Energy-Efficient Design of a Research Greenhouse with Modelica

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Greenhouses, especially for research applications, have high requirements on indoor climate control. The technical systems for heating, cooling, and moistening are more complex than in typical dwelling houses or office blocks and are highly dependent on local weather conditions. Increasing the energy efficiency and integrating renewable power into these systems is a sophisticated engineering task which requires extensive investigation.

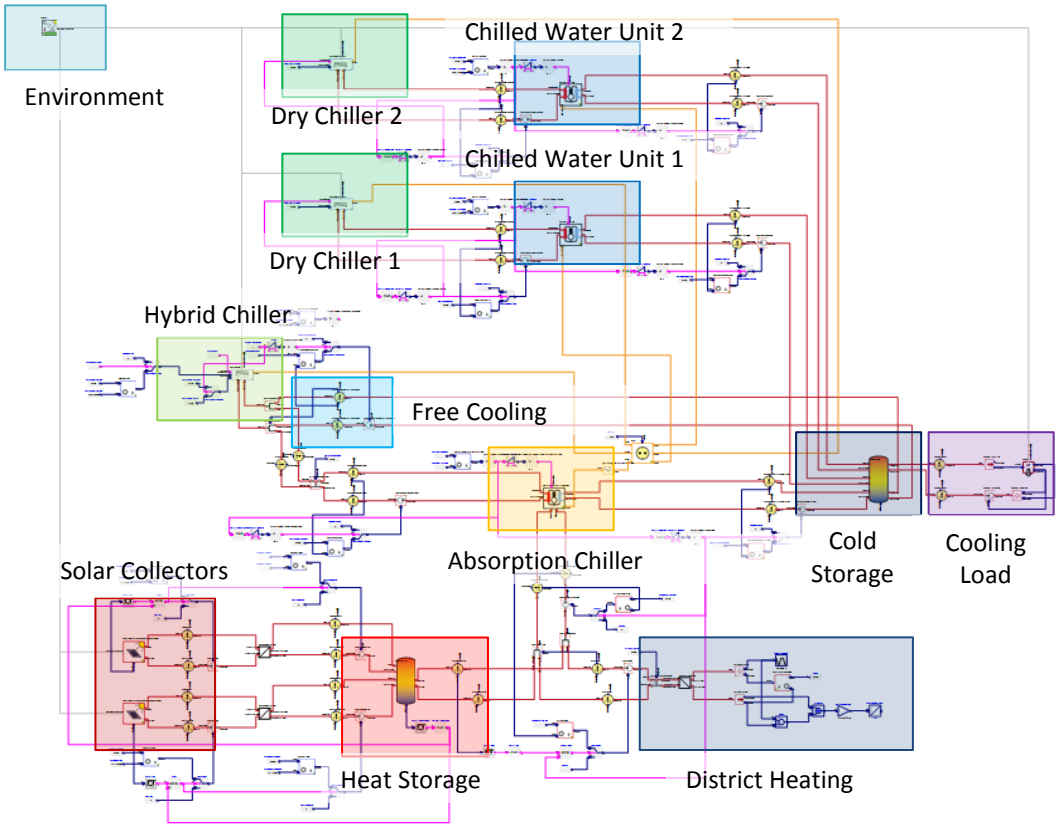

Figure 1. Modelica cooling system model of a research greenhouse based on Green Building library

This paper describes a combined approach to model and simulate building operation and HVAC (Heating, Ventilation, Air Conditioning) system behavior of a research greenhouse with Modelica. This includes the presentation of some important modelling paradigms as well as system concept validation with some interesting simulation results.