverse market segments, including day-ahead, intraday, and ancillary services, meeting the dynamic requirements of the energy market.
5. Barriers and Business Models: Despite facing technical, regulatory, and economic hurdles, innovative business models that involve aggregating distributed heat pumps for balancing services are proving effective.

Figure 1: Sdr. Felding District Heating plant

Background

Annex 57 addressed the urgent need for sustainable and efficient energy solutions amidst growing electrical demand. This requires a flexible, responsive energy supply capable of balancing the fluctuations in energy production and consumption, crucial for integrating renewable energy.

Heat pumps, by harnessing available heat sources, offer a versatile solution to heating and cooling, significantly reducing carbon emissions. Their capacity for providing load flexibility is especially valuable in areas with significant intermittent renewable energy sources.

Objectives

The objectives of Annex 57 were designed to explore and enhance the role of heat pumps in achieving a resilient and efficient energy system.

- Assess the potential of heat pumps: To quantify and enhance the contribution of heat pumps to district heating systems across Europe.
- Demonstrate flexibility services: To showcase the capacity of heat pumps in providing grid stability services such as frequency regulation.
- Expand market participation: To evaluate and facilitate the participation of heat pumps in energy markets, ensuring their economic viability and operational efficiency.
- Address existing barriers: To identify and mitigate technical, regulatory, and economic challenges hindering the broader adoption of heat pump technologies.
- Develop innovative business models: To explore and establish business models that capitalize on the distributed nature of heat pumps for enhanced grid support.

Annex 57 was committed to demonstrating that heat pumps are vital not only for meeting heating and cooling demands but also as a crucial element in the transition towards a more sustainable and flexible energy system. This initiative aimed to harness international expertise and collaboration to advance heat pump technologies and their applications, setting the stage for a smarter, more adaptable, and sustainable energy framework.

Further information

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Annex website:	www.heatpumpingtechnologies.org/annex57

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