

## Directions of Energy Development in the Republic of Uzbekistan

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### ABSTRACT

The article presents the directions of development of the energy sector in the Republic of Uzbekistan and the tasks for their improvement. The structure of priorities is based on the current state of the energy sector and the measures outlined in the concept until 2030.

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### Introduction

The global energy system is dominated by large-scale and centralized production and fossil fuels. This is, in particular, the paradigm of energy industry enterprises that determines the production process in countries. At the same time, changes in the energy sector lead to the need to amend this model and reconsider the distribution of productive forces in this area and create a basis for sustainable development of production activities. The purpose of these changes is to increase the efficiency and sustainability of the energy industry. In the transition to a digital economy, it is necessary to analyze the independent factors that require a broader focus on competitiveness and cost. This is due to the transition to low-carbon technologies and the maintenance of existing prices for raw materials. A number of modern and digital technological innovations can create favorable conditions for transformation.

### Materials and methods

Transformation is most evident in the field of electricity, where it can be divided into the following main features:

1. Demand: is a traditionally applied model that is built around consumers who cannot track energy consumption figures in real time and cannot change consumption depending on the price factor. The expanded application of smart measuring devices and intelligent technologies will enable consumers to more accurately assess energy consumption and become active participants in the retail energy market.

2. Suggestion: here, on the contrary, the traditionally applied model will be built around a small number of large energy producers operating in a centralized and controlled manner. This model is changing with the introduction of low-power, large-area, and discrete-mode, renewable energy devices. The change in this model is leading to the emergence of 34 new types of electricity generation. The inclusion of industrial wastes in the technological process of utilization is also creating new approaches. The cost-effectiveness of heat and electricity generation, especially from waste gas products, is high.

3. In the traditional energy industry, electricity storage technologies have been used very rarely. Electricity is mainly stored in hydroelectric power plants. Therefore, the need to balance supply and demand has a significant impact on the widespread use of renewable energy sources and maximizing overall efficiency. Although new energy storage technologies are not yet widely used, they are evolving with the

emergence of new technologies. In particular, under the influence of thermal energy storage technologies and structural shifts in solar energy concentrators, ie the widespread adoption of electric vehicles is developing.

At the heart of these changes and the development of the energy sector is the creation and implementation of these “smart” energy systems. The most important aspect here is the wider adoption of smart measuring devices and smart grids. At the same time, the prospects for technological innovation are much broader, which may create new opportunities for areas such as demand response, network and micro-network regulation. The regulation of this sector will help to make full use of the potential of the infrastructure in it. In particular, due to consumer participation in the wholesale electricity market or the formation of daily prices, thereby encouraging the reduction of consumption during peak periods of demand. However, these trends affect the performance of energy markets. At the same time, the variability of resource and electricity prices requires the creation of market structures that are not transparent and more flexible for short periods of complex hedging. And the market expands the prospects for the emergence of new participants. The main opportunities resulting from these changes are related to strengthening sustainability, firstly, to significantly increase the capacity to compensate for the discreteness of renewable energy sources, secondly, to regulate consumption during peak load periods, and thirdly, to reduce private consumption by authorized consumers; actively participates in the analysis of its control.

Smart metering devices and power storage systems are a central factor in the development of the energy sector, leading to changes in the volume and quality of data received by participants in this sector. Conventional electricity consumption is determined by measuring devices that record the total amount of energy consumed, but do not measure the time it takes to consume it. This situation may change with the advent of modern electronic measuring devices. To do this, introduce the following:

- recording both the time of energy consumption and the amount consumed and forming a consumer profile;
- they should be able to immediately send and receive data over cell phone networks or power lines.

Together, these innovations will significantly expand the range of opportunities for consumers, suppliers and operators. Consumers can get detailed information about the amount of electricity they consume in real time, which allows them to analyze their consumption characteristics and make adjustments to them as needed. Similarly, operators and suppliers can see the real-time status of their networks. This allows them to make clear planning and investment decisions, optimize power flows, and work with distributed discrete production capacities. Most importantly, an increase in this information could lead to the development of new business models and innovative efficient energy systems.

## **Results**

In the development of the energy industry in our country, mainly the production of electricity and heat, preparation, distribution and transmission of coal for consumption, as well as oil and gas extraction, refining and transportation, distribution to the population, industrial enterprises and their rational use. The regulation of processes is carried out effectively. To this end, the enterprises of the energy industry have the following tasks:

- optimization of enterprises in the energy sector;
- conclusion of contracts for the distribution of energy products and regulation of their implementation in a timely manner;
- creation of innovative types of energy sources, directing private capital of enterprises and foreign investors to the processes of extraction and production of existing natural resources;
- ensuring the expansion and development of the network on the basis of public-private partnership;
- Proper organization of pricing policy in order to create conditions for a competitive business environment, expand energy production and diversify products;
- introduction of modern elements of corporate governance in the energy sector, including the implementation of proposals for the implementation of regulations developed by international financial institutions, taking into account the proposals.

The process of developing a strategy for the development of the energy industry in Uzbekistan in 2020-2030 and a comprehensive digitization program for electricity in 2019-2021 has been launched. According to him, the system for automating the process of resource planning of enterprises (ERP - *Enterprise Resource Plan*) as a mechanism for the development of the energy industry and dispatch control and data collection (SCADA - *Supervisory Control And Data Acquisition*) has begun to put the system into practice.

One of the main manifestations of the mechanisms for the development of the electricity industry in Uzbekistan is the modernization of thermal power plants (TPP), nuclear power plants, renewable energy sources (REC), solar and wind power plants and other energy production with direct foreign and domestic investment. construction and commissioning of production facilities in areas that introduce innovative ways.

Another important mechanism has been launched in the country to improve the performance of the energy sector. This is being carried out at a rapid pace "Introduction of an automated system of accounting and control of electricity (ACASE- *Automated control and accounting system of electricity*)". In particular, by 2021, the installation of modern electricity meters for more than 7 million consumers has been completed.

Another mechanism for the development of the industry is the organization of activities based on international experience in the development and implementation of a number of investment projects on the terms of this public-private partnership.

At the same time, the Ministry of Energy, as an economic and financial mechanism, is regularly organizing measures to promote energy saving, the introduction of innovative technologies and raising public awareness about the importance of energy saving.

According to experts of the state inspection organization "Uzenergoinspektsiya", now each household has the opportunity to save an average of 400 kWh of electricity per year. If each family can save an average of 400 kWh of electricity per year, then the total amount of electricity saved in the country will be 1.8 billion kWh. It should be noted that due to these savings, it will be possible to provide Jizzakh or Syrdarya regions with electricity throughout the year.

In recent years, measures have been taken to increase the stability of electricity supply to the population. 2020 - the volume of electricity supply - by 10% or 800 mln. kWh.

The value of the indicator of sustainable electricity supply to the population will have a growing trend, especially for the rural population. As part of the energy industry development program, measures are being taken to modernize and build new infrastructure. Confidence in sustainable energy supply has increased in 2019-2020 - the share of the population in the use of electricity increased from 74% to 78%, the use of natural gas - from 62-67%. Measures taken to modernize and expand the power grid will reduce downtime and the number of accidents.

At the same time, despite the fact that the volume of redistribution of electricity to the population is much higher, there are trends in the regions of the country to reduce the balance of energy supply and demand. This was due to a lack of energy capacity and increasing restrictions on supply at the regional level. Despite the measures taken, issues related to the use of renewable energy devices in the homes of the republic are gradually being addressed. If in 2015, 26 households out of 10,000 households surveyed were ready to install renewable energy devices, in 2018 this figure will decrease by almost 3 times, which will maintain the high cost of energy supply based on the mechanism of their effective introduction in the regions and renewable energy sources. indicates the imperfection of the mechanisms used.

The following are the priorities for achieving the goal of sustainable use of cheap and reliable energy supply:

- Development and implementation of a set of measures to provide economic incentives for the introduction of renewable energy devices in households ;
- organization of a generation that will open and expand new opportunities in the field of energy supply, decentralization and distribution of development.

The share of renewable energy sources in the energy balance is expected to increase significantly to achieve a stable supply of electricity. However, addressing this target problem is done in conjunction with the remaining trend of maintaining different issues and constraints.

Despite the measures taken, the balance of fuel and energy resources and production capacity remains very diverse:

- almost 90% of all electricity generation is based on gas and coal;
- the share of modern renewable energy devices should be in the range of at least 20-35%, of which about 9-10% should fall on hydropower.

### Discussion

Renewable energy reserves in electricity generation are used very slowly at the level of implementation of local small projects that do not yet affect the structural parameters of the balance. For example, the share of renewable energy sources in electricity generation in China is 6.3%, Turkey - 8.4% and Germany - more than 27% [2].

In order to diversify the energy balance as quickly as possible, increasing the share of renewable energy sources in the electricity balance by 20-25% by 2030, which will significantly improve the balance of electricity supply and demand at the regional level, has been identified as a priority.

Priority measures to achieve this goal include:

- modernization of the country's energy system through the introduction of high-efficiency technologies using modern renewable energy devices;
- revision of modern regulations in the field of renewable energy development, ensuring effective and unimpeded connection of local renewable energy sources to the network of large producers and suppliers of the energy industry;
- ensuring maximum localization of components and spare parts for solar and wind power generators, taking into account the prospects of solar energy and wind energy, as well as increasing the possibility of their joint use to supply the local power system;
- construction of solar photovoltaic power plants with a total capacity of 1000 MW, not more than 10 and each with a capacity of 100 MW, located in six regions of the country: Tashkent, Samarkand, Navoi, Jizzakh, Surkhandarya and Kashkadarya regions;
- to increase the level of localization of main and auxiliary equipment used in the production of electricity using solar and wind energy to 25% by 2025 .

One of the positive changes in the development of the digitalization process in the economy is the tendency to reduce the energy intensity used in GDP. The value of this indicator has decreased by 2 times compared to the period of reforms, which is reflected in the economy as a factor of sustainable supply of fuel and energy resources.

In the same way together , energy efficiency increase for still both big reserves and opportunities are available . In this regard, Uzbekistan is 2.5-3 times lower than the average for Western European countries , 2.2 times lower than the United States, and 3.5 times lower than Japan and Korea. The level of energy intensity of GDP is much lower than in the CIS countries. However, in the composition of these countries, Uzbekistan has one of the highest rates. The energy intensity of Uzbekistan's GDP is 1.7 times higher than the average in the CIS countries.

In the long run, the introduction of energy-saving technologies and the expansion of renewable energy sources will reduce the energy intensity of the economy by at least 2 times, which will ensure the balance of fuel and energy production and consumption, which is an important factor in sustainable development and reliable energy supply. is

### Conclusion

Important measures to achieve the set goals by 2030 and double the energy efficiency of the economy are [3]:

- effective implementation of investment projects for the introduction of new resource-saving technologies for the use of alternative energy sources;
- increase and support of innovative projects in the field of energy saving, increase energy efficiency and ensure sustainable development;

- formation of new normative and legal documents in the field of energy efficiency, including clear parameters for standardization and certification of equipment and devices of renewable energy sources;
- implementation of a new tariff policy in the energy sector, which will bring the price of electricity to the level of cost recovery, accelerate the process of their efficient use.

The energy infrastructure of the republic is developing under the influence of large-scale reforms in the fuel and energy sector, and in this process, special attention is paid to the modernization and construction of infrastructure facilities. During 2018-2020, the total length of power grids increased by more than 11% and more than 70 thousand <sup>2</sup> meters of low-voltage networks of 0.4-10 kV were reconstructed.

As a result, there is a tendency to increase the sustainability of energy supply. At the same time, not all measures taken will lead to a sharp increase in the efficiency of the entire energy supply system. The depreciation rate of power grids and transformer substations lags far behind the world average, and more than 2/3 of power grids have been in service for more than 30 years.

Currently, more than 60% of the total length of power grids need to be upgraded and more than half or 55% of transformer points need to be replaced. The average power loss due to high physical wear of power lines and transformers in power grids, excessive length and inefficient placement of low voltage transmission lines has increased by 20%, which is much higher than the world average. For comparison, in developed countries this figure does not exceed 6-8%.

The introduction of renewable energy devices in the energy infrastructure is gradually being addressed, which will serve as an additional factor in the development of sustainable energy supply at the regional level and reducing the level of energy supply reliability in the context of declining demand balance. Thus, despite the increase in energy distribution to the social sector, the level of gas supply to the population is declining from 65% in 2016 to 60% in 2018, while in rural areas this figure does not exceed 40%.

In order to stabilize the electricity supply of the country, it is planned to implement measures on the existing mechanisms for the development of energy infrastructure, including:

- ensuring the renewal and modernization of obsolete low-voltage power grids in accordance with the program;
- ensuring the implementation of investment projects for the construction of solar photovoltaic power plants with a total capacity of 1000 mw, including the construction of 20 stations with a capacity not exceeding 50 mw;
- ensuring the timely commissioning of facilities for the construction of Nanay HPP on the Oqsaroy River in Tashkent region, a small HPP under the Tuyabuguz Reservoir, a cascade of small HPPs on the Fergana Canal;
- ensuring good maintenance of assets, expansion of funding for maintenance and training of emergency personnel, which is an important factor in ensuring the reliability of the energy system as a whole;
- ways to encourage the introduction of energy-saving technologies and renewable energy sources, which will be subsidized by the state;
- adoption of the necessary regulations governing the technical characteristics of energy systems, which directly affect the quality of energy services provided to the population.

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