Parametric Study of a Solar-Heating-And-Cooling System with Hybrid Photovoltaic/Thermal Collectors in North China

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Abstract : A solar-heating-and-cooling (SHC) system, consisting of a hybrid photovoltaic/ thermal collector array, a hot water storage tank, and an absorption chiller unit is designed and modeled to satisfy thermal loads (space heating, domestic hot water, and space cooling). The system is applied for Dalian, China, a location with cold climate conditions, where cooling demand is moderate, while space heating demand is slightly high. The study investigates the potential of a solar system installed and operated onsite in a detached single-family household to satisfy all necessary thermal loads. The hot water storage tank is also connected to an auxiliary heater (electric boiler) to supplement solar heating, when needed. The main purpose of the study is to model the overall system and contact a parametric study that will determine the optimum economic system performance in terms of design parameters. The system is compared, through a cost analysis, to an electric heat pump (EHP) system. This paper will give the optimum system combination of solar collector area and volumetric capacity of the hot water storage tank, respectively.

Keywords : absorption chiller, solar PVT collector, solar heating and cooling, solar air-conditioning, parametric study, cost analysis

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