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Increasing the Efficiency of Heting Buildings with Combined Solar Devices

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Abstract: *In the Republic of Uzbekistan 4 season comes in its place, which in turn creates a reserve for heating and cooling systems of buildings. The most effective way to provide each building under construction with such systems is to systematize it through a renewable source. That is, through energy, basically secured the performance of these systems we are one of the main renewable sources of energy, which is solar energy. In the construction of buildings of all developed countries, of course, such systems occupy a special place. In this article, we will analyze the practical work of the buildings being built on the territory of Uzbekistan in this area and compare it with the developing countries.*

Keywords: Uzbekistan, construction systems, solar panels, heating system, heating efficiency.

I. INTRODUCTION

Global climate change (GCC) is mainly caused by fossil fuel burning and consumption [1], [2]. The concentrations of greenhouse gases (GHG) in the atmosphere will continue increasing unless the global consumption of fossil fuel declines substantially [3]. The severe environmental problems resulting from fossil fuel using have drawn worldwide attention. The energy consumption of buildings, during construction and operation, accounts for 33% of the world's total energy use [4]. It was estimated that the consumption of heating energy in Uzbek's cold and severe cold zones could reach as high as 75% of total energy consumption, especially for the areas [5]. In addition, the incomplete combustion of fossil fuel further aggravates environment pollution due to the low oxygen abundance at high altitude [6]. The application of solar heating might be an ideal solution to these problems due to the high intensity of solar radiation [7]. The solar heated house can take full advantage of solar energy, building orientation and climate to minimize energy consumption [8]. All data were analyzed comparatively based on Chinese experience.

II. MATERIAL AND METHODS

The way solar systems are used in buildings is different from what it used to be. Buildings are no longer designed to use just passive solar energy systems, such as windows and sunspaces, or active solar systems, such as solar water collectors. In fact, the words passive and active no longer make sense, as the newer buildings combine several of these technologies. They may be both energy efficient, solar heated and cooled, and PV powered, i.e. they are simply “solar buildings”. The paper discusses the various approaches in building integration of solar systems, and presents a number of successful examples. It also presents some of the work being done on improving the design processes to account for the need for a holistic approach to solar building design [9].

In most European countries, buildings account for approximately 40% of the total energy use. The situation is not improving, despite the fact that improved technologies and stricter building codes are making buildings more energy efficient. Their total number is increasing, they use more equip- ment and have higher comfort requirements than they ever did before.

III. RESULTS AND DISCUSSION

Solar energy systems therefore have an im- portant role to play. The way solar systems are used is different from what it used to be, however. Buildings are no longer designed to use just passive solar energy systems, such as windows and sunspaces; or active solar systems, such as solar water collectors. In fact, the words passive and active no longer make sense, as the newer buildings combine several of these technologies. They may be both energy efficient, solar heated and cooled, and PV powered, i.e. they are simply ‘‘solar buildings’’. The large architecture firms, and some of the most famous architects, are picking up this trend, joining forces with energy specialists to design such totally solar buildings [9]. At the same time, the focus is shifting from small scale residential buildings to larger scale, more urban ones. This is very appropriate, as constantly increasing proportions of the world’s population live in large cities. A greater impact on the global energy use will therefore require an increased focus on the buildings in the cities. Such a focus has two effects, as buildings and transportation are two of the largest energy users. A reduction in the energy use in urban buildings will, due to the greater number of such buildings, substantially reduce the total amount of energy used in buildings. At the same time, the more dense settlements will reduce the amount of energy used for transportation.

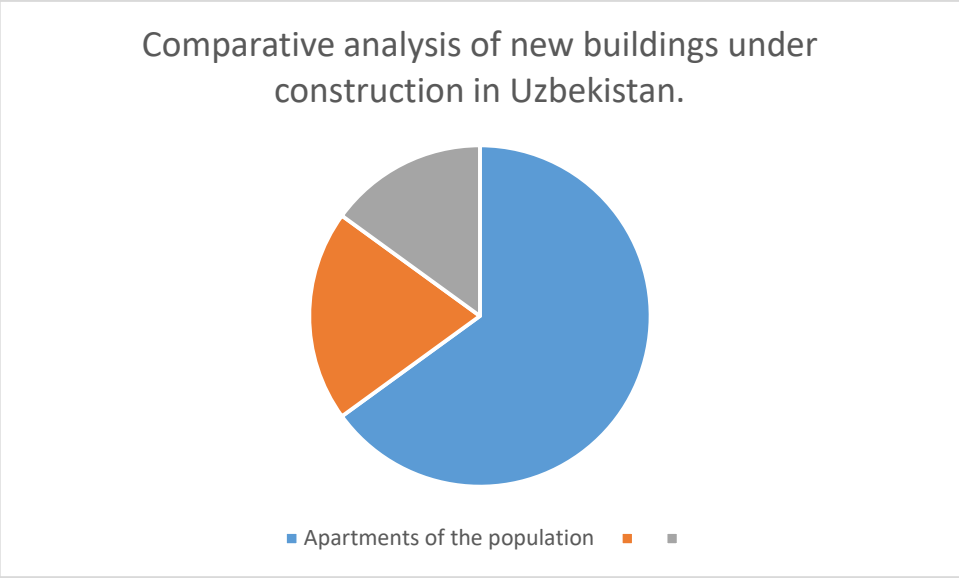

Fig.1. Classification of the most-built buildings in the territory of Uzbekistan in recent times occupies the main place in the most-populated block of apartments, centers of general use and office blocks

** In accordance with the resolution of the president of the Republic of Uzbekistan dated 02.12.2019 № PP-4542 "on additional measures for improvement of the Heat Supply System and financial recovery of heat supply enterprises" since the heating season of 2020-2021, a new procedure for payment of centralized Heat Supply Services for consumers has been established.

The tariff for 1 square meter of heating area for one day of the heating period for the city of Tashkent is 142 soums. The beginning of the heating period is determined by the decision of the mayor of Tashkent City. (The heating season began in 2020 year from 17 October). [** Payment for heat supply services starting from the heating season of 2020-2021 year].

IV. CONCLUSION

A main method to increase the solar energy utilization efficiency is to combine heat and power generation together. Critical reviews of the literature on solar combined heat and power systems (CHP) is conducted, which includes solar photovoltaic/thermal systems, concentrated photovoltaic/thermal systems, and various combination with different solar collectors and applications. It shows that there are serious gaps in this field, which calls for more research. The modeling and analysis of the electrical parts of the CHP systems are not adequate, and there are limited studies on the economic and exergy assessments of the solar concentrating CHP systems. The solar collectors for combined CHP were focused on optimizing the performance of the maximum average useful power generation and minimum total heat transfer area, little environment impact analysis was conducted. Careful exergy, economic and environmental analysis on both electronic and thermal performance is suggested, especially for large CHP system. Also, further studies are recommend for investigating the hybrids of concentrating collectors with CHP, with considering the economic issues.

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