

## ANALYSIS OF THE USE OF RENEWABLE ENERGY SOURCES IN KAZAKHSTAN AND FOREIGN COUNTRIES

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In this article, research and analysis of comparative indicators of the use of renewable energy sources in Kazakhstan and foreign countries, as well as the identification of methods for effective use and prospects for the development of non-traditional energy sources in the Republic of Kazakhstan. Renewable energy sources (RES) have been positioned by Kazakhstan in recent years as one of the vectors for the development of the energy complex. This is evidenced by increased attention to the process of their implementation by the state and a number of business structures. However, the formation of a sustainable RES complex in Kazakhstan causes significant financial and technological infusions with the direct participation of the state, without which renewable energy will remain virtually zero. The research was based on the following general scientific methods: abstract-logical, computational-constructive, forecasting, and generalization. Priority directions for the use of renewable energy sources and implementation of energy conservation policies have been established.

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**Keywords:** investment, renewable energy sources, energy stability, non-traditional energy sources, energy saving

The electric power industry, being one of the basic branches of the economy, plays an important role in the political, economic and social spheres of any state. In the next ten years, serious structural and technological changes are coming in the world electric power sector, which will be accompanied by unprecedented investments in the development of renewable energy technologies and effective energy saving policies [1].

### Purpose of the study

The purpose of the study was to develop priority areas for the use of renewable energy sources.

### Materials and methods of research

Theoretical and experimental methods of research are used in the work. The research was based on the following general scientific methods: abstract-logical, computational-constructive, forecasting and generalization. Experimental studies were conducted in the production conditions of renewable energy sources.

### Results of the study and their discussion

World production of electricity is about 13.5 trillion. KWh. Most of the world's electricity production falls on a small group of countries, including the United States (3.6 billion kWh), Japan (930), China (900), Russia (845), Canada, Germany, France (about 500 billion kW / h).

The gap in electricity production between developed and developing countries is great: developed countries account for about 65 % of all output, developing – 22 %, transition countries – 13 %.

In general, more than 60 % of all electricity in the world is generated by thermal power plants (TPPs), about 20 % by hydroelectric

power stations (HPPs), about 17 % by nuclear power plants (NPPs) and about 1 % by geothermal, tidal, solar, Wind power stations. However, in this respect, there are great differences in the countries of the world.

For example, in Norway, Brazil, Canada and New Zealand, almost all electricity is generated at the HPP. In Poland, the Netherlands and South Africa, on the contrary, almost all power generation is provided by thermal power plants, and in France, Sweden, Belgium, Switzerland, Finland, and the Republic of Korea, electricity is mainly based on nuclear power plants.

One of the priority areas for the development of the electric power industry and the solution of environmental problems in the world is the use of renewable energy resources.

In recent years, alternative energy has become the subject of intense interest and bitter discussions. Under the threat of climate change and the fact that average world temperatures continue to grow every year, the desire to find forms of energy that will reduce dependence on fossil fuels, coal and other environmental polluting processes naturally grew.

While most of the concepts of alternative energy are not new, only in the last few decades this issue has become topical. Thanks to improvements in technology and production, the cost of most forms of alternative energy was lowered, while efficiency was growing.

At present, alternative energy is still not developed rapidly. But this picture is rapidly changing under the influence of processes of political pressure, worldwide environmental disasters (droughts, famine, floods) and improvements in renewable energy technologies.

Some countries have become leaders in the development of alternative energy (Table 1).

Table 1

## TOP-10 Leading Countries in the Production of Alternative Energy

№	countries	From the Sible sources of bln kW / hr	share, %				
			hydro Electro energy	Wind	Bio fuel	Sun, wave and tidal energy	Geothermal energy
1	China	800	87	9	4	-	-
2	USA	527	61	23	13	-	3
3	Brasil	459	92	1	7	-	-
4	Canada	398	93	5	2	-	-
5	Russia	168	98	-	2	-	-
6	India	160	14	37	36	13	-
7	Germany	126	99	-	1	-	-
8	Norway	121	81	16	2	1	-
9	Japan	116	71	4	20	3	2
10	Spain	87	39	45	6	10	-

Table 2

## Investments in RES projects, (\$ bn)

	2012	2013	2014	2015	Overall
RES	238	210	247	266	961
Hydrocarbon energy	129	100	125	130	484
Hydroelectric power station	33	33	46,3	42,8	155
Nuclear energy	12	13	17	20	62

One of the most important factors affecting the development of alternative energy in the world, including in Kazakhstan, is investment.

China officially became the world leader in the use of alternative energy sources. Only in the first half of 2016, China installed 20 GW of new capacity for the processing of solar energy, for the entire 2015-about 45 GW. As for the wind, in 2015 China introduced about 145 GW. Slightly less capacity to obtain alternative energy was introduced by the United States, Germany, India, Spain. In 2015, the amount of funds allocated by the Chinese government for the development and installation of renewable energy sources exceeded the US investments (\$ 44.1 billion) and European countries (\$ 48.8 billion) combined [2].

The volume of investments in the development of renewable energy sources is growing in the world. In 2015, alternative energy projects created more than half (53.6%) of the new generation capacity in the world, according to the Ranking.kz analytical service.

Investments in renewable energy (RES) projects amount to \$ 266 billion, while in hydrocarbon projects only \$ 130 billion (Table 2).

Global investment in R & D research and development amounted to almost \$ 1 trillion over four years (2012-2015). During the same period, investments in fossil fuels (oil, gas, coal) amounted to only 484 billion dollars, which is 2 times less than investments in RES.

Against the backdrop of post-crisis stagnation in the world economy, investments in the development of renewable energy are growing, and for 4 years they exceed investments in other energy sources by 2 or more times. Including in 2015, the growth was 5%, or \$ 20 billion to the level of the previous year, according to a report by Bloomberg New Energy Finance (BNEF).

For the first time in 2015, RES (excluding HPPs) created more than half (53.6%) of all new power generation capacity (Table 3). A huge flow of investment has made it possible to achieve such indicators, and growth is everywhere.

In Kazakhstan, too, there is a shift in the field of renewable energy sources, for the period from the beginning of 2015 to the second quarter of 2016 installed capacity increased by 42% to 252.3 MW. In Kazakhstan, at the end of the second quarter of 2016, RES enterprises were commissioned at 252.3 mW.

**Table 3**

Renewable sources of electricity and capacity production in the form of a share from the global market, %

	2007	2008	2009	2010	2011	2012	2013	2014	2015
The share of renewable energy sources from the world electricity production (net)	19,5	27,3	41,7	31,6	39,8	48,6	40,2	49,0	53,6
The share of renewable energy sources from global capacity	7,5	8,2	9,2	10,2	11,4	12,7	13,8	15,2	16,2
The share of renewable energy sources from the world production of electricity	5,2	5,3	5,9	6,1	6,9	7,8	8,5	9,1	10,3

**Table 4**

General generating capacities in the world electric power industry and RK

	World	Kazakhstan
RES	134	0,2357
Coal	42	0,0500
Natural gas	40	0,1000
Hydroelectric power station	22	0,1500
Nuclear energy	15	0,0000

**Table 5**

Dynamics of renewable energy shares in the total electricity consumption in the Republic of Kazakhstan

Indicator	Unit of measurement	Years							
		2008	2009	2010	2011	2012	2013	2014	2015
Share of renewable energy in total electricity consumption	%	0,39	0,48	0,48	0,48	0,5	0,56	0,6	1,0

Electricity production for this period increased by 204% to 250.6 million kW / h. In Kazakhstan, the total generating capacity in 2015 was 0.2357 GW (0.17% of the world's generating capacity) (Table 4).

The share of electricity production from the energy producing organizations using renewable energy in the total volume of electricity production in the Republic of Kazakhstan is 1.21 % for the second quarter of 2016. In 2015, the amount of input of generating capacities (in GW) in the Republic of Kazakhstan amounted to 44 % of the total volume of input of generating capacities in the republic.

In his message to the people of the RK "Kazakhstan-2050 Strategy", President Nursultan Nazarbayev, as one of the main tasks facing the society, has set the task of developing alternative and renewable energy production, which will ensure by 2050 not less than half of total energy consumption [1].

The dynamics of the share of electricity produced by RES in the total amount of electricity consumption is shown in Table 5.

As can be seen from Table 5, the share of RES in the total amount of electricity consumption for the period from 2008 to 2015 increased by almost 2.56 times.

In accordance with the Strategic Development Plan of the Republic of Kazakhstan until 2020, the share of alternative energy sources in the total energy consumption should reach at least 3 % by 2020 [3]. For comparison, the share of alternative energy sources in the total electricity consumption in EU countries is 20 %, in Russia – 4.5 %.

The increase in the share of renewable energy use in Kazakhstan as a whole up to 20–30 % of the total energy balance, and subsequently the increase in this indicator, could play a huge role in the full exhaustion of mineral resources.

Table 6

The list of wind farms, according to the Plan for 2013-2020

№	Name of event	Terms of implementation	Estimated costs, mln. USD
1	Construction of SES in Kapchagai Almaty region with a capacity of 2 MW	2014	11,33
2	Construction of a SES in the Zhambyl region of the Zhambyl region with a capacity of 24 MW	2015	57,67
3	Construction of a SES in the Kyzylorda region with a capacity of 50 MW	2017	96,80
4	The project for the introduction of clean ecological energy using the solar photovoltaic system in the Republic of Kazakhstan	2014	10,00
	Overall		176,00

By the decree of the Head of the state N. Nazarbayev "Concept of the transition of the Republic of Kazakhstan to the green economy" was approved, in which the development of RES is considered as one of the effective mechanisms for the formation of the "green" economy [4]. For the development of RES based on the best practices of developed countries, the Law "On Amendments and Additions to Some Legislative Acts of the Republic of Kazakhstan on Support and Use of Renewable Energy Sources" was adopted [5]. It provides support for both investors and consumers. The law provides for the allocation of rural areas for the construction of renewable energy facilities, the need to develop fixed tariffs, create a clearing and financial center, and provide targeted assistance.

For the successful development of renewable energy, the state will reimburse 50 percent of the costs of an unauthorized user who is not connected to electric grids, for purchasing renewable energy sources of no more than 5 kW. This state measure will give impetus to the increase in the number of renewable energy sources in Kazakhstan and will protect the market of domestic energy producers. It will support users living in rural areas and rural commodity producers. This will contribute to the development of rural areas and will ensure broad user access to electricity. The law will also create conditions for the sale by autonomous users of surplus electrical energy generated from RES in the public network.

Wind, solar and etheric energies are perfectly ecological, as they do not pollute the environment at all. In addition, with proper organization, solar power plants can improve the insolation balance of the surface under arid re-insolation in the south, and thereby create a microclimate for more efficient agricultural land

use. The ether energy has unlimited resources and is anti-entropic, fundamentally improving microclimatic parameters. Despite serious resistance on the part of academic circles, nuclear scientists and oil producers, in Kazakhstan, as well as in other countries, developments are being made in the field of etheric energy, that is, the extraction of energy from space air. There are successful examples of the realization of cold nuclear reactions using gravity and similar physical phenomena.

By 2020, it is planned to commission about 31 renewable energy sources with a total installed capacity of 1040 MW, including: 4 SES – 77 MW (Table 6) [6].

### Conclusions

Ensuring energy and environmental efficiency are priority areas for the development of Kazakhstan, expanding the use of renewable energy is one of the ways the country moves in this direction. One of the main functions of renewable energy sources should be energy supply to consumers in areas with low energy density. Renewable energy should become a key factor in the development of remote regions of the country. The development of renewable energy in Kazakhstan requires a number of measures to support this activity, including:

- it is planned to work out the issues related to the support of renewable energy sources, including: reservation and priority in the provision of land for the construction of renewable energy sources;

- Obligations of the energy transmission organizations on the purchase of electricity produced using renewable energy sources;

- release of renewable energy sources from payment for transport of electricity through networks; Support for the connection of facilities for

the use of renewable energy sources to the networks of the energy transmission organization.

In conclusion, it should be noted that significant reserves of energy resources will help Kazakhstan to ensure further economic development. Today, the republic, which already has a strong oil and gas sector, is expanding the range of tasks in the energy sector, including the development of nuclear and green energy.

#### References

1. Message of the President of the Republic of Kazakhstan-Leader of the Nation N. Nazarbayev to the people of Kazakhstan Strategy "Kazakhstan-2050": a new political course of the held state" dated December 14, 2012.
2. Global Report on the Status of Alternative Energy in 2016, prepared by REN 21 – World Network on Energy Policy of the 21st Century.
3. Strategic plan for the development of the Republic of Kazakhstan until 2020, approved by the Decree of the President of the Republic of Kazakhstan dated February 1, 2010 No. 922.
4. The concept of the transition of the Republic of Kazakhstan to the "green economy", approved by the Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577.
5. Law of the Republic of Kazakhstan of July 4, 2013 No. 128-V "On introducing changes and amendments to some legislative acts of the Republic of Kazakhstan on issues related to support of the use of renewable energy sources".
6. Akopyants G. "Development of the Republic of Kazakhstan's Electric Power Industry for the Future to 2030" // [kazen-ergy.com/en / 1-2008 / 940-elektronergy.html](http://kazen-ergy.com/en/1-2008/940-elektronergy.html).