BULLETIN OF NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN
ISSN 1991-3494
Volume 1, Number 371 (2018), 68 – 72

UDC 621.383

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DEVELOPMENT OF AUTONOMOUS PHOTOVOLTAIC SYSTEMS WITH SMALL POWER

Abstract. The development of autonomous photovoltaic systems is one of the most pressing problems in the electric power industry. One way to get cheap and affordable energy is solar energy. The structure of an autonomous photovoltaic cell, its main functional blocks, is considered in the article. The basic physical quantities concerning batteries and their connection are also considered. To construct autonomous low-power photovoltaic stations (up to 3000 W), accurate calculations are needed to identify the necessary and sufficient capacity of storage batteries, as well as the necessary power of solar cells. For this purpose, energy costs have been modeled, and calculations of the load during the day have been made in an apartment building with an average set of electrical appliances. The number of battery packs necessary for correct operation of the system was calculated. Based on the received data, calculations were made and a graph of the battery discharge at nighttime in the winter period was constructed.

Key words: solar cell, inverter, controller, capacity of accumulator, load power.

Introduction. In the world practice, two forms of power supply for objects are widely used: centralized and autonomous [1-3]. In recent years, the desire to introduce clean technologies contributes to the most active development of autonomous power supply using renewable energy sources. The use of solar energy in Kazakhstan is one of the most promising key topics of development of alternative energy.

Autonomous systems today have become an integral part of various SMART systems. To operate correctly any autonomous system requires a power source, as well as a way to communicate with the environment and a device for exchanging information with the dispatcher [4-6].

Very often there is a need to deploy a system that will be able to operate without external power supply, that is, perform certain operations in the field in the absence of a power source, being an independent source of energy for various needs of the consumer. Such autonomous systems can completely replace fuel electric generators.

As a power source for low-power and flexible autonomous systems are photoelectric converters or solar cells [7-10]. The constant increase in the cost of fossil energy resources and the associated incidental environmental problems increase the interest in alternative, renewable energy sources, of which solar power and solar photo batteries in particular occupy an important place. The efficiency of solar batteries is determined by their efficiency (Efficiency), maintenance costs and the cost of batteries. Data on the cost can be found from a specific manufacturer, and in many respects this factor is determined by the technology of manufacturing the battery.

Another important problem is the accumulation of energy generated by solar panels. To date, there are a lot of different batteries with different parameters, the choice of which depends on what we will be feeding, what load to use, and for how long this load will function.

Structure of the autonomous photovoltaic system. When you design photovoltaic systems, the first step is to determine the level of load power, the number of consumers and the schedule of their operation. Then, depending on what kind of load is required, a selection of solar cells and batteries is made. Depending on the capacity and the nominal voltage, the battery charge controller is selected.