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RESEARCH INTERNSHIP / BACHELOR THESIS

From Concept to Application: Commissioning and Experimental Characterization of a Scientific Testbed for a Bidirectional Small-scale District Heating Network

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.

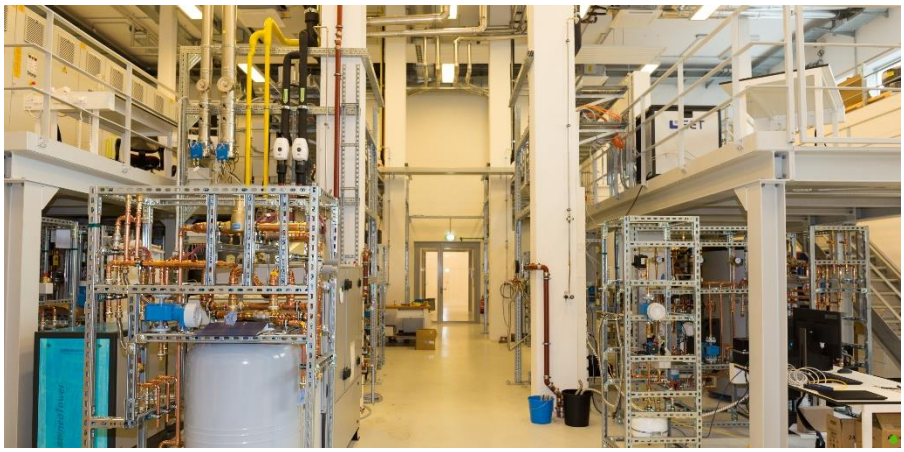

Figure 1: Front view of the CoSES lab with an experimental bidirectional heat network

Topic

The replicate of a bidirectional district heating system consisting of prosumers in the CoSES laboratory is unique in Europe (see Paper1 below). This offers great opportunities to research the characteristics and challenges of innovative thermal network concepts. In order to conduct meaningful experiments and simulation studies, controllers and models must be parameterized and calibrated for this specific setup. Therefore, in this work the commissioning of the testbed shall be completed and the parameters of the testbed shall be characterized, e.g. specific hydraulic resistance of the network emulator.

1. Familiarization with the background and the laboratory.
2. Defining parameters to be characterized and associated experimental setups.
3. Preparing the hardware testbed and implementing experiment routines for characterization
4. Conducting the experiments and evaluating the results.
5. (Setup simulation models to compare / reproduce experimental results)
6. Documenting the work: characterization data sheet & thesis writing incl. result interpretation and discussion

Literature: Paper1, Paper2

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