

MJ 1432

Project Proposal

TITLE

Heat and Cold Recovery from Buildings to District Heating & Cooling Networks

BACKGROUND

As society is moving towards a more sustainable and efficient energy consumption, the integration of energy systems in multiple areas should be assessed since it would hugely save energy in the long run. Minimizing such energy losses becomes one of the critical aspects to be investigated to achieve a reliable and efficient system since it can reduce carbon emission.

Main potential heat sources to be connected to the district heating network are the vapor compression systems in various applications, namely commercial refrigeration, ice rinks, and data centers cooling. Great amount of heat is rejected to the ambient from such systems which can be upgraded and recovered into the district heating network. For instance, there are about 3400 supermarkets in Sweden with an average total cooling demand of 150kW; this will result in an available heat recovery capacity of about 2000MWh/year for each supermarket. Additionally, 350 ice rinks in Sweden are also energy intensive buildings with about 1500MWh/year of heat recovery capacity for each installation. The same applies to recovering cold, where the high numbers of installed ground source heat pumps (about 30,000 units/year) can be used to provide it. The cold ground generated in the summer can be utilized to provide cooling to the district cooling network.

In order to recover heat and cold from existing systems it critical to know the amount of generated energy during operation, which strongly depends on the application requirements and the system solution used. Without such technical evaluation, it will not be feasible to properly evaluate if this concept actually saves energy and contributes to a better environment, particularly on the business perspective.

OBJECTIVE

The main objective of this project is to examine the potential of recovering excess heat/ cold from residential/ non-residential buildings for district heating and cooling networks. Past studies might be an initial lead to start for deep investigations on the technical analysis. Furthermore, the technical analysis would be an essential part to conduct an economic analysis both for prospect customers and companies who might purchase the excess energy.

METHODOLOGY

The project can be elaborated into following steps.

- Literature study and survey on the past research/ studies done in this topic
 - Investigate the possible areas where heat and cold can be recovered to district heating and cooling networks as well as its national level quantity
 - Select the application areas with highest potential for heat and cold recovery
 - Define the scope of the energy system that will be used in the energy modeling
 - Determine appropriate calculation/ simulation tools to assist in the modeling of energy system
- Possible software: *EES, EED (Earth Energy Designer)*

- Build simulation of the energy system by using proper model as in the existing
- Gain access to several real buildings data that is required for the model (field measurements if applicable or the data is unavailable)
- Evaluate the amount of heat and cold to be recovered and its impact to the overall system
- Recommend system modification to improve efficiency in the existing system if this intention would like to be installed, re-simulate using the new modified model
- Estimate the energy price at which heat/ cold can be sold to the district networks based on the built model

DELIVERABLES

The expected outcomes from thorough analysis of the project are:

- Bi-weekly progress report (if required)
- Intermediate report
- Presentation (Slides/ Poster)
- Final Report

WORK PLAN

Main activities which will be conducted during the project are presented here.

Planned Activity	January				February				March				April				May			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Seminar 1																				
Literature review																				
Energy recovery potential																				
Data gathering																				
Build and simulate model																				
Intermediate report																				
System modification																				
Economic analysis																				
Further analysis																				
Finalization (Report/ Presenting)																				

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