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Smart heat supply in Austria within the PITAGORAS project

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Abstract

The European funded cooperative research and demonstration project PITAGORAS is focused on efficient integration of city districts with industrial parks through smart thermal grids. The overall objective of the project is to demonstrate a highly replicable, cost-effective and greatly energy efficient large-scale energy generation system for sustainable urban planning of low energy city districts. As part of the project two demonstration plants namely in Brescia, Italy and Kremsmünster, Austria are being designed and will be built and tested during the project. The demonstration plant in Austria focuses on installing a large-scale solar thermal system of 10,000 m²; including seasonal storages with a total capacity of 60,000 m³ in order to supply the local district with heat and to reduce the gas consumption of a large combined heat and power (CHP) plant nearby. Additionally, to the demonstration plant in Austria the collector efficiency of several different collector types of different collector manufacturers is being tested under real outside conditions, which may give valuable insights on these collectors in order to choose the most efficient collector for the demonstration plant and ultimately on the future development of solar collectors.

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1. Introduction

Within the European Union cities are responsible for approximately 70% of the overall primary energy consumption. This share is expected to further increase up to 75% in 2030. Given the EU's ambitious 2020/30 reduction targets this issue represents an immense challenge for decarbonizing the EU energy system. More precisely, the development of low energy solutions for thermal energy supply to cities is one of the main needs nowadays. However, the recovery of waste heat of industries in and near cities offers a huge potential. It is evident, that industries throw away a large amount of energy.

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The European funded cooperative research and demonstration project PITAGORAS focuses on efficient integration of city districts with industrial parks through smart thermal grids. Technologies and concepts for low and medium temperature waste heat recovery, including the consideration of integrating renewable energy sources (RES) such as solar thermal energy for sustainable urban planning of low energy city districts are main concepts in this project. The project already started in November 2013 and will be finished in October 2017. As part of the project two demonstration plants namely in Brescia, Italy and Kremsmünster, Austria are being designed and will be built and tested during the project. In Brescia waste heat will be recovered from an electric arc furnace and from a steel factory, which will be fed into the city's district heating (DH) network. The demonstration plant in Austria focuses on installing a large-scale solar thermal system including seasonal storages in order to supply the local district with heat and to reduce the gas consumption of a large CHP plant nearby. Additionally, to the demonstration plant in Austria the collector efficiency of several different collector types of different collector manufacturers is being tested under real outside conditions, which may give valuable insights on these collectors in order to choose the most efficient collector for the demonstration plant and ultimately on the future development of solar collectors.

Nomenclature

PITAGORAS Sustainable urban Planning with Innovative and low energy Thermal And power Generation frOm Residual And renewable Sources

2. Pilot demonstration plant in Kremsmünster, Austria

2.1. Concept of the pilot demonstration plant

Kremsmünster is located in the northern part of Austria in the federal state Upper Austria approximately 30 km southwest from its capital Linz. The DH net in Kremsmünster is 30 years old and covers 65% of the overall heat demand of the municipality, which is approximately 20 GWh per year. Almost 75% of the energy demand for DH in Kremsmünster is supplied by a gas-fired CHP plant. Additionally, a gas boiler supplies 17.5% for the DH demand, mainly for peak load management in the winter season. The remaining 7.5% are supplied by a biomass heating plant and by waste heat from a glass manufacturer.

The gas boiler and the CHP plant are owned by the Austrian company Rohöl-Aufsuchungs AG (RAG). The CHP operates with three 800 MW gas turbines. The thermal capacity of the CHP plant amounts 6 MW. The vast majority of the produced electricity of the CHP plant is used for their own electricity demand, which estimates approximately 14.3 GWh/y. As already mentioned above, the produced heat of the CHP is mainly fed into the local DH network and to other heat consumers. The left side of Figure 1 gives an overview of the location of RAG's gas boiler, CHP plant and their oil storage tanks.

RAG's core business includes among the other things, the exploration, development and storage of oil and gas. Through the use of company-owned storage facilities, RAG does not only ensure the supply of petroleum products within Austria, but also plays an important role for the security of supply in Central Europe. Other activities include storing oil, trading and transporting gas, as well as realizing projects in the renewable energy sector.

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