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Risk of industrial heat recovery in district heating systems

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Abstract

Industrial heat recovery can be used in district heating systems. It is a possibility to make use of heat that is otherwise lost. Increased usage of industrial heat recovery reduces the need for fuel combustion lowering green-house gas (GHG) emissions, such as CO2. Industrial companies can, however, move or close down industrial activities. This is apprehended as a risk and lowers the interest of district heating companies to invest in industrial heat recovery.

In Swedish district heating systems, industrial heat recoveries have been undertaken since 1974. Today, the heat recovery is active in about seventy systems. This leads to the question of how risky it is, for district heating companies, to engage in industrial heat recovery.

Over forty years of operation statistics have been collected and analyzed in order to estimate the risk of industrial heat recovery to district heating companies. Key results show that the risk is not linked to different industrial branches. Recommendations include suggestions to management on how to consider risk and consequence when assessing potential industrial heat recovery investments.

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Keywords: Industrial heat recovery, risk assessment

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1. Introduction

There are ongoing initiatives in the European Union (EU) to save energy and to reduce greenhouse gas (GHG) emissions. By 2030 the goal is to save 27% of the primary energy used in the EU and to lower GHG emissions by 40% [1]. There are both environmental and economic gains to be made from industrial heat recovery [2] and there is a large potential for further industrial recovery [3]. In Sweden, residual heat is reused in district heating networks. Approximately 3TWh is reused per year whereas the available amounts of residual heat are in the range of 6,2-7,9 TWh per year [4]. The first EU level study on available residual heat considered three industrial branches; oil refining, chemicals and steel and dates to 1982 [5]. In it 2.4 million toe is identified as available resource. A more current study shows that only 1% of the available residual heat is being reused in the EU [6]. There is potential to use more residual heat. If the EU, Iceland, Norway and Switzerland resorted to residual heat in its district heating networks, to the same extent that Sweden does, it could lead to 300 TWh of heat per year [7].

Residual heat investments lead to lower costs of district heating production by putting energy that would otherwise be lost to alternative use. Also, since less fuel is incinerated the emission of GHG is lowered. There are, however, risks to residual waste investments. In Sweden, current legislation with landfill ban and green certificates makes waste incineration and biofuelled combined heat and power plants (CHP) more competitive than utilization of industrial residual heat [8]. Other, known risks to residual heat investments are geography (where distance can hinder investments), different mindsets in industries compared to municipally owned district heating companies, a desire of industries to have own and independent heating solutions, volatile residual heat deliveries into district heating systems, the risk that industries go out of business, the notion that residual heat losses must be covered for by back-up facilities and an inability between parties to reach agreements that are mutually beneficial [ibid,2,4,9,10,11,12].

Swedish district heating companies and industries seem to have a greater ability to enter residual heat investments than corresponding parties in the EU. Why is that? Are Swedish district heating companies and industries better at managing investment risk than others or are residual heat investments in Sweden less risky than in other countries? Or are residual heat investments not as risky as they seem to be? In Swedish district heating systems, industrial heat recovery has been undertaken since 1974 and heat recovery is currently active in more than seventy systems. Analysis of Swedish data makes it possible to make a first estimation of the risk of residual heat investments. *The question of research in this study is if it is possible to asses risks of residual heat investments based on the Swedish experience.*

2. Data collected

The first assessment of risk related to residual heat investments is performed in this pre-study by focusing on how long co-operations have existed in both current and terminated projects. Also, heat recoveries from various industrial branches have been analyzed. Later, complementary analysis will be performed focusing on why residual heat investments are undertaken and on how the risk of residual heat investments can be minimized.

Over forty years of operation statistics have been collected and analyzed in order to estimate the risk of industrial heat recovery to district heating companies. Main data resources have been the annual statistical surveys from the Swedish District Heating Association, the Swedish Energy Market Inspectorate, and Statistics Sweden.

Until 2014, 1570 years of residual heat deliveries have been identified in verified co-operations, as indicated in Table 1.