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Factors influencing industrial excess heat collaborations

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Abstract

In Sweden there is a potential to double the amount of industrial excess heat from today's 5 TWh that is delivered into district heating networks. This paper investigates factors that are influencing industrial excess heat collaborations. The paper presents results from qualitative interviews as well as answers through a more quantitative web-based survey which has been sent out to stakeholders in existing Swedish industrial excess heat collaborations. This work provides new evidence on that economic motivations are the most common driver for starting up a collaboration, but well in place factors like transparency as well as investment sharing between the partners becomes important for a long-term successful collaboration.

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1. Introduction

Industrial excess heat could be, depending on the temperature levels, used for many areas besides supplying heat to district heat systems [1]. For example, it could be used for electricity production or to provide heat to other heat demanding industrial processes within the companies.

Nomenclature

DH	District heating
CHP	Combined heat and power

In Sweden, the district heating (DH) systems receive almost 5 TWh of industrial excess heat from different industrial processes across the country. It has been reported that the potential could be as high as 21 TWh [2], but at least half of this amount of industrial excess heat should be available to DH systems in an economic way. In total the district heating systems delivers above 50 TWh to the DH customers [3], so the future potential of industrial excess heat share in the final delivery to end-users is about 20 percent. Amongst the industrial companies delivering excess heat to DH systems in Sweden, chemical companies, food producers, oil refineries, producers of different plastics, pulp and paper plants and steel producers are common.

In the past, investment support has been available in Sweden to, amongst other things, promote the use of industrial excess heat. The last investment support was ended in 2008 [4]. Today's policy instruments have mainly supported electricity production from renewable fuels, for example through electricity certificate trading. This financial support may lead to district heating system owners choosing to supply heat by CHP plants instead of using the existing industrial excess heat [4]. A new law stipulates DH system owners to consider third party access to DH systems which could increase the possibilities for industrial excess heat.

For industrial excess heat collaborations to be successful it may however not be sufficient to implement supportive policies. There is also a need to improve the understanding of various factors influencing the collaborations in order to realise the full potential of industrial excess heat into district heating system. This study focuses is on industrial excess heat collaborations, where either primary or secondary heat supply is appropriate for district heating.

2. Methodology

2.1. Data collection

The data in this study was collected in two steps. In step one, 25 qualitative interviews were conducted with district heating companies and industrial companies that are involved in partnerships for utilizing industrial excess heat. The interviews formed the basis for a web-based survey that was sent out in step two to 87 companies involved in industrial excess heat collaborations. The selected companies were identified through information provided by the industry associations Swedish District Heating and Swedish Steel Producers. The companies in the study represents a majority of all industrial excess heat partnerships in Sweden. Almost 60 percent of the selected companies answered the survey. All in all, the study included stakeholders from 32 different partnerships for industrial excess heat delivery to district heating systems.

2.2. Description of respondents

The respondents in the study represented two types of companies: energy utilities' companies that operate district heating systems and industrial companies producing excess heat.

Energy utilities

58 percent of the companies that participated in the study were energy utilities that operate district heating (DH) systems. There are two main groups of DH companies; those having a thermal plant connected to the distribution system and those who operates one or several combined heat and power (CHP) plants. Thermal plants only supplies heat to the end-users, meanwhile CHP plants produce both

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