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UZBEKISTAN RENEWABLE ENERGY SHORT OVERVIEW: PROGRAMS AND PROSPECTS

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Abstract

The use of renewable energy sources in the Republic of Uzbekistan is relevant for the purpose of both ensuring energy security and improving the social and living conditions of the population. The main components of renewable energy in the country are solar energy, hydraulic, wind and geothermal energy, as well as biomass energy. The total technical potential of renewable energy in the republic is 179.4 million tons of oil equivalent, which is more than three times of the annual demand for energy resources.

Key words: *Solar energy, renewable energy, wind power plant*

1. Introduction

The territory of the Republic of Uzbekistan (447,4 thousand square kilometers, of which 70% are deserts) is located in relatively favorable climatic conditions (between 37° and 45° north latitude and between 56° and 73° east longitude) for SE use, the energy potential of which is 98.5% of renewable energy combined [1], and therefore it is considered the main determining factor in planning the share of renewable energy use in the overall energy balance of the Republic.

From the analysis of the state of work in the field of using solar energy in the republic and comparing them with the foreign levels in this area it follows that in order to expand the scale and shorten the time of solar energy introduction, it is necessary to accelerate the development of competitive, environmentally friendly and modern technologies adapted to operating conditions, creating of power equipment's market which SE use, eliminating financial and legislative barriers to their widespread use.

2. Actions and prognosis

In 2013-2016, UZB TA 8008 project "Republic of Uzbekistan: Solar Energy Development" in cooperation with ADB was implemented in the Republic. The main objectives of the project "UZB TA 8008" are:

1). Development of the Roadmap "Republic of Uzbekistan: Solar Energy Development".

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2). Development and strengthening of the infrastructure of the International Solar Energy Institute.

3). Development of feasibility study (feasibility study) of a 100 MW PV plant in the Samarkand region.

The Roadmap "Republic of Uzbekistan: Solar Energy Development" has been prepared to identify problems and barriers in order to create favorable conditions and develop mechanisms, actions, programs and implementation specific projects where the development of solar energy use will be realized for sustainable environmentally safe, socio-economic Development of Uzbekistan, in accordance with its national interests and the government program, phased implementation in the period until 2030.

As Uzbekistan has a sufficiently high technical potential for renewable energy, namely, energy production from solar generation can range from 525 to 760 billion kWh, wind generation of more than 1 billion kWh, biomass energy up to 6 billion m^3 biomethane per year [2].

If appropriate actions are taken, in 2030, it would be feasible to supply 6% of total electricity produced in Uzbekistan using solar technologies, less than 0.1% of its territory (88 km^2) would be needed [3].

The market for RES services remains extremely limited for the solution of the issue with regard to the cardinal change in the structure of the fuel and energy balance due to the introduction of renewable energy sources. In industrial use of solar energy, no more than 1 MW of solar energy is involved, and industrial use of wind energy is practically non-existent.

Evaluation of the results of solar radiation intensity shows practically uniform distribution of solar potential across the territory of Uzbekistan [4].

Table 1. Solar radiation intensity across the territory of Uzbekistan

	Regions	$\sum q_{\perp}$, kW h/m^2.	n, hour
1	North of the Republic (The Republic of Karakalpakstan, the Khorezm region and the north of the Navoi region)	1900-2100	2900-3000
2	South of the Republic (Kashkadarya and Surkhandarya regions)	1900-1960	2950-3050
3	Fergana Valley (Ferghana, Andijan and Namangan regions)	1500-1550	2650-2700
4	Zeravshan Valley (Samarkand, Jizzakh, Bukhara regions and the south of Navoi region)	1910-1980	2930-3000
5	Tashkent	1943	2852

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The Republic of Uzbekistan has significant wind energy resources suitable for the development of commercially successful large-scale wind power plants (WPP). The aggregate technical potential is estimated at over 1 million GWh of electricity or 520 MW of installed capacity.

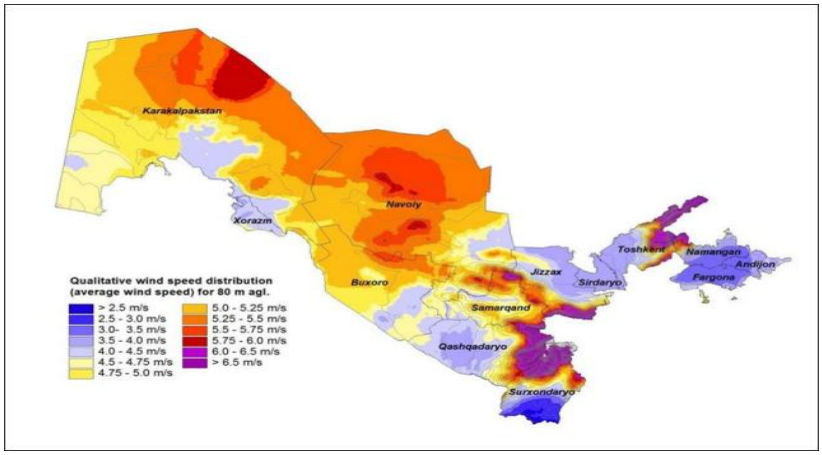

Fig. 1. Atlas of wind speed distribution across the territory of Uzbekistan [5].

For the implementation of projects on the introduction of WPP within the framework of the draft Concept of "Development of renewable energy in the Republic of Uzbekistan for 2017-2019 years" may be selected Nukus sites in the Republic of Karakalpakstan, Zarafshan in Navoi region and some promising places in the Jizzakh region, that are located accessible territory near the electrical infrastructure, based on preliminary research results, and also do not damage land use [2].

To replace generated electricity at thermal power plants, the construction of wind farms are being considered with a capacity of 100 MW and more. For the energy supply of rural remote settlements and social facilities, the possibility of using combined wind-photovoltaic installations are being considered with a capacity of up to 100 kW [2].

The most prepared sphere of large-scale use of solar energy in the economic sectors of the republic, as well as all over the world, is its conversion into low-potential heat with the help of flat-plate solar collectors for water heating and use of the latter as a source in hot water supply systems for residential, communal and social objects, which are the main consumers of heat in the social sphere.

Thus, in low-rise residential buildings, which account for 76% of the housing stock, of the total gas flow rate (8.1 billion m^3) only for the needs of hot water consumes about 3 billion m^3.

In order to reduce the consumption of electricity and natural gas for social purposes, industrial enterprises are planning to introduce helioboilers with the capacity of 54.3 Gcal/day, solar photovoltaic plants with a total capacity of 1.5 MW.

On the social facilities are provided introduction of solar collectors with a total capacity of 1.3 Gcal/day for purposes of hot water supply and heating.

For the development of the bio-waste potential in the period 2017-2019, it is planned to introduce biogas installations in 726 large poultry and livestock farms in the country. The share of livestock and poultry farms equipped with biogas plants will increase from 0.7% in 2017 to 11.2% in

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2019, which will allow to annually calculate up to 60.8 million m^3 of biogas with the possibility of using it for power supply for own needs of farms, and in the presence of excess - the supply of energy to a local or unified electricity grid. This will also allow for the production of 170 thousand tons of bio fertilizers (dry weight) in these farms.

The abovementioned draft Concept provides the feasibility study of more than 30 industrial projects of solar photovoltaic plants with a total capacity of 212 MW (from 10 to 25 MW) in remote and energy-deficient areas, and the creation of four wind farms with a total capacity of 254 MW in order to improve the quality of electricity supply.

3. Conclusions

As a result of the implementation of the proposed Concept and the program for the development of hydropower, the share of renewable energy sources (RES) in the country's energy balance in the near future can reach 19-23%, which will allow replacing at the expense of RES over 5-6 billion m^3 of natural gas per year, and solar energy can become the main driving force of the local economy and the energy production sector. In the optimistic scenario, the installed capacity could reach 3 GW in 2030: with generating 5 TWh and around USD 50 million yearly incomes, creating 2,700 direct jobs and needing USD 900 million of annual investment. The cumulative investment would be USD 7,000 million USD.

Due to its climate data, already acquired experience in the field of RES use and strategic location in Central Asia, Uzbekistan can become a regional center of knowledge, technology, energy and production based on RES.

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