Coupled modeling of a District Heating System with Aquifer Thermal Energy Storage and Absorption Heat Transformer

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Aquifer thermal energy storages (ATES) are a promising technology for seasonal thermal energy storage which can bridge the gap between constant production and seasonally varying demand. This paper presents first simulation results of an energy concept proposed for the university campus Berlin-Charlottenburg, which is characterized by the combination of an ATES system as a seasonal thermal energy storage and an absorption heat transformer (AHT), which supplies 50 buildings of the campus with heating energy. Furthermore, the paper deals with the modeling of the different subsystems, described in Modelica; energy production, storage, consumption and distribution and their integration in a coupled Modelica system model.

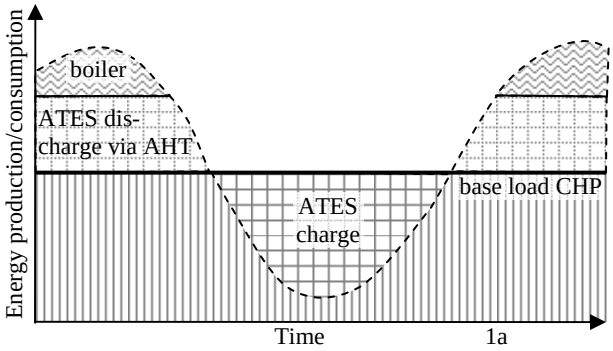

Figure 1. Seasonally fluctuating energy demand (dashed) covered by combined heat and power plant (CHP, solid) and previously stored CHP surplus recovered from aquifer thermal energy storage (ATES), topped up by a boiler.