



SIMULATION MODEL IN TRNSYS OF A SOLAR HOUSE FROM BRAȘOV, ROMANIA

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Abstract. Energy consumption in buildings is a large share of the world's total end use of energy. Residential and commercial buildings require approximately 35% of the end use of energy, in addition to this energy is used for buildings also in the industry. In this context the paper proposes the energetically analysis for a small-scale modern station, providing solar heat to a solar house with 2 floors, located in the city of Brașov, România. The paper describes the location, size and thermal regime of the solar house; there are also presented the heating system facility and equipment components, designed for the solar house located in Transilvania University Campus. Based on the achieved simulations it is shown that compared to the ordinary control the energetically-based control provides remarkable advantages and savings concerning the auxiliary heating energy. This result should be valid for any systems similar to the particular one in Brașov.

Key words

Building energy system simulation, TRNSYS, small-scale system, energetic analysis, dynamic simulation.

1. Introduction

Energy consumption in buildings represents a large share of the world's total end use of energy. Residential and commercial buildings require approximately 35% of the end use of energy, in addition to this energy is used for buildings also in the industry. Globally, buildings account for close to 40% of total end use of energy. Given the many possibilities to substantially reduce buildings' energy requirements, the potential savings of energy efficiency in the building sector would greatly contribute to a society wide reduction of energy consumption. By reducing buildings' energy consumption, a nation can reduce dependency on imported energy and strengthen its strategic position.

Moderation of energy-end use in buildings will also reduce greenhouse gas emissions and pollution produced by the combustion of fossil fuels. This environmental benefit appears on two scales, local and global. Because

much of buildings' demand for energy requires local energy combustion in individual heating systems or district heating, reduced energy demand improves air quality at the local level. In particular in developing countries a reduced demand for energy requires fewer power plants, thereby delaying or obviating the construction of new generation and grid capacity and enabling communities to devote public funds elsewhere. Given the potential scale of energy savings across the building sector, reduced demand for energy and fossil fuels can substantially contribute to a nation's compliance with domestic or supranational targets for the reduction of greenhouse gas emissions [1].

Economic strategy of sustainable development clearly requires the promotion of energy efficiency and the rational use of energy at national level. Specific consumptions of heat and hot water in România amounts to approximately double compare with those in European Union countries, as a direct consequence the pollutant emissions are higher.

The specific actual situation in România requires the introduction of government policy priorities, the policy of energy efficiency at wide scale. Due to the strong decline of internal hydrocarbons resources, and in the perspective of economic growth, it becomes obvious that, if we maintain the current usage of energy, energy import dependency will increase, further aggravating the external deficit, which will lead to the increase of external debt.

It is emphasized that the annual energy consumption of a building, regardless of its intended use, thermal energy for heating and hot water consumption represents the main annual energy consumption by about 75%. For the overall residential buildings in România, the efficiency of the supply for heating, hot water and cooking is only 43% of the amount of heat provided by the sources; for Bucharest, it is of 63%, but still unacceptably low.