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Abstract

The concept of integrated energy management is presented in this study. It defines a global strategy for the management and control of an energy system following five steps, namely, i) selection of resources and technologies, ii) mathematical modeling, iii) optimal sizing, iv) optimal references and v) operational control. First, the above-mentioned concept is introduced and explained. After that, integrated energy management is applied for two case studies; i) a simple conventional domestic electric water heater and ii) a hybrid domestic water heating system mainly composed of an air source heat pump, flat-plate solar thermal collectors and wind turbines. These systems are numerically investigated using both Matlab and Trnsys softwares in different weather climates. Compared with specified base cases, results prove that the introduced concept is very efficient from the energetic and economic points of view, where savings in operational costs touched 29% in a typical meteorological year for case I and about 15% in a typical week of the winter for case II.

Keywords*: integrated energy management; resources selection; sizing; modeling, optimal references; operational control*