

# Development of Renewable Energy Sources in the Kyrgyz Republic: Current Status, Problems And Prospects

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## Abstract

**PURPOSE.** Determination of prospects for the development of renewable energy sources in the Kyrgyz Republic by assessing their potential, current state and development in the Kyrgyz Republic, as well as analyzing the regulatory framework, opportunities and barriers to their development. **METHODS.** Anonymous surveys of specialists in the field of energy and renewable energy, systematic and integrated approaches, analysis and synthesis, induction and deduction were used. A survey of the expert community was also conducted in order to identify "bottlenecks" in the state management of renewable energy projects and find ways to solve them. **OUTCOMES.** Ways to improve the state policy and mechanisms for the development of renewable energy in the Kyrgyz Republic through the introduction of auctions, the expansion of the practice of public-private partnership (PPP), the solution of the issue of guaranteed state purchase of electricity from small and medium-sized producers at mutually attractive tariffs and terms, the issue of land allocation, zoning for projects for the deployment of photovoltaic solar and wind generating plants are proposed.

## Keywords

Renewable energy sources, diversification of fuel and energy balance, small hydroelectric power plants, photovoltaic power plants, greenhouse gases

## Introduction

The Kyrgyz Republic (KR) has significant potential for renewable energy sources (RES): solar, hydro resources of small rivers, wind energy on mountain passes, geothermal energy of hot springs, biomass of agricultural waste, etc.[1,2]. The country has accumulated experience in a number of organizations and enterprises in the development, design and industrial use of equipment operating on renewable energy sources, as well as some experience in conducting scientific work and research, there are good results in the development of new technical means operating on renewable energy sources and their application in practice [3].

Despite the existing potential of renewable energy sources, and, in particular, small hydropower, today their share in the structure of the fuel and energy balance (TEB) is scanty [4] and does not meet the requirements of diversification in the context of global warming due to the imperfection of the regulatory framework, low and socially oriented electricity tariffs, insufficient financial resources and unattractiveness for investors. Their development remains less cost-effective and significantly more capital-intensive than traditional ones.

According to [5], over the past 20 years, a number of national strategies in this area have been approved. Their ambitious goals were not met due to frequent institutional changes and imperfections in the regulatory framework. Only a few small hydropower (SHPP) projects have been implemented,

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funded mainly by international or bilateral donors. They faced regulatory, institutional, technical and financial obstacles, as well as a shortage of qualified local personnel for the design, construction, operation and maintenance of SHPPs.

The issues of assessing the potential and prospects for the development of renewable energy sources are also considered by foreign scientists and researchers, scientists from Russia and the CIS. According to the quantitative analysis carried out in [6], "the introduction of renewable energy sources will stimulate economic growth, provide new employment opportunities, increase the well-being of mankind and contribute to the achievement of a climate-friendly future."

According to the conclusions of the Report [7], "New technologies for the use of renewable energy sources can provide competitive energy supply, while reducing the negative impact on the environment and human health, opening up the possibility of universal access to inexpensive, reliable, sustainable and modern energy sources for various categories of consumers, which is one of the obligations of the Kyrgyz Republic to achieve the United Nations (UN) Sustainable Development Goals."

Despite the fact that the Kyrgyz Republic has a huge potential and reserves of water and energy resources, its dependence on energy imports (natural gas, petroleum products, partly coal) accounts for more than 50% of total energy consumption. The share of renewable energy in the country's electricity balance does not exceed 1%, while many states are now beginning to pay great attention to the production of environmentally friendly forms of energy. [8]

Other CIS countries are at different levels of renewable energy development. CIS scientists reveal the problems and challenges they face [9-13].

The Government of the Kyrgyz Republic consistently calls the development of renewable energy as one of its priorities in the development of green energy [14].

Thus, we can conclude that the researchers have extensively studied various factors influencing the widespread involvement of renewable energy sources in the country's energy balance, but the risks arising due to their variability for the Kyrgyz Republic have not been sufficiently studied.

The solution of the above problems requires an integrated approach based on a serious analysis of the current situation in the state management of renewable energy projects, supported by economic studies that take into account the potential of renewable energy sources, the commissioning of new energy capacities, the forecast of the country's economy's energy needs for the medium and long term, taking into account the socio-economic development of the country in the future, which this work is aimed at.

*The scientific and practical significance of the work* lies in assessing the potential and prospects for the development of renewable energy sources of the Kyrgyz Republic, taking into account environmental aspects, determining the principles of the energy policy of the Kyrgyz Republic in the field of renewable energy development, taking into account the successful experience of neighboring countries, justifying the mechanism for improving the rational development and use of renewable energy sources. Also, the study identified priority organizational problems, the solution of which will ensure the expansion of areas and increase in the use of renewable energy sources in the Kyrgyz Republic.

*The scientific novelty* lies in the discovery of clear dependencies between the implementation of specific mechanisms for the development and stimulation of renewable energy sources, widely used in other countries, and the degree of development of renewable energy sources in them, and the substantiation of prospects for improving the rational development and use of renewable energy sources in the Kyrgyz Republic through the introduction of similar mechanisms.

#### *Problem Statement*

The current situation, problems and prospects for the development of renewable energy in the Kyrgyz Republic are considered, including various aspects.





The purpose of this work is to determine the prospects for the development of renewable energy in the Kyrgyz Republic by assessing their potential, the current state and development in the Kyrgyz Republic, as well as analyzing the regulatory framework, opportunities and barriers to their development.

### Outcomes

Renewable energy is a rapidly developing high-tech sector of the economy that has a positive impact not only on the energy security of countries, but also on the growth rate of the economy as a whole, the level of employment and well-being of the population, as well as the environmental situation.

The assessment of sustainable energy policies and regulatory support for 111 countries (representing 96 percent of the world's total population) was carried out by the RISE project, an initiative of the World Bank. The analysis covers three energy pillars: energy access, energy efficiency, and renewables. According to 27 indicators measuring the policy of states in the field of renewable energy and energy conservation, Kyrgyzstan received 64 points out of 100. In the assessment system, where a higher score means better readiness for sustainable energy, the global average score is 56, Russia is 77, Kazakhstan is 78, Tajikistan is 60, and the average score for the region is 71. Thus, Kyrgyzstan lags behind the regional average by 5 points.

The installed capacity of small hydropower plants is 56.7 MW with electricity generation up to 250 million kWh per year. About 24 SHPPs are in operation, including those belonging to OJSC Chakan HPPs and private electricity producers. (Table 1.)

**Table 1.** - Existing small hydropower plants in the Kyrgyz Republic

№	Name of small hydroelectric power station	Installed capacity, MW	Net power, MW	Average annual output, million kWh
<b>OJSC "Chakan HPP"</b>		<b>38,5</b>		
1	including: Lebedinovskaya HPP	7,6	5,6	34,4
2	Alamedin HPP Cascade (8 HPPs)	21,78	19,3	83,82
3	Malaya Alamedinskaya HPP	0,4	0,33	2,04
4	Bystrovskaya HPP	8,7	8,5	41,08
<b>Other SHPPs:</b>		<b>18,23</b>		
5	Kalinin Hydroelectric Power Station	1,4	1,4	6
6	Tegirmenta SHPPs	3	3	12
7	Satellite-2005	0,2	0,2	1
8	Konur-Olonskaya	3,6	3,6	0
9	Kok-Sai	3,4	3,4	0
10	Nyman	0,6	0,6	3
11	SC ARC	1,4	1,4	10
12	KSCC	0,5	0,5	2
13	Jidalik	1	1	0
14	Maryam HPP	0,5	0,5	2,44
15	Ak-Buura Group	0,23	0,23	1,4
16	Impex Trade	2,4	2,4	11,9

**Source:** Compiled by the authors according to the Ministry of Energy of the Kyrgyz Republic.

OJSC "Chakan HPP" is the main producer of electricity among small hydroelectric power plants in the Kyrgyz Republic and has extensive experience in the field of their operation. The share of generation of OJSC "Chakan HPP" in the structure of the incoming part of the electricity balance is more than 1%. At the same time, since the establishment of the company, annual output has increased by 2 times, the company's revenues for this period have increased 10 times. The main problem in the operation of the stations of OJSC "Chakan HPP" is the high level of depreciation, which at the moment is more than 80.8%. The low domestic electricity tariff and the ban on the export of generated





electricity do not allow the company to make a profit for the reconstruction and new construction of power plants.

The total gross *hydropower potential* of the *small rivers and watercourses* surveyed on the territory of the republic exceeds 80 billion kWh per year, of which the technically acceptable for development averages 6 billion kWh per year. The level of their development is 0.000003%.

Promising areas for the development of the electric power industry include the development of the hydropotential of small rivers in high-mountain regions, as well as the restoration and construction of SHPPs.

There are about 270 rivers and 1000 small streams in Kyrgyzstan. Among the priority rivers proposed for development are the following rivers:

1. Chon-Kemin, Shamsi, Issyk-Ata, Alamedin, Ala-Archa, Sokuluk, Ak-Suu, Kara-Balta in *the Chui region*;
2. Uch-Koshoy, Karakol, Talas, Urmaral, Kurkuresuu in the Talas region;
3. Zhergalan, Turgen-Aksuu, Ak-Suu, Karakol, Arashan, Zhety-Oguz, Juuku, Ak-Sai, Akterek, Chon-Aksuu, Tyup, Sary-Jaz, Kuylyu, Inylchek, Akshiyrak in *the Issyk-Kul region*;
4. On-Archa, Kokgerty, Alabuka, At-Bashi, Kokomeren, Karakol, Suek, Jungal, Min-Kush, Juanaryk, Karakujur, Kochkor, Suusamyr, Keckerim in *the Naryn region*;
5. Karadarya, Tar, Kara-Kulja, Iasi, Sokh, Akbura, Isfaramsay, Shakhimardan, Khojabakirgan, Kyzyl-Suu, Aravansay, Karakol, Kurshab in *Osh region*;
6. Aflatun, Padshaat, Kara-Suu (right), Kara-Suu (Lev.), Tenteksay, Kugart, Mailuu-Suu, Chatkal, Chichkan, Uzunakhmat in *Jalal-Abad region*.

According to Kyrgyz scientists, it is possible to restore 39 previously functioning small hydroelectric power plants with a total capacity of 22 MW on these rivers and build about 100 new small hydroelectric power plants with a total capacity of about 200 MW in new sections.

Of all the small hydropower plants proposed for new construction, the most promising are 27 stations with a total capacity of 69 MW and an average annual output of 350 million kWh.

It is possible to build seven hydroelectric power plants with a total capacity of 74 MW at existing water facilities. The priority reservoirs are the Orto-Tokoy and Kara-Buura reservoirs on the Chu and Talas rivers.

Order No. 156 of the State Committee for Industry, Energy and Subsoil Use of the Kyrgyz Republic dated April 5, 2017 approved the List of promising alignments for the construction of SHPPs in the Kyrgyz Republic (130 alignments), which included 63 alignments for which research was carried out within the framework of the UNDP project "Development of Small Hydropower Plants".

The United Nations Development Programme (UNDP) and the United Nations Industrial Development Organization (UNIDO) have estimated that 87 to 92 new SHPP sites could be developed or rehabilitated. According to their estimates, the total installed capacity of these potential facilities is about 180 MW – at the same time, the average utilization factors of installed capacity are 63%, and the generation potential is about 1 billion kWh per year [5].

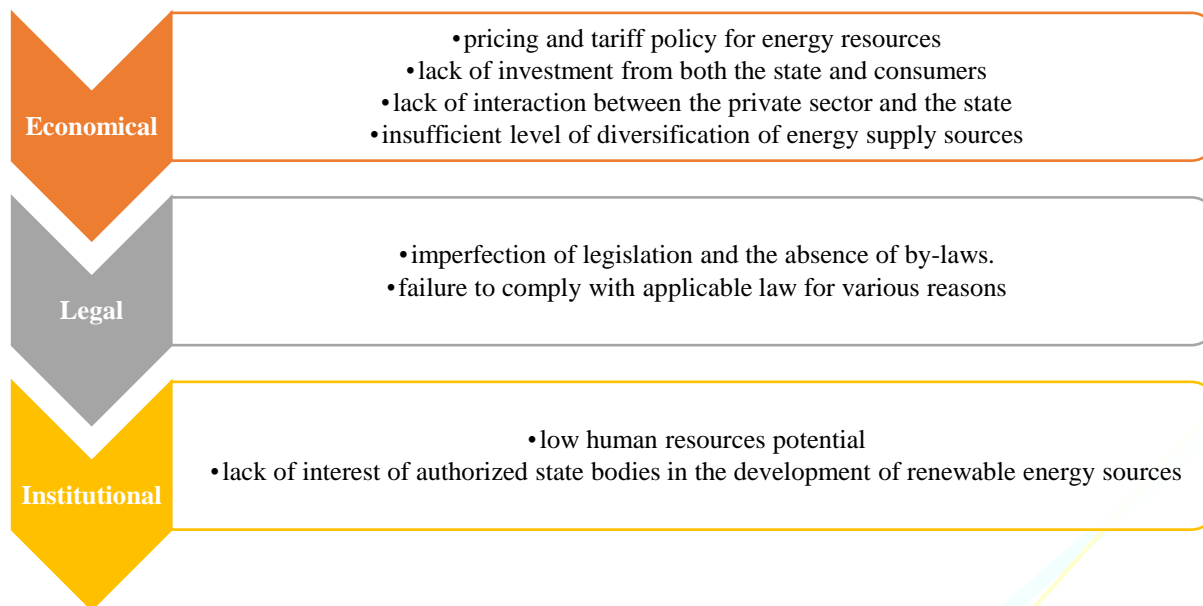
In addition to small hydropower, solar and wind energy are promising areas of development.

For the rational use of the high potential of *solar energy*, as well as *wind energy* in the Kyrgyz Republic, it is necessary to reassess them across the territory of the country's regions using modern advanced methods, including using the results of space surveys. The potential of geothermal sources is used mainly for health purposes in the sanatorium-resort areas of the country's regions. [5].

The analysis made it possible to identify the following problems and barriers to the use of the potential of renewable energy sources. 1.).



One of the main barriers was the socially-oriented tariff policy for electricity. The tariff for the population is subsidized and does not cover the costs of generating and delivering electricity to consumers. At the same time, these subsidies are used by the population consuming up to 700 kWh per month at 77 tyin per kWh, all segments of society, regardless of the welfare of the subscriber, because the law on the electric power industry prohibited the price form of discrimination. However, the Medium-Term Tariff Policy for Electricity and Heat sets a tariff for socially vulnerable segments of the population in the amount of 50 tyin per kWh. with a total cost of electricity of 160 tyin per kWh. A tariff of 5.04 soms per 1 kWh has been introduced for the rich segments of the population. without limiting their consumption.



**Figures 1.** *Problems and barriers to using the potential of renewable energy sources*

The transition to a sustainable energy system, in which various problems of the energy sector are solved through the use of a variety of renewable energy sources, requires favorable, carefully designed and effectively implemented procedures and regulatory conditions.

Uzbekistan and Kazakhstan, in particular, have made great strides in public management of renewable energy projects over the past decade, where governments have begun to pay special attention to reducing greenhouse gas (GHG) emissions.

For example, Uzbekistan's Nationally Determined Contribution (NDC) sets a target of reducing carbon intensity (emissions per unit of GDP) by 35% by 2030 compared to 2010 levels. To achieve the NDC goals, the Government took initial measures to develop renewable energy sources and in April 2020 approved a plan to expand generation for 2020-2030, which provides for the commissioning of about 15 GW of total generating capacity by 2030 (with an estimated investment value of USD 14.7 billion).

The first project of a solar power plant (SPP) of an independent electricity producer with a capacity of 100 MW in Navoi was developed within the framework of the Large-Scale Solar Program in Uzbekistan by the World Bank Group ("Scaling Solar"). Building on this success, the Government has entered into agreements with the All Bank Group to support the preparation of an additional 900 MW of solar power plants, as well as with ADB and the EBRD to support the preparation of an additional 1,000 MW solar power plants and 1,000 MW wind farms (WPPs) of an independent electricity producer, respectively. To date, the Government has signed agreements on the purchase of electricity for 2900 MW of solar power plants and wind farms of public-private partnership (PPP) projects, and another 1000 MW of projects are at the tender stage.





However, other Central Asian countries are on a par with the CD. In Turkmenistan, for example, the Decree of the President of Turkmenistan dated February 21, 2018 No. 674 State Program On Energy Saving for 2018-2024 was adopted. This state program provided for the selection of sites for the introduction of solar and wind energy infrastructure within Turkmenistan and the development of solar and wind inventories, as well as the assessment of solar and wind energy resources. Also, in accordance with the decree of the President of Turkmenistan from On April 12, 2019 No. 1207, within the framework of the adopted concept for the development of the Altyn-Asyr Turkmen Lake for 2019-2025, at the first stage, it is planned to build a solar and wind power plant with a capacity of 10 MW, in order to protect the environment and introduce environmentally friendly "green" technologies in the country.

An analysis of the successful experience of renewable energy development in neighboring countries showed that they widely use the auction method and implement PPP mechanisms for investors in the field of renewable energy.

The Law of the Kyrgyz Republic "On Public-Private Partnership in the Kyrgyz Republic" defines PPP as "long-term (up to fifty years) interaction between public and private partners on the involvement of a public partner of a private partner in the design, financing, construction, restoration, reconstruction of facilities, along with the management of existing or newly created facilities - including infrastructure."

The law allows the use of PPP for infrastructure facilities and/or services in the field of generation, transmission and distribution of electricity and heat. There is no prohibition in the PPP law on the use of PPP frameworks for the development of small hydropower.

When managing a renewable energy project, it is necessary to take into account the specifics of this industry, which is expressed in the support mechanisms defined in the country's legislation. To obtain it, it is necessary to meet certain criteria in order to be able to pass the competitive selection and get into the register of qualified renewable energy facilities. Only after that, in the conditions of modern realities, the project becomes viable.

In accordance with the National Development Program of the Kyrgyz Republic until 2026 [8], it is necessary to reduce the degree of dependence of the country on hydrocarbon energy sources. One of the acceptable solutions is a larger-scale development of hydropower and the transition to alternative energy, taking into account changes in the internal structure of energy consumption and technological modernization of the economy, especially climate change processes. This is a fundamental and complex task that requires a lot of effort and resources.

In the medium and long term, electricity consumption will grow. It is necessary to launch the process of designing, developing and launching SHPPs with guaranteed state purchase of electricity from small and medium-sized producers at mutually attractive tariffs and terms. The Cabinet of Ministers of the Kyrgyz Republic, together with local authorities, should resolve at the legislative level the issues of land allocation for hydropower projects. This will make it possible to put into operation generating facilities with a total capacity of 300-400 MW.

In addition, given that from a financial point of view, the energy sector is in a critical state and remains unattractive to investors, it is necessary to take a difficult but necessary step for the sustainability of the sector - a gradual increase in electricity tariffs.

At the same time, in the conditions of variability of renewable energy entities, it is necessary to work out the issue of differentiating tariffs by zones of the day in order to significantly reduce peak loads in the morning and evening maximums. For example, the current ratio of energy prices from various energy sources in Russia is such that during peak hours, fuel types of generation are profitable, and wind power plants and energy storage achieve grid parity. At the same time, small hydroelectric power plants and photovoltaic solar systems cannot compete with a centralized grid from a market point of view.

The commissioning of new capacities will simplify the connection to power grids and infrastructure and obtain the necessary technical conditions. In the context of growing electricity





consumption and the number of new subscribers, a favorable condition for the placement of mining farms is their location in close proximity to renewable energy entities. This will also affect the reduction of electricity losses during transportation.

As Kyrgyzstan seeks to achieve a more diversified structure of generating capacity, one of the priority areas of work should be zoning for photovoltaic solar and wind generation projects.

Renewable energy zones can be defined as potential areas with high-quality resources, where the deployment of new renewable energy systems is economically and environmentally feasible. These zones meet various criteria, including proximity to power grid infrastructure, load centers, highway networks and other power generation projects. Implementation of zoning can contribute to future planning, goal setting, and the development of policy instruments.

In this regard, within the framework of the USAID project, work is underway to develop a map of renewable energy sources. Zones for solar and wind potential have been preliminarily identified and work is underway on the possibility of connecting to power grids and the availability of transport infrastructure.

Initially, 41 zones for the sun and 27 zones for the wind were identified, of which zones with the lowest costs for the implementation of renewable energy projects were also identified. Currently, the issues of connection to electrical networks and the availability of transport infrastructure in selected areas are being worked out.

It should be noted that with the involvement of solar power plants and solar power plants in the country's fuel and energy balance, the problem of maintaining stability in the Central Asian Unified Energy System (UES CA) may turn out to be the main obstacle to their large-scale integration.

In recent years, with the widespread development of renewable energy sources in neighboring countries, the situation with electricity imbalances in the UES CA has worsened, and on January 25, 2022, the largest systemic accident occurred in the UES CA in its entire history of operation.

CDC "Energiya" has repeatedly noted that the imbalances created by changeable and intermittent renewable energy sources increase the likelihood of large uncompensated overflows on the North-South transit of Kazakhstan by several orders of magnitude.

The existing imbalances, which are significantly increasing with the introduction of renewable energy sources, are due to the fact that regulatory systems in national energy systems do not have time to react to disturbances earlier than primary and secondary regulation stations in Russia.

If effective measures are not taken, such imbalances will occur every day, which casts doubt on the possibility of fully ensuring the stability of parallel operation of power systems.

If the impact of the variability of renewable energy sources in Uzbekistan and Kazakhstan is more or less solved by maintaining hot reserves at power units and with the help of storage devices, then the problem of intermittency inherent in solar stations has its own characteristics. It is not possible to solve this problem at the expense of mobile gas stations, for example, gas turbines or gas piston stations, even in such a gas-rich country as Uzbekistan. The problem with replacing the solar power that disappears in the evening is not due to the lack of generating capacity in the power system, but to restrictions on the speed of power gain at gas stations due to the underdevelopment of the country's gas transmission system.

Currently, there are not enough reserves in the energy system of Kyrgyzstan, about 150-200 MW. The authorities of the Kyrgyz Republic, in addition to the implementation of hydropower projects, are talking about the construction of a gas-fired thermal power plant with the support of the Russian Federation with a capacity of 600 MW. However, given that there are practically no industrial volumes of gas in Kyrgyzstan, and its supplies from abroad will be expensive and with an unpredictable price in the long term, the construction of this thermal power plant is fraught with serious risks.

To increase the maneuverability reserves in the UES CA, it is necessary to create an International Water and Energy Consortium with the joint construction of the Kambarata HPP-1 and Rogun HPP





countries, as well as, taking into account the decrease in water resources in the region, pumped storage stations (PSPPs), which will help reduce imbalances from renewable energy sources.

At the country level, it is necessary to develop Network Codes that provide for the development and maintenance of the parameters of electric grids with the wide involvement of variable renewable energy sources. Such work is already underway in Uzbekistan and Kazakhstan.

In recent years, the Ministry of Energy of the Kyrgyz Republic, with the support of international projects and the expert community, has been working to improve the regulatory framework in the field of the use and development of renewable energy sources. Recent developments in this area include:

**1.** *On June 30, 2022, the new Law of the Kyrgyz Republic "On Renewable Energy Sources" came into force.*

The objectives of the Law are the development and use of renewable energy sources, the improvement of the energy structure, the diversification of energy resources, the improvement of the social situation of the population, ensuring the energy security of the Kyrgyz Republic, environmental protection and sustainable economic development.

**2.** *In order to create equal conditions and mechanisms for the commissioning of renewable energy facilities, the issue of acceptance of completed construction of renewable energy facilities and their further connection to the national electric networks of energy companies has been resolved, that is, a unified approach and the same acceptance procedure have been chosen, in accordance with the Regulation "On the procedure for issuing documents for the design, construction and other changes to real estate objects and assessing the conformity of completed construction of facilities in the Kyrgyz Republic", approved by the Resolution of the Cabinet of Ministers of the Kyrgyz Republic dated August 6, 2021 No. 114.*

**3.** *The Resolution of the Cabinet of Ministers of the Kyrgyz Republic dated October 4, 2021 No. 196 "On approval of the List of specialized goods and equipment intended for the construction of power plants based on the use of renewable energy sources subject to exemption from VAT when imported into the territory of the Kyrgyz Republic" was adopted.*

**4.** *In order to regulate relations arising in the process of technological connection of generating sources, electrical networks of electricity distribution organizations and electrical installations of consumers to electric networks, and to determine the sequence of actions in the implementation of technological connection, Resolution No. 169 of March 29, 2018 approved the Rules for technological connection of generating sources, electric networks of electricity distribution organizations and electrical installations of consumers to electrical networks.*

*According to the National Development Strategy of the Kyrgyz Republic for 2018-2040. In the structure of the electricity balance, the share of renewable energy sources is projected to be at least 1.0%, and taking into account the construction of large hydroelectric power plants - up to 90%, which will contribute to the reduction of greenhouse gas emissions and not contribute to a temperature increase of more than 2 degrees Celsius.*

The assessment of readiness for the development of renewable energy sources is a multi-stakeholder process carried out under the leadership of the country, and includes the study of key conditions for the development of renewable energy sources and the development of short-term and medium-term actions and recommendations to improve the country's preparedness and overcome existing barriers by creating an enabling environment conducive to investment in the development of renewable energy sources. The process of assessing renewable energy sources is based on a multi-stakeholder consultative process, where the development of an institutional and regulatory framework that meets modern requirements is crucial.





## Discussion

In order to discuss and test the results of the study, an anonymous survey of specialists in the field of energy and renewable energy in particular was conducted. 90% of respondents confirmed our theses on the need for widespread involvement of renewable energy sources in the country's fuel and energy balance to meet the growing needs of the economy and the population. Respondents noted that the development of energy capacities using renewable energy sources for remote areas, mountainous and rural areas, industrial complexes and mining enterprises that do not have centralized power supply, road maintenance services, tourism and cultural heritage facilities, medical institutions, etc., is of particular importance.

Respondents endorsed our findings on the effectiveness of PPP mechanisms in the implementation of renewable energy projects to remove existing barriers.

Respondents presented the following recommendations for improving the state management of renewable energy projects in the Kyrgyz Republic:

1. A separate state body is needed, in which all the necessary departments will be concentrated to obtain all the necessary documents for the construction and generation of electricity by renewable energy entities. The authorized body in the field of renewable energy must independently prepare permits for the right to build renewable energy entities.

2. Renewable energy facilities should be located in close proximity to large consumers in hard-to-reach places.

3. The total volume of electricity generation from renewable energy sources should not exceed 18-20% of the volume of traditional generation in order to avoid difficulties with power regulation.

4. The costs of purchasing electricity from renewable energy sources should not be borne by distribution companies, but compensated from the republican budget. There is a need for state support for the purchase of electricity from renewable energy sources and open and accessible mechanisms for regulating renewable energy sources.

5. It is necessary to introduce the practice of building "smart" cities and villages with providing them with autonomous power supply through "clean" renewable energy sources to improve the investment climate.

6. It is necessary to develop and implement preferential lending services for renewable energy entities in the banking sector, as well as to stimulate PPP participants by simplifying the procedures for concluding contracts.

7. As a state partner for the implementation of SHPP construction projects, it is necessary to attract a state-owned company that will deal with land allocation procedures and preparation of the project for the PPP competition.

## Conclusion

The paper examines the development of renewable energy in the Kyrgyz Republic.

The implementation of measures for more intensive use of practically inexhaustible renewable energy sources will make a great contribution to the further development of energy supply, will significantly reduce the tension of the fuel and energy balance by reducing the share of consumption of fossil fuels (natural gas, fuel oil and coal), which is so necessary for other sectors of the national economy.

It should be noted that if the use of renewable energy sources in industrialized countries is determined mainly by environmental issues and the requirements for finding additional energy resources, then for Kyrgyzstan the use of renewable energy sources should be considered as a solution, first of all, to the socio-economic problems of the rural population.



It is the understanding that the large-scale use of renewable energy sources in rural areas can contribute to solving problems such as poverty, unemployment, the development of medium and small businesses, solving the issues of migration of the rural population to cities, increasing the yield of agricultural land, introducing the population to modern innovative technologies, and of course, solving issues of environmental protection and energy supply of autonomous consumers. Such a formulation of the question will make it possible to find a response both in international financial organizations and various funds that provide support for these technologies and, thereby, to carry out the inflow of funds to the Republic for the implementation of projects in the field of renewable energy.

Well-known studies of the issues of wide involvement of renewable energy sources in the fuel and energy balance of the country in the Kyrgyz Republic are mainly devoted to the analysis of technical and economic aspects, regulatory legal and institutional framework [2, 3, 5], as well as studies by foreign authors are devoted to the indicative and economic assessment of the introduction of renewable energy sources [6-8], features and prospects for the development of certain types of renewable energy sources in states [9-13].

Thus, in the well-known literature, the issue of the development of renewable energy in the Kyrgyz Republic, taking into account all aspects, has not been studied deeply enough. The scientific increment of the results of this study is to find clear dependencies between the implementation of specific mechanisms for the development and stimulation of renewable energy sources, widely used in other countries, and their direct widespread implementation in the Kyrgyz Republic.

Taking into account the experience of many countries, PPP projects in the Kyrgyz Republic can use private financing to distribute project costs over many years when the Government does not have enough budget funds to implement the project at the moment. The Government of the Kyrgyz Republic does not have sufficient human and financial capacity to provide and manage all the necessary infrastructure and services. Thus, the development of PPP is possible and, moreover, necessary for the Kyrgyz Republic. Partnership between business and the state can become an important tool for developing the country's economy and improving the quality of life of the population.

It is advisable that now the state authorities begin work on the definition of a pilot PPP project in the field of renewable energy, the model of which, if successful, can be applied to any subsequent PPP projects. The pilot project should be developed taking into account the experience of other countries and preferably be medium in terms of funding, achievable, in terms of results, and commercially viable for the business in order to increase its motivation to participate in future PPP projects.

### **Ethical Declaration**

During the writing process of the study "*Development of Renewable Energy Sources in the Kyrgyz Republic: Current Status, Problems And Prospects*" scientific rules, ethical and citation rules were followed. No falsification was made on the collected data and this study was not sent to any other academic publication medium for evaluation.

### **Statement of Contribution Rate of Researchers**

The contribution rates of the authors in the study are equal.

### **Declaration of Conflict**

There is no potential conflict of interest in the study.





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