ANALYSIS OF COOLING SYSTEMS FOR SOLAR PHOTOVOLTAIC PANELS THAT WORK EFFECTIVELY IN THE CLIMATIC CONDITIONS OF UZBEKISTAN.

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Introduction

Currently, the use of renewable energy sources in energy supply is being studied as a topical issue due to the growing demand for energy, the depletion of energy resources and the harmful effects of energy use on the environment. The main type of renewable energy sources is solar energy. We currently use a very small amount of solar energy that falls to the ground. To increase the share of efficient use of solar energy, i.e. conversion of solar energy into secondary energy, it is necessary to properly maintain solar power plants, choose the right installation site and use additional equipment that will improve their working conditions. The influx of solar radiation onto the planet produces 150,000 billion kWh of wind power and 33,000 billion kWh of hydropower per year.

Numerous studies are being carried out around the world on the efficient use of solar photovoltaic panel cooling systems, especially in areas with hot climates and low humidity. For example, in this study, an automatic water spray control mechanism was used to cool the high temperatures that occur in a solar photovoltaic module (SPM) and in hot weather. Relatively low-temperature water is sprayed onto the surface of the solar panels, through which the heat flow is transferred to the lower environment. The system used Arduino microcontrollers to control the water spray. It has been established that the introduction of an automatic sprinkler system increases the efficiency of solar panels. In the course of the study, an algorithm for controlling temperature conditions in the cooling system was developed, which made it possible to increase the efficiency of solar panels by 16. It was found that it increases to 65% [2]. This article presents the results of a study on the implementation of a solar PV cooling system called GC-CPCS in Bhopal, India. This study is based on three major new case studies using a central cooling system for SPS and the feasibility of this system for all SPS. The results of the study were obtained with solar radiation in real time [3]. This study is based on three major new case studies using a central cooling system for SPS and the feasibility of this system for all SPS. The results of the study were obtained with solar radiation in real time [3]. This study is based on three major new case studies using a central cooling system for SPS and the feasibility of this system for all SPS. The results of the study were obtained with solar radiation in real time [3].

Methodology

The Bukhara region is located in the center of the Republic of Uzbekistan, in the lower reaches of the Zeravshan River. The climate of the Bukhara region is dry, with an average daily temperature in January of 6.6°C and an average of 37.2°C in July. Annual rainfall averages 135 millimeters [4].

As shown in Figure 1, July has the highest number of days with temperatures above 40˚C. The graph data is from meteoblue.com and is based on 30 years of data.

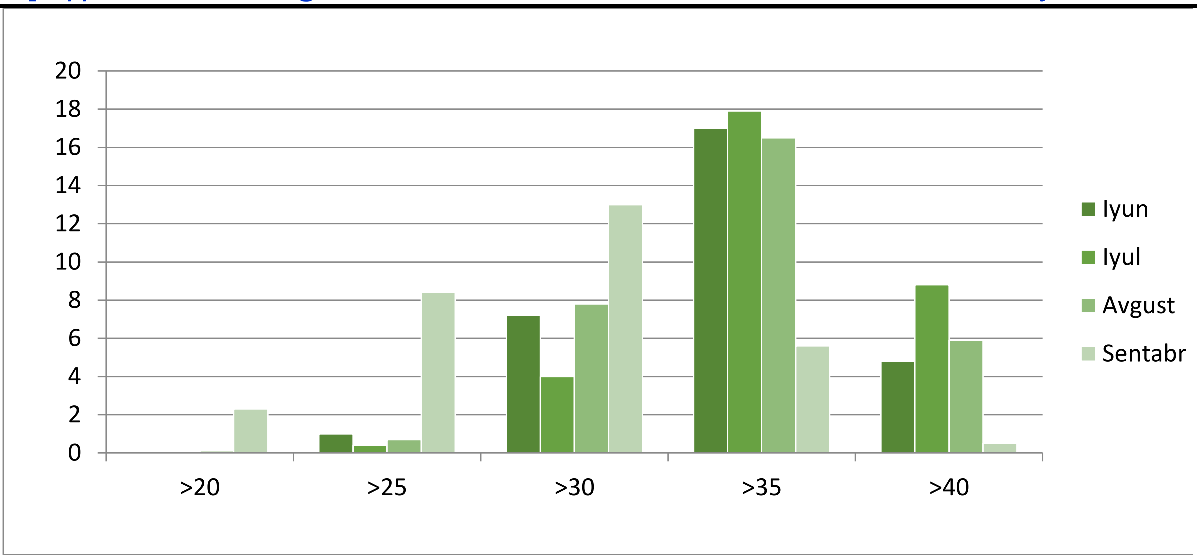

Figure 1. The number of days with high temperature in the Bukhara region [6].

In this study, a system with a cooling system was compared with a system without a cooling system, and it was observed that the electricity generated by the FMS increased by 33.3%. Water was used as the cooling system. As the surface temperature of the SPM rises, water is sprayed using special devices. In the course of the study, factors were studied that allow saving water resources and electricity through effective management of cooling modes. In conclusion, the water-cooled system with pulse control was rated as efficient [7].

Due to the hot climate of the country, especially in the Bukhara region, it is recommended to use water as an energy carrier. The thermal energy released in the system can be stored or used for hot water supply in households. The cooling system consists of SFM and copper tubes placed under it. Water inside copper pipes performs the function of transporting thermal energy, i.e. The hot water inside the copper pipes moves to the water tank located at the top of the device through the phenomenon of natural convection. The accumulated thermal energy in the water heater can be used in public utilities. To extract most of the thermal energy in the SFM, it is necessary to use materials that accumulate or change the phase of thermal energy in the volume of the water tank or in the water tank (gravel, salt, paraffin, etc.). It is also possible to use an additional pumping device to create artificial convection on days with high temperatures [8].

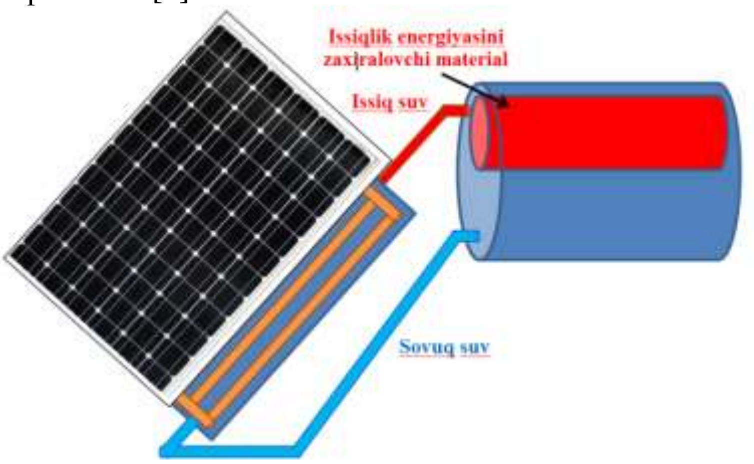

Figure 2. Structural structure of the cooling system for the photovoltaic module.

Figure 3. Experimental model of cooling system for photovoltaic module.

When using a pumping unit, it is important to set up a temperature control system and select the correct device capacity. This is because if an effective control system is not implemented or the engine power is not selected correctly, excessive energy consumption can occur and negatively affect the system's power generation efficiency.

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