INP Reference

Feasibility study large heat pump KW Lausward and sewage treatment plant

LOCATION: Düsseldorf, Germany

SYSTEM/TECHNOLOGY: Regenerative heat generation

SERVICES: Solution development / Feasibility studies

INDUSTRY BRANCH/TYPE OF PLANT: Green Energy

CLIENT: Stadtwerke Düsseldorf

ACTIVITY PERIOD: 2023

Project description

In order to achieve the city of Düsseldorf‘s climate targets by 2035, Stadtwerke Düsseldorf (SWD) commissioned an investigation into the use of large heat pumps to supply heat to the district heating network.

SWD operates natural gas-fired combined heat and power (CHP) plants and boilers to generate electricity and district heating at the Lausward power plant in Düsseldorf. On the electricity generation side, renewable electricity generation from wind and solar power is to be expanded in the future, particularly outside Düsseldorf, so that electricity generation from CHP will decrease in the future. Natural gas as a fuel represents a transitional solution.

In the feasibility study, large heat pumps (GWP) were examined in order to cover part of the heat demand from renewable sources. Rhine water or cooling water from the power plant units is a suitable heat source. This is extracted via an inlet structure with cooling water pumps and fed back into the Rhine via two outlet structures. Alternatively, wastewater from a sewage treatment plant around 3 km away can be used as a heat source for large heat pumps, which can be connected to the Lausward power plant‘s district heating network.

The aim of the feasibility study was to determine the technical and economic feasibility of large heat pumps in relation to the available heat potential of the cooling water or Rhine water and the purified wastewater from the sewage treatment plant for feeding into the district heating network. Large heat pumps with a thermal output of 20, 40 and 60 MW_{th} were investigated.

INP Services

The following focal points were considered in the feasibility study:

- Comparison of technologies from manufacturers with evaluation and recommendation
- Comparison of different refrigerants
- Consideration of different integration options for the GWP (e.g. also

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return booster)
- Considerations and recommendations for the flow temperatures of the GWP on the river water and district heating side
- Determination of the respective performance data of the GWP
- Determination of installation space requirements, proposals for installations outside and inside existing buildings with expansion options including installation sketches, taking into account the interfaces and the existing building
- Presentation of relevant costs and boundary conditions
- Recommendations for further investigations and procedures with intermediate steps
- Determination of the respective measures with foreseeable delivery and implementation times