IEA-SHC TASK ON EFFICIENT SOLAR DISTRICT HEATING SYSTEMS INCORPORATING HIGHER TEMPERATURES

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1 SUMMARY

Heat is the largest energy end-use, accounting for 50% of global final energy consumption in 2019 and contributing to 40% of global carbon dioxide (CO2) emissions. Regarding the heat supply of buildings, district heating plays an important role and is well-established in many countries. However, most of the district heating networks worldwide are still operated with supply temperatures of 70-120°C (medium-high temperature) typically produced by caloric power plants. Currently operated solar district heating (SDH) systems are mostly installed with flat-plate collectors providing either heat at lower temperatures or with lower efficiency in case of higher temperatures. In order to increase the efficiency of SDH systems and to support their dissemination, a new task of the International Energy Agency (IEA) from the technology cooperation program – solar heating and cooling (SHC) is in preparation. This contribution presents the new task, its goals, structure and preliminary outputs.

Key-words: *efficient solar thermal systems, district heating, high temperature application, IEA, SHC, task*

2 INTRODUCTION

In order to decarbonize the district heating sector, solar thermal technologies provide a very efficient option. This has been proven in Denmark in particular, which has achieved a high degree of decarbonisation through large-scale solar thermal plants in combination with seasonal heat storages. In the previous IEA SHC Task 55, however, it was shown that the "Danish concept" cannot simply be transferred to district heating grids in other countries, as most grids worldwide have significant higher supply temperatures in the range of 70-120°C (Mazhar et al., 2018). Whereby the heat at these temperatures is still produced by caloric power plants. Currently operated SDH systems are mostly installed with flat-plate collectors providing either heat at lower temperatures or with lower efficiency in case of higher temperatures. In order to increase the efficiency of SDH systems and to support their dissemination aside Denmark the new task with the short title *Efficient Solar District Heating Systems* addresses the four main goals shown in Table 1.

Table 1: Main goals of the new task in order to support the increase of solar district heating (SDH) systems.

	Efficiently providing the heat at the desired temperature level of district heating grids (70-120°C), either directly through solar technologies or indirectly through solar technologies in an efficient combination with other technologies (e.g. heat pumps) with a special focus on the system aspect.
	Increasing the degree of digitalisation of SDH systems in order to achieve a more efficient integration into district heating systems (e.g. by considering solar yield forecasts) and a more efficient processing and use of data for evaluation, advanced controls and automatic fault detection.
	Reducing the costs of solar thermal plants to increase their economic attractiveness and competitiveness, and developing new financing and business models.

Disseminating the knowledge and results about the potential, areas of application, different solar technologies and their efficient combination with other technologies and systems.

3 METHODOLOGY

In order to achieve these main goals, the task is split into four subtasks A- D, addresses different solar technologies but focuses even stronger on the system aspect in order to investigate how to efficiently provide the desired temperatures by a combination of technologies. The main objective of subtask A is to develop concepts, models and performance measures in order to efficiently provide solar heat by SDH systems, with a special focus on medium-high temperature heat. The main objective of subtask B is to increase the efficiency of SDH by taking a next step regarding digitalization aspects, especially regarding data preparation and utilization. The main objective of subtask C is to evaluate and identify new business models as well as find ways to make SDH systems more business appealing (e.g. by reducing the costs). Finally, the main objective of Subtask D is to gather data and insights from real installations and to disseminate the knowledge to industry and public. This contribution presents the new task, its goals, structure and preliminary outputs in more detail. An exemplarily concept for future solar district heating systems, efficiently providing the heat at the desired temperatures is shown in Fig. 1.

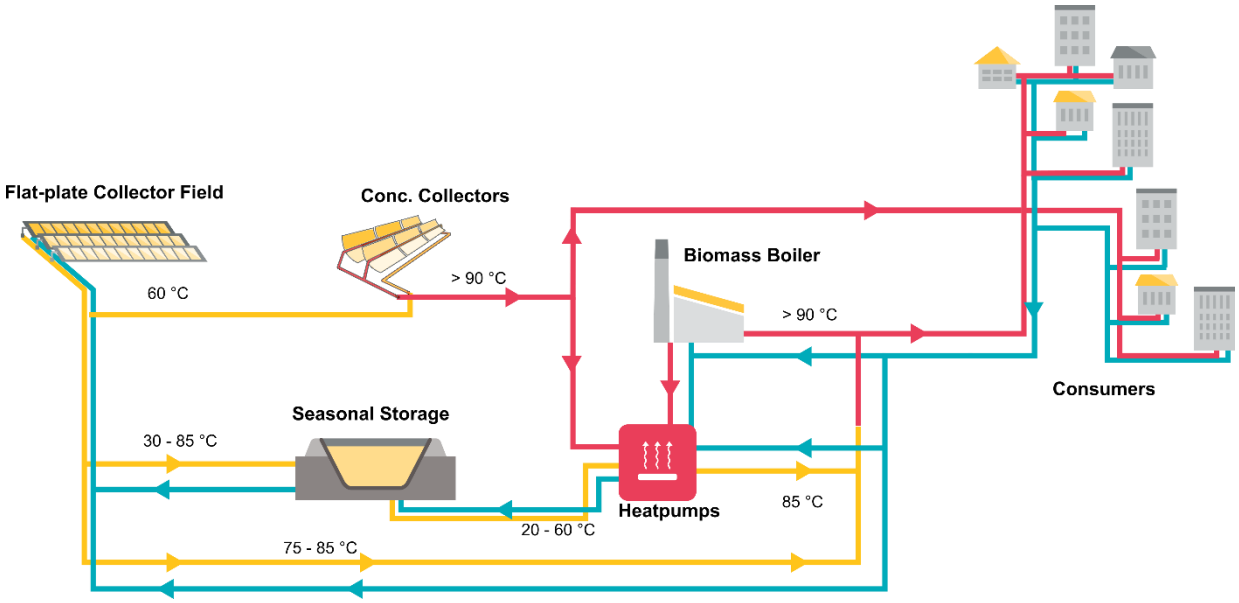

Fig. 1: Possible concept for future solar district heating systems efficiently providing the heat at the desired temperature

4 REFERENCES

Mazhar, A., R., Liu, S., Shukla, A., (2018), A state of art review on the district heating systems, Journal of Renewable and Sustainable Energy Reviews, vol. 96, pp. 420-439

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6 CONFERENCE TOPIC

Renewable Heating and Cooling including high temperature applications; Replacement of big fossil Power Plants by Renewables – Impact on District Heating