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TRNSYS SIMULATION OF THE USE OF SOLAR COLLECTOR-BASED DOMESTIC HOT WATER SYSTEM IN CENTRAL AND EASTERN EUROPEAN COUNTRIES (CEEC)

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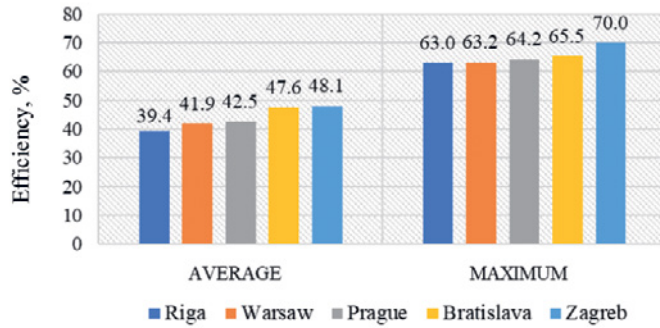
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Abstract – With the prevailing energy crisis and the public's growing environmental awareness, renewable energy sources (sun, wind, water) are playing an increasingly important role in Europe and around the world. Due to its easy availability and relatively high efficiency, it is the solar energy that is attributed with great potential in decarbonizing the energy sector. Among the most popular devices that enable the use of solar radiation are solar collectors. They are used in heating and domestic hot water preparation systems, as well as for heating swimming pool water. However, their efficiency depends on many factors, of which the main one being the climatic conditions. This paper presents the results of energy simulations of a solar collector-based domestic hot water system for the capitals of five selected Central and Eastern European Countries (CEEC) – Riga (Latvia), Warsaw (Poland), Prague (the Czech Republic), Bratislava (Slovakia), and Zagreb (Croatia). The system model was developed using the TRNSYS software, in which dynamic simulations were also performed for an entire year (8760 h). For each location, the efficiency of the flat-plate solar collectors, the amount of useful energy generated by them, as well as the amount of energy needed to meet the load and auxiliary energy requirements were analyzed and compared. The extent to which increasing or decreasing the area of solar collectors affects the operation and efficiency of the system for different locations was also estimated. The results showed that in terms of efficiency, the use of solar collectors is most favorable in Slovakia and placed southernmost-located Croatia, where it also achieved the lowest annual auxiliary energy demand. The least favorable location, on the other hand, turned out to be the capital of Latvia. It is also worth noting that regardless of location, the area of solar collectors has a significant impact on the efficiency of the entire system.

Keywords – *Domestic hot water; renewable energy; simulation; solar collectors; trnsys*



Annual results of average daily efficiency of solar collector.

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