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PRODUCTION IMPROVEMENT STUDIES ELECTRICITY IN UZBEKISTAN UNTIL 2030

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ABSTRACT

The article discusses the possibility and necessity of using solar and other alternative energy to generate electricity in the region based on the experience of the development of the world electric power industry.

Keywords: Central Asian Electric Power System, CAPS; electrical energy storage systems, self-sustaining energy systems, ENSS; hybrid energy complexes, GEC; renewable energy sources-RES.

INTRODUCTION

Energy can be defined in many ways. In a broad sense, energy refers to the ability of something—human, animal, or physical system (machine)—to do work and produce change. It can be used to describe someone who engages in vigorous activities such as running, talking, and acting in a lively and energetic manner. In science, it is used to describe the part of the market where energy itself is used and sold to consumers. Today, energy is the primary resource for almost all economic activities and has become vital for improving the quality of life. In fact, the entire infrastructure is based on energy. The energy consumption of any country in the world is now generally regarded as an indicator of its development. About 24 per cent of the world's energy consumed is used for transport, 40 per cent for industry, 30 per cent for domestic and commercial purposes, and the remaining 6 per cent for other purposes, including agriculture. There is a large disparity in energy consumption between developed and industrialized countries and developing countries. About 2 billion people, one-third of the world's population living in developing countries, do not have access to energy. Three billion people depend on firewood, coal, charcoal, manure, kerosene, etc., for cooking and heating. On the other hand, industrialized countries, home to only 25 per cent of the world's population, account for 70 per cent of commercial energy consumption.

Since gaining independence in 1991, the Republic of Uzbekistan has done a lot of work to integrate into the global electric power industry. At the same time, the electric power industry was only a part of the overall strategy for the formation of Uzbekistan as an integral part of the world economy. It is becoming a common requirement for high-quality electricity consumption.

One of the requirements of quality indicators is the uninterrupted supply of electricity to the consumer. To achieve this goal and to reduce losses, a combined hybrid power supply system is used. Under the right conditions, hybrid energy systems will be an ideal solution as they have the following features: [6] Variety of energy sources – hybrid systems can include several different energy sources, such as solar, wind, hydropower, thermal, biomass, diesel, etc., allowing the system to make optimal use of available resources depending on specific conditions; Increased reliability - the use of multiple energy sources increases the reliability

of the system and reduces the risk of downtime or malfunctions, i.e. the need for electricity can always be covered; Cost reduction - the use of more than one energy source can reduce energy costs and make the system more cost-effective, but for this to happen, it is necessary to carefully select the most appropriate generation methods for the specific conditions that will be included in the SEC; Reduced environmental impact – hybrid systems can incorporate renewable energy sources, making electricity generation cleaner and reducing the impact of burning fuels; Flexibility and adaptability - hybrid systems can be adapted to different climatic conditions and user requirements; reduction of electricity losses – the use of energy storage in the SEC allows you to accumulate electricity that is not in demand for a certain period of time, and then, when it occurs, it is released to the grid. Independence from centralized power supply - HECs can be installed in remote and hard-to-reach places where there is no possibility of connecting to power grids, which makes it possible to provide power supply for various remote facilities. Thus, the use of hybrid energy systems provides a number of advantages and ultimately makes it possible to increase the reliability of the energy system and reduce emissions into the environment, which is especially important in the context of the concept of sustainable development.

Fig.1. Hybrid solar power plants

Solar energy is the fastest growing segment of the renewable energy market, the energy market in general. The sun will soon become the main energy resource used by humans. The actual rates of development of solar energy are shown in Figure 2

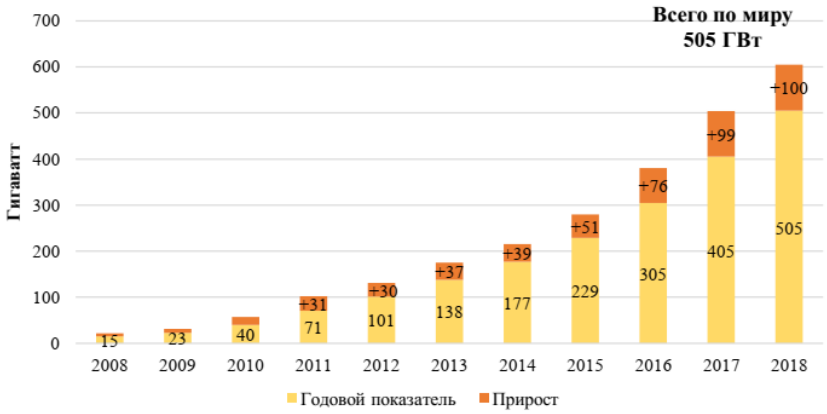

Figure 2 - Dynamics of solar energy development in the world

On its own, solar energy is unlikely to be able to replace coal, oil and gas, but at the same time, in combination with other renewable energy sources, it is quite capable of removing hydrocarbons from the world arena in the near future. [7]

Economic growth, rising prosperity and urbanization, rising per capita consumption, and increased access to energy are the key factors that will be responsible for the substantial increase in overall electricity demand. Thus, there is an imbalance in the supply and demand of energy. It should be noted that the countries of the CAEC region are engaged in strengthening their own generating and transmission potential in order to increase national energy independence and expand export opportunities to countries outside CAEC. All five CAEC countries are seeking new opportunities for cross-border trade (with Afghanistan, Pakistan, Turkey, Iran, and Russia). Electricity exports have become the top priority for all countries. However, these countries are not yet ready for the reliable operation of their own national energy systems. The examples below illustrate this: In Tajikistan, there is no possibility of supplying energy to remote regions, as well as the ability to cover peak demand in winter at the expense of the current stage of development of the energy system. Uzbekistan's participation is needed to supply energy to the northern region and two regions in the west of the Kyrgyz Republic. To supply energy to the Fergana Valley of Uzbekistan, it is necessary to use power lines of the Kyrgyz Republic. Uzbekistan, Turkmenistan and Kazakhstan cannot cover peak loads without regular services, which can be provided by the Kyrgyz Republic and Tajikistan. The use of existing intersystem lines between individual sections of the Central Asian region is the most cost-effective solution for reliable power supply to consumers in the region. For a number of reasons, the joint operation of CAPP as an integrated energy system, as well as the exchange of electricity in the region, has decreased. The following facts allow you to verify this: [3]

Technical losses in power grids amount to about 13%, of which 25% are in the national sections of the regional 500/220 kV backbone network and 75% in distribution networks. Uzbekistan faces the problem of electricity shortage in some energy regions. With the existing unevenness of the location of power grids and generation facilities to the load centers, power outages most often occur in the Fergana Valley. Also in the south - in Kashkadarya, Surkhandarya, Samarkand regions, especially in the autumn-winter period. Electricity flows to and from Kazakhstan, to Kyrgyzstan and from Kyrgyzstan are transited through the republic's electric grids. Uzbekistan supplies electricity to the Northeast Energy System of Afghanistan (NEPS) via a 2-circuit 220 kV Surkhan-Naibabad overhead line. Currently, Uzbekistan is actively working to ensure the transit of electricity through the networks of the energy system of Uzbekistan. The resumption of electricity transit from Turkmenistan to Kazakhstan and Kyrgyzstan through the energy system of Uzbekistan is being discussed.

In a year, 365 days of this 300 days in Uzbekistan are sunny. The average temperature in January is 2 ° C to -5 ° C (absolute minimum - 38 ° C), in July +30 to +38 ° C (absolute maximum +49.6 ° C). The number of sunny days of about 300 days per year makes it possible to increase the use of solar energy through solar photovoltaic panels. [3]

It is expected that in the next five years, electricity consumption will increase from 1,132.6 million kWh to 5,787.8 million kWh due to an increase in the number of consumers. [2]

In this regard, in the next five years, power engineers plan to implement 21 major projects for the construction of small photovoltaic power plants as alternative power sources. The structure of Regional Electric Networks JSC includes 12 regional branches and 2 enterprises of territorial (regional) electric grids (Bukhara PTES JSC and Fergana PTES JSC), which operate 0.4-6-10-35-110 kV power grids. [4]

Currently, the available generating capacity of the republic is 12.9 GW, of which: thermal power plants - 11 thousand MW or 84.7 percent; hydroelectric power plants – 1.85 thousand MW or 14.3 percent; block station and isolated stations – more than 133 MW or 1 percent.

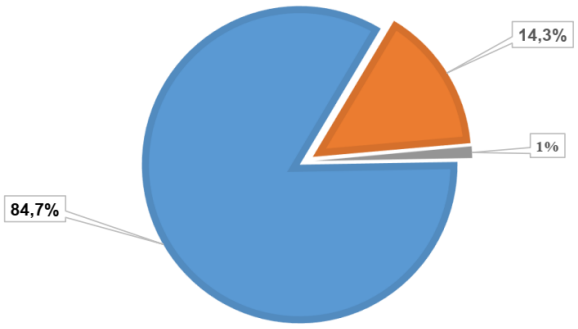

Figure 3 – Structure of electricity generation

Fig.3 shows TPPs and CHPP-84.7%, HPP-14.3%, Block Station-1%, data from 2019.

The main source of generation is 11 thermal power plants, including 3 thermal power plants.The capacity of modern efficient power units is 2825 MW or 25.6 percent of the total capacity of thermal power plants.

Change in installed capacity 2019-2030 [5]

Electricity generation **in Uzbekistan will** reach 120.8 billion kWh, including:

TSE	–	70.7	billion	kWh	(58.5	%);
GES	–	13.1	billion	kWh	(10.8	%);
FES	–	9.9	billion	kWh	(8.2	%);
VES	–	8.6	billion	kWh	(7.1	%);
AES	–	18.0	billion	kWh	(14.9	%);

block station – 0.6 billion kWh (0.5 %);

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