

“Library concept and generic parametrization for energy planning of polygeneration systems”

The objective of this research was to develop and test simple equation-based energy systems library with less number of parameters required for energy planning process. It is required due to the large number of variants in polygeneration systems, due to availability of little information and time budget constraints during the conceptual and design stage of energy planning process, and also to decrease computation time of the system models.

The objective was approached by developing modeling strategies for the showcase with an orientation towards generic parametrization of the energy systems. This research work consists of certain key areas, namely, identifying the gaps in energy planning process; monitoring, modeling, simulation and validation of the showcase using Modelica language on Dymola environment; and development of an open-source library concept. The showcase is the energy center at the Offenburg University of Applied Sciences, Germany. It was used to conduct field tests and measurements for the purpose of component and system validation. It consists of two boilers, two CHP systems, an absorption chiller, a hot and cold water storage as shown in Figure 1. The energy center uses natural gas as a fuel and provides the thermal and electrical energy needs of the university community.

As of now, it can be concluded that the components of the showcase were developed and validated. An open source library with a general concept and structure was developed. The library consists of the showcase example with 37 parameters and 20 fitting coefficients. Additionally, the library consists of renewable components such as solar PV and solar thermal with 11 parameter. Most of these parameters can be found in the manufacturer’s specification sheets and some of them can either be calculated or guessed with minimal knowledge about the system. The modeling strategies developed particularly for the CHP systems and absorption chiller reflect and give the first ideas on the generic approach for parametrization. The outlook is to validate the complete system with hydraulic components and a controller, i.e, the validation of showcase for different modes of operation with a control strategy.

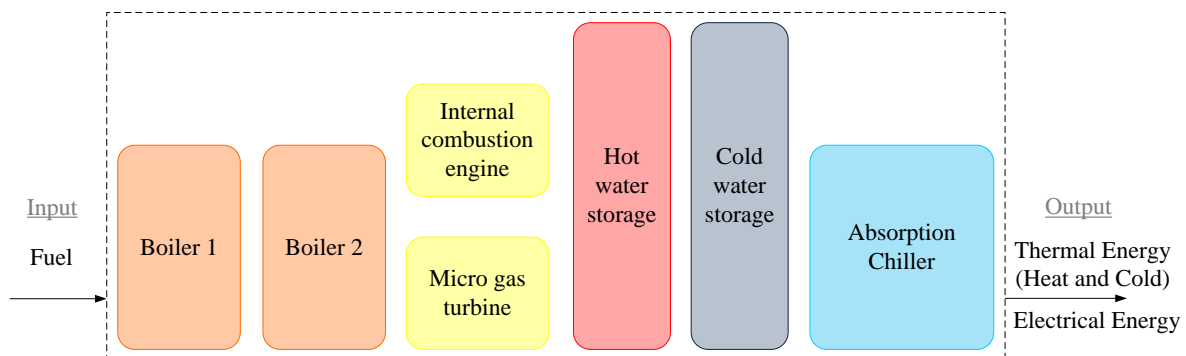


Figure 1: Abstraction of the showcase