Grant Agreement No: 680447

Project acronym: MODER

Project title: Mobilization of innovative design tools for refurbishing of buildings at district level

Funding scheme: Innovation Action

Starting date of project: 1st September 2015

Duration: 36 months

Journal article:

Project-level multi-modal energy system design - Novel approach for considering detailed component models and example case study for airports

Authors: Sebastian Thiem, Vladimir Danov, Michael Metzger, Jochen Scheafer, Thomas Hamacher

Energy 133 (2017) 691-709
https://www.sciencedirect.com/science/article/pii/S0360544217309489

Abstract
The current situation, which is driven by environmental concerns and increased air traffic, forces airport operators to examine their energy systems in an integrated approach. In order to optimize total expenditures, demands of energy in all forms must be considered. This paper introduces a novel method for the optimal design of multi-modal energy systems, which will be put to further use in the European Union Horizon 2020 MODER project. The optimization problem was formulated as mixed-integer linear programming based on a superstructure approach, including all feasible state-of-the-art technologies. Part-load efficiencies as well as the influence of ambient conditions on available output capacities were considered. The model took into account several types of energy storages, i.e., electrochemical, thermal and water storages. For fifteen locations, the optimal set of technologies, their capacity and operation was identified. Results showed that for this load range, combined heat and power plants were economically very attractive. Furthermore, photovoltaic energy was a viable option, even without designated feed-in tariff. Last but not least, compression chillers with chilled water storages offered an attractive option for enhanced flexibility. Combined total cost savings by using both the described method and on-site generation of up to 61% were achieved.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 680447


MODER