Webinar – District heating in decarbonizing economies

October 29th, 2018 – 14:00 to 15:00

Location: Online

AGENDA

Moderator: Stefan Petrović, Technical University of Denmark

14:00	**Welcome and introductions - to the webinar and to the project** • *Sascha Lehmann, Fraunhofer-ISI*
14:05	**Future sources of district heating – results from energy systems analysis** • *Marie Münster, Technical University of Denmark*
14:20	**Future sources of district heating – focus on excess heat from data centres and industries** • *Fabian Bühler, Technical University of Denmark* • *Stefan Petrović, Technical University of Denmark*
14:35	**Heat maps and GIS for analysis of district heating systems** • *Stefan Petrović, Technical University of Denmark*
14:45	**Questions from participants and answers from presenters**

Future sources of district heating – results from energy systems analysis

In the EU and in Denmark, the aim is to reduce dependence on fossil fuels and to use energy more efficiently. District heating and combined heat and power have significant potential with regard to achieving this aim. New technologies may make individual solutions such as electric heating and heat pumps more attractive than before. Therefore, the competitive conditions between district heating and other types of heating may change in the future. The question is therefore whether district heating can contribute to ensuring the sustainability of future energy systems? Denmark is used as a case as the country has a high shares of district heating, high shares of fluctuating renewables and high renewable energy targets. The presented results are obtained using energy systems analysis tools.

Future sources of district heating – focus on excess heat from data centres and industries

Excess heat is available from various sources and its utilisation could reduce the primary energy use. The accessibility of this heat is however dependent amongst others on the source and sink temperature, amount and potential users in its vicinity. This presentation will present a new method which analyses excess heat sources from the industrial sector and how they could be used for district heating. This method first allocates excess heat to single production units by introducing and validating a new approach. Spatial analysis of the heat sources and consumers are then performed to evaluate the potential for using them for district heating. In this way the theoretical potential of using the excess heat for covering the heating demand of buildings is determined. Through the use of industry specific temperature profiles the heat usable directly or via heat pumps is further found. The results show that for the case study of Denmark, 1.36TWh of district heat could be provided annually with industrial excess heat from thermal processes which equals 5.1% of the current demand. More than half of this heat was found to be usable directly, without the need for a heat pump.

The global data centres (DCs) electricity demand has been estimated around 194 TWh, roughly corresponding to 1% of the global final demand for electricity in 2014. However, the increasing digitalization is driving an unprecedented growth in the energy demand of DCs, being estimated to double in every five years. These facilities work 24/7 for the whole year and are highly energy intensive to power both the information technology (IT) equipment (servers, network ports, storage disks) and the supporting infrastructure (mainly cooling systems). The annual power consumption of DCs is therefore influenced by several factors, which can be summarized by the quality and operating conditions of IT equipment and cooling systems. This presentation will present the dual role of data centres – as a large power consumer and as a source of district heating. The presentation will use Denmark as a case study.

Heat maps and GIS for analysis of district heating systems

To make drastic changes in the energy system, it is necessary to take several aspects into account: technical, economic, environmental, social acceptance, etc. This presentation will focus on the use of Geographic Information System (GIS) and energy system model TIMES-DK to analyse developments of the future Danish energy system. TIMES-DK is the only full-foresight, optimisation model covering all sectors Danish energy system. It is usually utilised for long-term analysis, usually until 2050. It proved to be powerful tool for analysing complicated interactions between energy demand, supply and energy savings, between short and long-term future, between different sectors, etc.

Energy system models used for long-term analysis and planning are usually not very geographically detailed; their geographical definition is usually based on the national energy statistics. When analysing future heat supply, the interactions between heat supply and heat savings, as well as prospects for utilisation biomass, wind, solar and waste, geographical information can play a very important role. For example, waste potentials are high in cities and towns, manure potentials are high in farming areas, average wind speeds are high in coastal areas, etc. This presentation will focus on the choice of heat supply/saving option depending on the position relative to existing district heating and natural gas grids. Therefore, GIS is utilised to perform stand-alone analysis and to provide inputs to TIMES-DK.