Master Thesis
Modeling a real substation for district heating grids with variable temperatures

Research project and background:
As part of the research project NATAR "Low Temperature Networks as a Provider of Balancing Power", the Institute of New Energy Systems performs comprehensive metrological investigations on a modern local heating network in Dollnstein as well as modeling with Modelica / Dymola. The local district heating system with variable temperatures is the first of its kind. Optimizing the operation mode is the aim of the project.

Objective of the thesis:
Within the scope of the present thesis, two concepts for the modeling of a real substation for variable temperature heat networks will be developed and implemented. The substations consist essentially of a heat exchanger, a heat pump and a storage tank.

The modeling will be carried out in the programming language Modelica, which is particularly suitable for physical modeling. There are various useful component models available. The implementation of the system model for the substation and its control constitute the core of the work.

Subsequently, the validation is performed based on measured data and the comparison of the models with each other. The simulation time is a critical comparison feature, since a large number of home transfer stations are needed to model the entire district heating system.

As result of the work, a model of the substation station is expected, which can be integrated into the full model of the heating network.

Tasks:
1. Introduction to the subject of substations and their modeling
2. Training in the software tool Modelica / Dymola and the required libraries
3. Development of two concepts for the modeling of house transfer stations with heat pumps (a simple and a more complex model)
4. Modeling and simulation of the substation
5. Validation of the simulation model based on measurement data

Target Group:
Students of the disciplines:
- Renewable Energy Systems
- Mechanical engineering, computer science (engineering)
- comparable degree programs

Period: From now

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