Master's Thesis
Title: Sustainable Cooling – Analyzing Drivers and Obstacles for Success
Author: Clara Josefine Feldmann

Abstract:

Cooling is essential to our daily lives but at the same time it consumes significant amounts of energy. This study offers a founded definition of the concept 'sustainable cooling', taking various perspectives into account.
In the face of a rapidly growing global cooling demand this study investigates how cooling can be obtained sustainably focusing specifically on the vast amounts of excess energy from large cooling consumers, such as industry, retailers and data centers, and how this excess energy can be used efficiently to reduce the overall environmental impact of energy systems.
Based on a case study of the industrial company Danfoss A/S the study explores the opportunities of cooling consumers to become prosumers within the greater energy system. The study investigates the potential of recovering excess heat, which can be utilized for the cooling consumers own purposes, replacing heat demand from other sources and/or can be fed back into the grid. With the development of smart energy systems and the increased deployment of renewable energies, such as wind and solar, this study finds that thermal energy system can play an increasingly important role in balancing the electricity supply from intermittent renewable energy flattening the peak electricity demand by offering demand side flexibility through thermal energy storage. Identifying obstacles to increased system integration and ways to overcome these, the study makes recommendations for a more sustainable future of cooling as an active part of the greater energy system.
The study further emphasizes the urgent need to implement minimum energy performance standards and to adopt a holistic long-term focus on energy planning to keep the growing environmental impact of cooling at bay.