Munich Institute of Integrated Materials,
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RESEARCH INTERNSHIP / BACHELOR OR MASTER THESIS

Putting Theory to the Test: Experimental Validation of Control Approaches for Heat Transfer Stations in Bidirectional Prosumer-based Heat Networks

Background

The decarbonization of the heat sector poses a central challenge for the future energy supply. Innovative district heating concepts can play a key role by enabling the integration of diverse and sustainable heat sources, efficiently utilizing synergies among network participants, and providing increased flexibility for the entire energy supply through coupling with the electrical grid. In prosumer-based district heating (PBDH) networks, each participating building can act as producer or consumer to the network and change between these modes. Thereby, the participants can supply each other over the network and use synergies between them. The increased flexibility comes along with higher complexity in the hydraulic and thermal operation. Our CoSES laboratory (see Paper1 below) replicates the technical building equipment of a neighborhood with five buildings, connected by such a PBDH network.

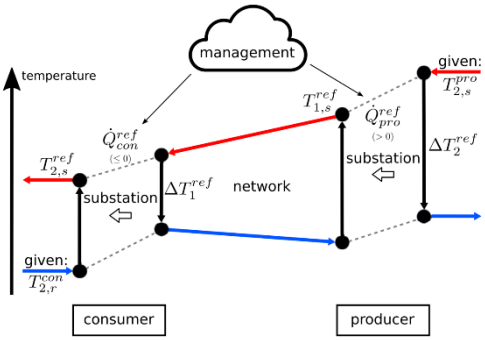

Figure 1: producer supplying consumer over the network

Figure 2: bidirectional heat transfer station in the CoSES laboratory

Topic

In previous work we developed a control approach (see Paper2&3 below) for bidirectional prosumer substations that anticipates specific characteristics and challenges of the innovative type of heat networks under consideration. The controller so far has been tested in simulations and first preparations for experiments were made. In this work, as a next step, the controller shall be tested in laboratory experiments under emulated realistic conditions.

1. Familiarization with the background, control approaches and the laboratory.
2. Defining an experimental setup and evaluation criteria.
3. Implementing the controllers to be tested in the lab and preparing the hardware testbed.
4. Conducting the experiments and evaluating the results.
5. Documenting the work: experiment documentation & thesis writing incl. result interpretation and discussion

Literature: Paper1, Paper2, Paper3

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