Case Studies

https://heatpumpingtechnologies.org/annex57/

ANNEX 57

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

Large-scale power plant Mannheim, Mannheim-Neckarau, Germany

"Large-scale heat pumps in district heating networks – installation, operation, monitoring and system integration"

KEY FACTS

Type of heat pump:
river heat pump

Energy distribution System:
1.958 MW_{el}, 1.500 MW_{th}, 20,5 MW_{th} heat pump

Energy Storage:
district heating storage (43.000 m^3, 1.500 MWh_{th})

Control for the flexible heat pump operation:
Heuristic control: optimization for minute reserve on the electricity market

General description:
20,5 MW_{th} heat pump

Heat Source:
river water, electricity, hard coal

Project:
Place: Mannheim / Germany
Time Frame: 4/2021 - 3/2026
Owner/leader: MVV Energie AG
R&D-project partners:
AGFW; Fraunhofer ISE; IER Stuttgart

Funding:
Federal Ministry for Economic Affairs and Climate Protection (BMWK) due to an enactment of the German Bundestag under grant number 03EWR008A.

Summary of the project:

In the large-scale power plant Mannheim about 1,6 TWh heat are generated each year and distributed through a nearly 600 km long network around the city. The heat is provided by the burning of hard coal in 4 power plant blocks. Additionally, the heat is stored in a storage with a thermal capacity of 250 MW_{th}. The network reaches supply temperatures up to 130°C and provides for about 60 % of Mannheim's households.
The newly installed heat pump is a first step towards climate neutrality. The river heat pump uses about 5°C warm water from river Rhein to provide district heating water up to a temperature of 99°C. The LHP has a nominal thermal power output of 20,5 MW_{th}, uses a two-stage compressor with a flash tank and operates with the refrigerant R-1234ze(E).
In the Real-World Laboratory the integration of the LHP in den district heating network and the optimal application regarding grid friendliness and economic efficiency is being investigated.

Contact Information/Links

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https://www.ise.fraunhofer.de/de/forschungsprojekte/reallabor-grosswaermepumpen.html