



Heat Pumping Technologies

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Heat Pumps Unleashing Flexibility and Sector Coupling

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A HEAT PUMP CENTER PRODUCT

Foreword

Navigating the Grid Challenges and Solutions in the Netherlands' Energy Transition

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In the Netherlands, the ever-increasing rate at which additional transmission capacity is required exceeds the speed at which grid operators can expand the electricity grid. Although work on the grid is in full swing in all regions, the billions of euros invested and additional measures are unfortunately not enough. The grid operators signal that the Netherlands is entering the next phase, in which access to the electricity grid will come under further pressure. Without drastic measures, housing construction, economic growth and sustainability in the Netherlands will slow down.

There are currently more than 105 gigawatts (comparable to more than 150 times the capacity of Amsterdam) in applications for reinforcements or new connections for electricity consumption. These are, for example, applications for large-scale batteries (75GW) and industry, companies, data centres, hydrogen plants and new residential areas. All these developments add up to much faster than grid expansions can be realized. Rising energy prices and increasing climate ambitions are accelerating this considerably. Nationally, the trend is that the limits of capacity are coming into focus in more regions. The grid operators also note that the electrification of businesses and households makes the electricity grid in the district busier. This means that, unfortunately, small businesses and consumers will also have to wait longer for a connection.

The energy transition is accelerating, and the demand for renewable electricity has exploded. The grid operators currently invest 3.9 billion euros annually in the electricity grid. However, this is not enough to keep up with the pace of the transition, as the electricity grid is reaching its limits. To achieve climate goals, companies and industries are investing in sustainability, but they are hampered by a shortage of transport capacity. Priority one remains to expand the electricity grid as quickly as possible so that more and faster grid capacity becomes available, but more is needed. The National Action Programme for Grid Congestion, drawn up and endorsed by a broad representation of stakeholders, focuses on four main goals:

1. Faster construction and faster realisation of grid expansions;
2. Stronger efforts to make better use of the grid;
3. Increasing flexible capacity: public-private actions for smart solutions;

4. Smart EV charging and smart sustainable homes.

The actions are not only aimed at tackling grid congestion but also necessarily to improve the energy system. Flexible capacity could easily be enlarged by a heating grid. In the Netherlands, the district heating sector does have an approximately 6% market share due to an extensive natural gas infrastructure, which is the most common heat source for buildings.

In the future, district heating will be aimed at covering around 1/3 of the energy supply. Electrical heat pumps will cover 1/3, and 1/3 will be covered with hybrid heat pumps that run on renewable gas. Supporting policies will help to achieve these national climate goals; for example, in 2023, the government opened a new subsidy scheme to reduce the CAPEX investment of new district heating grid projects.

The acceleration of hybrid heat pumps is seen as a transition technology from gas boilers to electrification in the building environment. A couple of heat pump manufacturers invested in a large-scale experiment named DACS-HW. This experiment is supported by the government and provides insight into the flexibility potential of hybrid heat pumps by peak shaving power peaks due to the large-scale use of heat pumps. The Dutch Association of national-regional Electricity and Gas Network Operators has introduced a plan to deploy up to 2 million (hybrid) heat pumps by 2030, especially in existing building stock. The plan is supported by a government subsidy scheme and will enable the installation of at least 100,000 heat pumps per year starting in 2024. Hybrid systems can easily increase the flexible capacity, not only because of the backup boiler but also to optimize the control strategy between the heat pump, gas boiler and hydraulic system.

Together with Denmark, Germany, Sweden, and Austria, we joined HPT Annex 57 Flexibility by implementation of heat pumps in multi-vector energy systems and thermal networks, which will be finalised soon. The reports will give some insights into the potential flexible capacity of heat pumps in the energy system. Hopefully, it will contribute to the discussion of how to unlock the potential flexibility because the urgency is here and now.



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