

«Use of clean, renewable and / or alternative energy technologies for rural areas in Kazakhstan»

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Part 1

Introduction

Improvement of power supply efficiency to consumers in rural and remote areas by providing access to energy services and introduction of advanced technologies in the field of renewable sources of energy

Lack of access to clean, reasonable and reliable sources of energy restrains social and economic development and is a major obstacle to achieving the goals of the Millennium Declaration adopted by United Nations General Assembly on September 8, 2000.

According to the UN, more than three billion people in developing countries are still using traditional biomass and coal as the main source of energy for cooking and heating, and almost half a billion people have no access to electricity. Moreover, even in those cases where energy services are available, millions of poor people are unable to pay for them. Meanwhile, the demand for energy in developing countries has increased. Increasing growth of population and rising standards of living will increase even more the scale of the problem. If universal access to electricity is provided up to 2 million people could be saved annually.

According to UNDP [1] a fifth of the world's population living in countries with the highest income, or "golden billion" consumes 58% of the world's sources of energy, 65% of electricity. Wherein, it accounts for over 53% of total emissions of carbon dioxide.

As you know, energy largely determines the socio-economic development in each country. At the same time, it exacerbates the problem of energy reserves and exacerbates irreversible anthropogenic impact on the environment.

Energy and sustainable development are inextricably linked. Undoubtedly, to eradicate poverty can be achieved through providing energy access. In April 2010, the Advisory Group UN Secretary-General for Energy and Climate Change under the chairmanship of Mr. K. Yumkella urged the international community to ensure universal access to modern energy services and reduce power consumption by 40 percent by 2030.

At the Vienna Energy Forum, held on the 21-23 of June 2011, it was noted [2] that the lack of affordable, reliable energy services is a major obstacle to social and economic development. The forum also noted that without access to modern forms of energy it is almost impossible to achieve the goals of the Millennium Declaration, adopted by 189 nations and signed by 147 heads of states and governments during the UN Millennium Summit in September 2000. There are already successful examples of how the government of several countries have increased the population's access to modern and reliable forms of energy.

In addition, it should be noted that the use of renewable energy has become one of the fastest growing areas in economy of industrialized countries. Increasing the share of renewable sources of energy in the fuel and energy balances of these countries has become one of the trends of their modern economic development, determining its stability. According to Eurostat, in 2004 7.9% of the electricity was obtained from renewable sources of energy in the European Union (EU), and in 2011 this indicator has already been 13%. According to the International Energy Agency (IEA), power generation from renewable energy sources is annually growing by 10-20% in the leading EU countries.

Taking into consideration all these facts, UN Secretary-General Ban Ki-moon in 2011 launched a global initiative "Sustainable Energy for All", which provides the solution of three interrelated tasks by 2030:

- ensuring universal access to modern sources of energy,
- doubling the level of energy efficiency,
- doubling the share of renewable energy in global energy balance.

These three tasks identified by Ban Ki-moon, complement each other. Increased availability based on the use of renewable energy technologies, allows supplying electricity to rural areas, where setting up conventional power lines is unacceptable and very expensive.

Today, electricity is a major integrating factor for all industries in all countries. The international community expects electricity to be available to everyone and the technologies of energy generation to be clean and efficient. It is a matter of justice, and its importance was the motivation for the development of the UN Secretary-General's initiative "Sustainable Energy for All".

Ban Ki-moon stressed that sustainable energy is necessary to promote sustainable development in order to reduce poverty and change the climate. "We encourage others to follow these examples and build commitments" - said Ban Ki-moon.

The report of the IEA World Energy Outlook 2011 states that timely investments in sustainable power engineering pay off: every dollar invested in the energy sector until 2020, will provide an opportunity after 2020 to avoid the costs amounting to \$ 4.30 to compensate for the increase emission levels. In addition, the access at least at the basic level of energy supply has minimal impact on greenhouse gas emissions.

United Nations General Assembly in recognition of the importance of energy for sustainable development proclaimed 2012 the International Year of Sustainable Energy for All. During this year, the entire world community had the opportunity to raise awareness of the importance of increasing sustainable access to sources of energy, energy efficiency and renewable energy at local, national, regional and international levels. On the 21 of December, 2012 the UN General Assembly at its sixty-seventh session, decided to declare 2014-2024 the Decade of Sustainable Energy for All in relation to all sources of energy [3].

The General Assembly noted that wider use and promotion of new and renewable sources of energy for sustainable development could make a significant contribution to sustainable development and the achievement of internationally agreed development goals, including those contained in the Millennium Declaration. The General Assembly has called on UN member states to intensify efforts to ensure universal access to modern services in the field of sustainable energy. Ensuring universal access to modern energy services and the use of renewable energy sources is determined by not only the main tasks of Sustainable Energy for All, but global security.

The Republic of Kazakhstan faces the task put forward by the President Nursultan Nazarbayev to join the top list of the 30 most developed countries of the world. This means that the country must use advanced technologies and actively participate in global international programs, one of which is a UN initiative "Sustainable Energy for All". Therefore, Kazakhstan supports the UN initiative "Sustainable Energy for All"; within the Eurasian Economic Union, the country pursues a coordinated energy policy aimed at the efficient use of energy resources, non-discriminatory access to transport systems and formation of a common energy market, as well as development of renewable energy sources [4].

Therefore, on April 25, 2014 the UN Economic Commission for Europe and the Electric Power Council of the Commonwealth of Independent States signed a memorandum of understanding in the field of sustainable energy, including issues of energy efficiency, renewable energy, environmental protection and other agreed areas [5].

It should be noted that the CIS countries carry out considerable work on cooperation in the area of access to energy services, energy efficiency, energy

saving, and promotion of renewable energy sources [6]. So even on October 7, 2002 the CIS countries signed the "Agreement on cooperation of CIS countries in the field of energy efficiency and energy saving". The task to form the interstate energy saving policy, through joint action, in particular in the development of technologies for renewable energy is stated in Article 1 of this document. Moreover, constant scaling up of involvement in the energy balance of renewable energy and alternative fuels is in Article 3 of the document.

The strategy (main directions) of interaction and cooperation of CIS countries in the field of electric power for the period up to 2020 was approved on May 26, 2005.

The CIS Economic Development Strategy for the period up to 2020 (approved by the Council of Heads of CIS of 14 November 2008) was concluded in 2008. This document provided for deeper cooperation in the energy sector in order to optimize the use of energy resources and the development of alternative energy sources including alternative and renewable sources.

The Council of the CIS Heads of Government approved the Concept of Cooperation of the CIS countries in the field of energy on November 20, 2009. The Concept is a set of coordinated views and approaches of CIS countries to cooperate in the energy sector. It defines the aims, the main objectives, principles, mechanisms and basic directions of cooperation of CIS countries in this area. The Concept identified the use of renewable energy as one of the priority lines of cooperation between countries of the Commonwealth.

The CIS Economic Council decision on the implementation of the Plan of priority measures to implement the concept of cooperation of CIS countries in the field of energy was signed on September 23, 2011.

The process of formation of the legal framework and institution building in order to expand the use of renewable energy and alternative fuels is going on in the CIS countries. The organization of regulatory support development for renewable energy development in the CIS countries enters into the final stage. This step is characterized by the development of a concept draft of cooperation of CIS countries in the field of renewable energy and the plan draft of priority measures for its implementation.

It should also be noted that the concept of the "Strategy of Sustainable Energy Future of Kazakhstan until 2050" is developed in Kazakhstan [7]. The purpose of this project is to consolidate Kazakhstan's initiatives in the field of sustainable energy for the country's transition to a "green economy", to demonstrate the country's commitment to the energy of the future at EXPO-2017.

Thus, this project is Kazakhstan's contribution to the implementation of the UN initiative "Sustainable Energy for All" (SEFA). Developers of the "Strategy of future sustainable energy of Kazakhstan until 2050" held a series of meetings with the UN Secretariat and the Office of the UN Secretary General staff. It resulted in approving the decision of Kazakhstan to develop a national energy strategy [8]. The UN Secretariat approved the concept of «Strategies for Sustainable Energy Future Kazakhstan until 2050». The developed strategy, as noted by representatives of the Secretariat, "is fully consistent with the outcome document of RIO + 20 "The future we want", as well as the objectives of the SEFA initiative up to 2030: universal access to modern energy sources, doubling the share of renewable energy, and doubling energy efficiency. Some recommendations for the promotion and implementation of Kazakhstan's strategy were delivered following the meetings [8].

Moreover, a concept draft of "Strategy of Sustainable Energy Future of Kazakhstan until 2050" was reviewed and discussed on the session "Strategies for sustainable energy future of Kazakhstan" in the framework of the VI Astana Economic Forum in 2013.

Part 2

Power industry in Kazakhstan

When considering sustainable energy it is necessary to analyze the possibility of transporting electric energy to all regions of the country in terms of availability of electricity in all regions for all consumer groups over the forecast period.

Power industry is an important component of fuel and energy complexes (FEC) in Kazakhstan. Power generation sector in Kazakhstan is presented by 64 power plants of different ownership with total installed capacity of 19,127 MW and available capacity of 14,821 MW [9] including: thermal power plants - 88%, and hydroelectric power stations of about 12%. Hydropower is the second source of energy in the fuel balance of power industry after coal only. About 75% of the electricity are generated in Kazakhstan from coal, 12.3% - from hydro sources, 10.1% - from gas and 4.9% - from oil. Thus, four basic types of power plants produce more than 99% of electricity, and alternative sources account for less than 1%. Thermal stations generated almost 90% of all electricity produced in Kazakhstan in 2010. Seventy percent of electricity are produced in the Northern zone of Kazakhstan.

Table 1. Generation and consumption of electricity in the Republic of Kazakhstan in 1990-2020

	2009 fact	2010 fact	2011 fact	2012 fact	2013 fact	2014	2015	2020
Power consumption (bln kWh)	77,96	83,7	88,1	89,52	93,18	96,84	100,5	116
Power generation (bln kWh)	78,43	82,3	85,81	90,53	91,9	97,91	103,46	120,2
Providing electricity by own sources (%)	98,2	98,3	95,8	99,87	99,92	99,85	100	100

It should be noted that prior to the beginning of the current decade Kazakhstan electricity balance remained in deficit: the volume of imports was 37% of total consumption (Figure 1). Only in 2002, the import of electricity for the first time no longer exceed its exports.

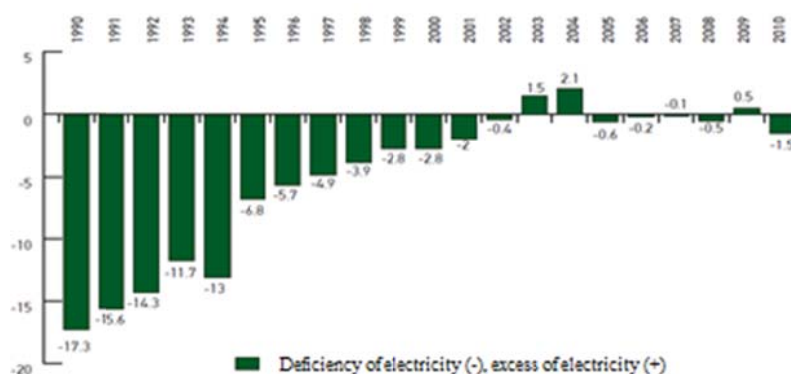


Figure 1. Deficiency, excess of electricity in 1990-2010. [10].

Source: data from the Agency for Statistics, KOREM, KEGOC

Nowadays new market relations are created in the energy sector of the Republic of Kazakhstan. Restructuring is completed in the electricity sector: almost 100% of the generating units at the national level have been privatized or are managed by private companies. National Grid and open competitive electricity market were created in the republic.

Unified Power System (UES) of Kazakhstan works in parallel with the power system of Russia and the united energy system of Central Asia.

Kazakhstan UES is located in the center of a four-beam star with directions to the Urals, Siberia, Omsk and Central Asia. Kazakhstan UES is actually not uniform throughout the country and due to its geographical location, is divided into three zones: Northern, Southern and Western, the Western Zone being divided into two parts (Aktobe and Uralsk, Atyrau and Mangystau) that are not related to each other and with Kazakhstan UES power grid through its territory.

Akmola, Eastern Kazakhstan, Karaganda and Pavlodar region are included into the Northern zone. Coal deposits and key generation stations of Kazakhstan are concentrated there. This area is not only self-sufficient in electricity, but also has a surplus, which is offered for the domestic market or for export to Russia.

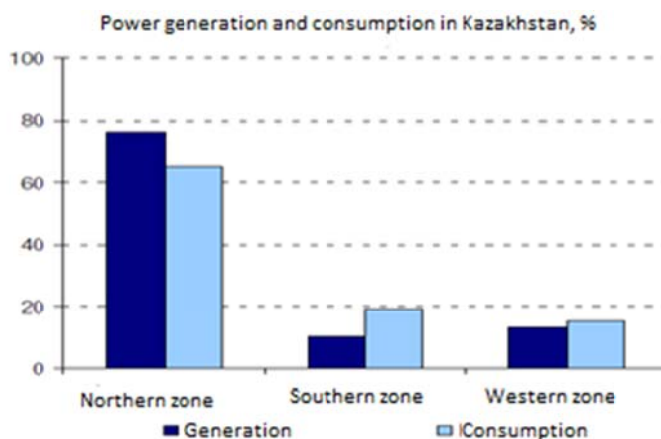


Figure 2. Power generation and consumption in different zones in Kazakhstan [10].

Almaty, Zhambyl, Kyzylorda, South Kazakhstan regions, as well as the Almaty city and Baikonur region are included in the southern zone. Southern zone energy balance has a deficit due to the lack of available and consequently, sufficient own primary energy resources. The shortage of energy sources is filled by transferring electricity on Kazakhstan North - South transit and import from the Central Asia UES. Before putting into use the second circuit of "North - South" line the value of power shortage, not covered by their own sources, amounted up to 1,500 MW. After putting into use the above-mentioned line, the deficit has decreased. However, the problem of the deficit is still not fully resolved.

Atyrau, Western Kazakhstan and Mangistau regions are in the western zone, which has no electric connections with UES of Kazakhstan's territory. A part of the region's demand for electricity is covered by imports from Russia [9].

Meanwhile, in recent years there has been a steady growth in demand for electricity and the excess of electricity consumption in comparison with generation. Electricity demand growth is uneven both in regions and across industries. In some regions, such growth has led to significant power shortage (Fig. 2) especially in the south and west and not only in terms of the peak consumption in winter.

There is shortage of electric generation at current generating facilities. In addition, there is a significant deterioration of power generation and transmission equipment, which substantially limits the possibilities of existing power plants to generate and deliver electricity to final consumers. Therefore, we can say today that there is power shortage in some regions of the country.

The lack of energy can be a significant deterrent to the development of industrial and economic growth. This is an obstacle on the road to sustainable development in Kazakhstan, since electricity is the inertial sphere in the sense that new capacities require long time to implement.

Thus, summing up, we can conclude that at present the state of power industry in the country does not fully meet the requirements of the republic's economy:

1. There is renouncement in the connection of new consumers in certain regions of the country, both thermal and electrical energy.
2. There are cases of restrictions to consumers at peak hours.
3. There is shortage in generating facilities and capacity at networks, primarily in terms of the peak consumption in some regions.
4. There is considerable unevenness of power generation in different regions of the country to meet its own needs, as well as isolation of certain regions from Kazakhstan UES.
5. There is not enough (less than 12%) maneuvering hydropower plants to cover peak loads.
6. Lack of operational reserves of generating facilities and first of all to cover peak loads.
7. There is a large gap between the installed and available capacities of power plants.

8. There is a significant deterioration of generating equipment, which limits the production of electricity at power plants, as well as electrical equipment of RECs grids. This reduces the reliability of power supply and increases accidents.

9. Lack of effective supervisory control in regime management.

10. Deficit of generating capacities in the south of Kazakhstan.

11. Need for modernization of the main equipment at substations of national electric system and rehabilitation of regional electric grids.

The country now faces an urgent task to resolve two strategically important directions of development in the field of power generation:

1) modernization of existing facilities, as most of the existing ones were built in the 70-80s of the last century;

2) elimination of power shortage in the southern regions of the country.

As energy generation plays an important part in economic and social sphere of the state and is a strategic sector, the program of development of electric power industry of Kazakhstan until 2020 is adopted in the Republic to correct the above-mentioned problems.

Part 3

Problem solution of consumer access to energy services and use of renewable sources of energy

3.1. Legal documents of Kazakhstan in the field of consumer access to energy services and use of renewable sources of energy

3.1.1. Legislation in the field of consumer access to energy services

State regulation in the electricity sector, among other goals, is carried out in order to meet maximum demand of consumers for energy and to protect participants' rights for electricity and heat market in Kazakhstan. It is defined in "Electricity Act" [11], Article 3. This provision is implemented through the creation of competitive conditions at energy market, guaranteeing consumers the right to choose suppliers of electrical and heat energy. Therefore, a system operator

provides with equal opportunities to access the wholesale market of electric energy to the national electricity grid (Article 10 of the Law).

In addition, to implement physical access for all electricity consumers and connect them to the grid it is necessary to comply with the requirements of "electric grid rules for the Republic of Kazakhstan", approved by Order of the Deputy Prime Minister of the Republic of Kazakhstan - Minister of Energy and Mineral Resources, December 24, 2001 № 314. They identify technical requirements and conditions for electrical networks, establish relationships between members and, along with other issues they control the terms of access to power grids and relationship between different users of electric networks.

Chapter 3 of the Rules determines the procedure for access to the grid. It states that access to the power grid gives electricity market participants the possibility to connect their electric installations to power grids and receive (deliver) bought (sold) electric energy on an equal and non-discriminatory basis. However, all market participants must comply with the requirements set forth in this chapter, as well as regulatory legal acts ensuring the reliability of the UES of Kazakhstan. The chapter, concerning grid access, applies to both in the process of being connected and already connected energy consumers.

And in the "Rules of use of electrical and thermal energy" (amended on 14.12.2009), approved by the Minister of Energy and Mineral Resources of the Republic of Kazakhstan dated January 24, 2005 № 10, the question of access of consumers to electric networks is also highlighted. So in Articles 3-5 it is stated that free access for electricity market participants to electric networks both regional and (or) local is regulated by laws and regulations. The "Rules" determine that consumers of electricity should place meters in areas that provide an easy access to their examination by inspectors of power transmission companies.

Economic problems arising in the country in relations between consumers of electric power and energy supply organizations are reflected in laws and legal documents. Therefore, limited, calculated and individual rates are determined in the manner prescribed by the Government of the Republic of Kazakhstan. Power generating companies independently set the selling price for electricity, but not above the limited tariff of energy producing organizations. Maximum (limited) tariff is approved by groups of energy producing organizations for a period of not less than seven years, broken down by years and is adjusted annually based on the need to ensure investment attractiveness of the industry. The basis for determining the limited tariff for the first year of operation is the maximum actual price prevailing in the respective group of energy producing organizations during the

year preceding the year of introduction of maximum tariffs. For sales of electricity at prices not exceeding the maximum tariff, power-generating companies in the prescribed manner conclude an agreement with the competent authority. Investment commitments of a power generating company for the implementation of measures aimed at creating new assets, expansion, upgrade, support, reconstruction and modernization of existing assets are provided in the agreement. Prices and terms of delivery of electrical energy by power supply organizations shall be in accordance with the contract of sale and purchase agreement of the parties, taking into account the tariff of power transmission companies. User fees for the consumed electric energy are made by the payment document issued by Energy Supply Company based on meter readings, and in case of their absence or temporary violation - by calculation.

The authorized institution monitors the execution of agreements by power generating companies, the cost of production and sale of electric energy, as well as output and sales volume of electric energy.

Unjustified refusal or evasion of the agreement by the parties is not permitted.

In accordance with the "Electricity Act», consumers have the right to:

- 1) receive electricity and heat in accordance with agreements;
- 2) demand from energy-producing, energy transmission and power supply organizations reimbursement of actual damage caused by short shipment or by delivery of defective electrical and thermal energy, in accordance with the terms of the contract;
- 3) apply to the court to resolve disputes related to the conclusion and execution of contracts;
- 4) pay for consumed electricity by a differentiated tariff system of accounting in accordance with the legislation of the Republic of Kazakhstan.

Persons found guilty of violating the laws of the Republic of Kazakhstan on electricity shall be liable in the manner prescribed by the laws of the Republic of Kazakhstan.

Thus, in accordance with the recommendations of the UN EEC [12], not only the problems of consumers' physical access to energy services and economic

aspects of the relationship while buying electricity, but also the quality of services are solved in the Republic.

3.1.2. Legislation in the field of use of renewable energy

Today the market of renewable sources in Kazakhstan is absent. However, it should be noted that the integration of renewable energy into the energy balance of the country is considered as a key factor in stimulating the development of renewable energy in Kazakhstan. It is necessary to improve the legal basis for the use of renewable energy. The country has made efforts to develop the legal framework of using renewable energy sources.

So, the program for renewable energy development in the Republic of Kazakhstan, approved by the Minister of Energy and Minister of Science in 1995 became an integral part of the State program of energy saving.

"Law on Energy Saving of the Republic of Kazakhstan" was approved in December 1997. It was to regulate social relations in the field of energy saving in order to create economic and organizational conditions for the efficient use of energy resources and environment protection. Chapter 4 is fully devoted to the Law of Renewable Energy. It notes that the use of renewable energy resources is a priority direction in programs for the development of energy sector and in environmental problems solution in Kazakhstan. In addition, it is stated that necessary legal, organizational and economic conditions to involve renewable energy resources into the energy balance and develop energy facilities on their base are created in the Republic of Kazakhstan. The competent authority is responsible for coordination, development and implementation of programs on involving renewable energy resources into the energy balance. However, in fact, there was no such authority, and work on the implementation of renewable energy was not carried out.

The use of renewable energy is ranked among priority directions in the development of energy sector and in environmental problems solution in the "Power development program of the Republic of Kazakhstan until 2030", approved by the Government of the Republic of Kazakhstan dated 09.04.1999, № 384. "Program of power development until 2030 ", set the following parameters on building power plants by 2030:

- small hydropower plants (installed capacity up to 30 MW) - 210 MW, with annual output of electricity - 1.03 billion kWh;
- wind mills - 520 MW, with annual power 1.8-2.0 billion kWh.

The Ministry of Energy, Industry and Trade on the basis of "Strategy 2030" developed and adopted the "Program of the energy sector development up to 2030" on April 9, 1999. It provided:

- improving the environmental situation in Kazakhstan;
- introducing renewable energy into the energy balance of the country.

The installation of 500 MW of wind power units was also envisaged there.

The regional electricity companies are obliged to use electrical energy produced from renewable energy sources if these plants are connected to power grids of regional electricity companies. It is noted in the Law of the Republic of Kazakhstan dated July 9, 2004, № 588-II «On Electric Power Industry" in Article 13 "Requirements for participants of production and transmission of electric energy".

The Concept of transition of Kazakhstan to sustainable development for 2007-2024 approved by the Decree of the President of the Republic of Kazakhstan dated November 14, 2006, № 216, provides that the sustainable economic development of Kazakhstan will be done by supporting environmentally efficient energy production, including the use of renewable energy. The concept states that the share of alternative energy sources should be 5% of the total energy balance of the country by 2024. The plans for 2007-2009 to implement the Concept envisage improvement of legislation on the sustainable development of the Republic of Kazakhstan, including renewable resources and alternative energy sources.

The government of Kazakhstan and the United Nations Development Program in a joint project for the development of renewable energy in the country "Kazakhstan is Wind Power Market Development Initiative" in 2006 drafted the National Program for development of wind power by 2015 with the projection up to 2024 [13]. The program aims at using wind energy potential of Kazakhstan for production of electricity for 900 million kWh per year by 2015 and 5 billion kWh by 2024. These figures go with the concept of transition of the Republic of Kazakhstan to Sustainable Development for 2007-2024 and the Strategy of Industrial and Innovation Development of Kazakhstan for 2003-2015. The

program aims at involving significant wind resources into the country's energy balance, and thus, at supporting plans to reduce the energy intensity of the economy, to increase the share of alternative energy in the overall energy balance of the country up to 5% by 2024 and to stabilize greenhouse gas emissions at the level of 1990.

The Parliament of the Republic of Kazakhstan, ratified the Kyoto Protocol to the UN Framework Convention on Climate Change in February 2009, and the President signed it in March. Ratification of the Kyoto Protocol allows using financial mechanisms to support renewable energy projects. According to the Protocol Kazakhstan has committed to reduce greenhouse gas emissions by 15% compared to the level of 1992. Now dealing with shares of greenhouse gases emissions has become a reality. Kazakhstan has an opportunity to receive additional millions of dollars annually to the state budget. This will allow Kazakhstan not only creating possibilities to solve energy consumption problems and implementing energy efficiency policy in the sectors of the economy, but will also promote widespread adoption of renewable energy sources and Kazakhstan joining the thirty leading countries [14].

The Head of State Nursultan Nazarbayev signed the Law "On supporting the use of renewable energy sources" in July 2009, aimed at defining the objectives, forms and directions of supporting renewable energy in the country. N. Nazarbayev signed the Law "On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on supporting renewable energy sources", aimed at further improvement of the legislation of the Republic in supporting renewable energy sources.

The Government of the Republic of Kazakhstan adopted a decision In November 2009. The decision was about adoption of voluntary quantitative commitments to reduce national greenhouse gas emissions by 15% by 2020 and by 25% - by 2050 relatively to the baseline level in 1992.

In accordance with the "Strategic Development Plan of the Republic of Kazakhstan till 2020" approved by the Decree of the President of the Republic of Kazakhstan dated February 1, 2010 № 922, the share of alternative energy sources in total energy consumption should reach 1.5% in 2015, more than 3% by 2020 and up to 5% by 2024. One of the target indicators of the Strategic Plan is to achieve the volume of electricity generated by renewable energy sources in 2014 - 1 billion KWh per year.

Directions and tasks of renewable energy in Kazakhstan are defined in the "State program for accelerated industrial and innovative development of Kazakhstan for 2010 - 2014" approved by the Decree of the President of the Republic of Kazakhstan dated 19.03.2010, № 958. It defines the target indicators:

1. Achieving the volume of energy of 1 billion KWh per year generated in 2014 by renewable energy sources (windmills, solar plants and hydroelectric power stations up to 35 MW).

2. The share of electricity generated by renewable energy sources (windmills, solar plants and hydroelectric power stations up to 35 MW) being more than 1% by 2015 in total energy consumption.

The closest government purposes for using renewable energy are presented in the "Program for the development of electric power industry in the Republic of Kazakhstan for 2010-2014" approved by the Decree of the Government of the Republic of Kazakhstan dated October 29, 2010 № 1129. The following indicators are established:

- increasing electricity generation in 2014 on the basis of renewable energy - 1 billion KWh.

- the share of renewable energy in the total energy consumption will be more than 1.0% by 2015.

The Law of RK "On energy saving" dated January 13, 2012, № 542-IV refers to the need of development and use of renewable energy, however, no direct measures to support renewable energy sources are provided.

The message of the President of the Republic of Kazakhstan dated December 14, 2012 "Strategy Kazakhstan-2050" says: "The new political course of the held state indicates the need for the development of alternative forms of energy and active introduction of technologies using solar and wind energy."

For the purposes of further development of renewable energy sources and exchange of experience with the international community, Kazakhstan has joined the International Renewable Energy Agency (IRENA), and on March 21, 2013, the President Nursultan Nazarbayev signed the Law of the Republic of Kazakhstan "On ratification of the Statute of the International Renewable Energy Agency (IRENA)." Participating in the organization will provide many help from the organization in terms of, first, obtaining international development grants and research of renewable energy potential.

Several issues in the field of using renewable energy sources are regulated by other laws, such as land and water codes (Land Code of the Republic of

Kazakhstan, № 442-II dated 20 June, 2003, Water Code of the Republic of Kazakhstan, № 481-II dated July 9, 2003), as well as by the Code of Administrative Offences, № 155-II of January 30, 2001, and the Law "on natural monopolies and regulated markets», № 272-I dated July 9, 1998. In addition, there are a number of regulations on certain issues of using RES.

Relations in the field of biofuel production and turnover are regulated by the Law of RK "On state regulation of production and turnover of biofuels», № 351-IV on November 15, 2010.

In addition, it should be noted that in almost all regions of the country energy saving programs have been developed and adopted. They also deal with using renewable energy sources. For example, "Concept of energy saving in East Kazakhstan region for 2007-2015" considers the construction of mini-hydroelectric station, windmills and heat pumps for power and thermal supply of remote rural settlements and objects in the East Kazakhstan region.

It should also be noted that guiding by the objectives of alternative energy development, the concept of the transition of the Republic of Kazakhstan to the "green economy" was adopted. It was approved by the Decree of the President of Kazakhstan, on May 30, 2013 № 577. It was established goals and objectives, as well as the basic principles and common approach to the transition to the "green economy". The development of renewable energy sources is one of the most effective mechanisms for implementation of "green" low-carbon economy. The Concept says that Kazakhstan should start the development of renewable energy through the construction of wind and solar power stations of a 3% share of such power stations in total energy production by 2020 and a 10% share - in 2030.

First, the idea of "green" tariff was implemented in the US in 1978. In 2012, more than 50 countries have effectively used a "green tariff". It is economic and political mechanism designed to encourage investment in renewable energy technologies. Three main factors are in the basis of this mechanism: the guarantee of grid connectivity; long-term contract for the purchase of all renewable electricity generated; premium to the cost of electricity produced. The essence of special tariffs for renewable energy sources is that the state or the population buy electricity at special, higher rate. Therefore, the construction of "clean" power stations becomes economically attractive [15].

3.2. Activities of the Republic Government to provide sustainable energy services and support the use of renewable energy in rural areas

3.2.1. Providing sustainable energy services for consumers in rural areas

Kazakhstan is an agro-industrial country. The degree of development of agricultural production depends largely on the living standards of not only those who work in this sphere, but also those who are in one way or another associated with this area. The level of development of agricultural production is closely related to the well-being of the majority of Kazakhstan people.

The difference of agricultural production from other industries and its specificity is in the fact that agriculture is not only a sphere of production, but also the sphere of life for a large mass of the population.

Over 43% of population of the country live in rural areas, of which about one-third, according to official statistics, have an income below the subsistence level.

Traditional sector of agriculture in Kazakhstan is animal husbandry; it provides the population with food and light industry with raw materials.

The rural economy and rural settlements are inextricably linked: the rural settlements were historically formed because of agricultural activity and ceased to exist with the termination of the latter.

In Kazakhstan, after gaining sovereignty, it was agriculture, where the workers were mostly affected by shortcomings of the Soviet economy, and that they were more likely to feel its inferiority in the transition period to a market economy.

Due to market relations, the conditions of economic activity changed in the rural areas. The reforms in Kazakhstan agriculture began later than in other industries. Only in 1994, prices for agricultural products became flexible. By that time, prices of equipment have already been allowed to float. As a result, there was a huge price gap between industry and agriculture products.

In 2002, the European Bank for Reconstruction and Development gave a hundred million dollars to support the agriculture in Kazakhstan, which was certainly a positive impact on improving the efficiency and competitiveness of agricultural business in the country, but did not remove all numerous problems in this sector of the economy.

Wages of workers in agricultural production were quite low among other industries in the past. Because of socio-economic transformation, the problem of rural employment and income greatly aggravated. This has increased disparity in living standards of urban and rural population. Regional differences in income became significant. In rural areas, a third of rural residents had incomes below the living wage. Rural poverty and increased unemployment, deterioration of the demographic situation (population moving to the city), as well as decreasing institutions of social infrastructure in rural areas became alarming.

Because of this, there was a need in the market conditions, a new way to consider the problems of socio-economic development of rural areas of Kazakhstan.

According to the World Bank classification, Kazakhstan belongs to the group of low-income countries in terms of GDP per capita. The level of gross production in agriculture per one villager in Kazakhstan is 1.8 times lower than in Russia, 1.3 times lower than in Ukraine, 3 times lower than in Turkey, 7.5 times lower than in South Korea, Germany, 8.8 times lower than in France, 43 times lower than in Belgium [16].

Low level of agricultural technologies and agro-processing technologies was a major cause of lack of competitiveness of domestic products on the global and domestic markets, reducing the potential income in agriculture. The agricultural sector remained high-risk and low-yield sphere in the economy.

At that time, together with production problems, rural social development of village came to the fore. Mistakes made during administrative economy of productive forces distribution in the countryside in the market created a complex problem. A significant part of rural settlements was economically untenable because of hopelessness and lack of competitiveness of productions placed there. Therefore, a significant number of agricultural productions and rural settlements experienced the problems with power supply and complexity of access to energy services.

In the fifties of the last century, the development of virgin lands in the USSR gave a powerful impetus to the development of agriculture in Kazakhstan. Planned development of virgin lands, led to fundamental changes in the countryside. At that time, there were no large power plants on vast territories. Therefore, there was no electricity in countryside. Everywhere there was the need for electricity. This situation has highlighted the socio-economic problem - the need to provide as soon as possible the vast territory with cheap and high quality electricity. Effective

solution was only possible due to the mass connection of consumers to centralized energy sources.

Since rural electrical loads are low-powered and placed over a huge territory, there was an enormous need of power grid construction. Massive electrification of rural areas in Kazakhstan was started. It provided the connection of all consumers to centralized power generation sources. Allocated by the State financial and logistical resources allowed annually setting up to 20 thousand kilometers of rural distribution lines of 110 kW and below with distributed and consumer transformer substations [17].

In Soviet period, Kazakhstan was the leader among the republics of the Union in terms of electrical equipment of agricultural production. There was a powerful electric Grid base. Electricity was supplied to all the settlements and industrial structures (except for distant grazing lands). The total electrification of rural areas of Kazakhstan has been completed by 1985. The level of centralization of power supply has reached 99.7% by 1990. Centralization coefficient of power supply achieved 99.9% [17].

However, after the period of perestroika rural consumers energy supply has become extremely important. This was due to the fact that the huge territory of Kazakhstan required to have a considerable length of rural power lines of about 360 thousand km. Small population of remote rural communities made low density loads in electric grids. The maintenance of long rural electric grids, low level of energy consumption became uneconomical. In addition, significant energy losses in these unloaded extensive distribution networks have reached 25-50%. Experts estimate that real cost of electricity transportation for low-power remote consumers could reach up to 17.3 tenge / kWh, making energy consumer supply economically unprofitable. All this further worsened economic indicators, increased the cost of electricity for consumers and led to the fact that consumers were not able to pay for it.

In addition, a large part of rural distribution networks has been used up to 60-70%. So, most of them could not provide reliable power supply. They almost fell into disrepair, and the restoration of these networks was not possible. All this led to the fact that in a market economy, maintenance of such lines and power supply of remote consumers became economically viable. Therefore, they were turned off.

The results of the first agricultural inspection in 2006-2007 showed that infrastructure of agricultural enterprises deteriorated significantly in rural areas.

About 90% of enterprises have access to roads for communication with the regional center and highways. Slightly more than 52% had access to the main electricity grids, 5% - to heat supply networks, 17% - to water supply, 3% - to gas. There were no independent power and heat sources, including renewable alternative energy sources. Only 5% of the agricultural enterprises had independent sources of electricity, 10% - heating, 15% - water. 50% of enterprises had telephones. 8% - Internet access. 2% - drainage and cleaning system. [16].

According to the Ministry of Agriculture, [13], 255 rural settlements had no electricity in 2006. There were about 180,000 farms in Kazakhstan, some of which also had no access to electricity. Water supply to rural consumers was a great problem. Many rural water supply facilities were deteriorated, due to lack of energy supply. Thus, only in the Mangistau region such settlements were 35 with a total population of more than 28 thousand people [13]. About 300 settlements disappeared in 2000-2002. According to local government offices, there were no people in 136 rural settlements [16]. In 2012, Vice Minister of Industry and New Technologies of Kazakhstan B. Dzhaksaliyev noted that so far about 70 settlements with a population of more than 16 thousand people are not provided with electricity [18].

Thus, it is clear that there are some problems of access to the centralized energy, heat and gas supply in the field of infrastructure in rural areas. These problems not only worsened living conditions of the population, but also led to the collapse of life support systems in rural settlements, affected the level of energy efficiency of residential and industrial infrastructure of rural settlements. Moreover, these problems enhanced country's population differentiation income, inhibited social and economic development in rural areas, reduced the production of rural products and other factors. They affected the agricultural economy as a whole and were reflected on the indicators of human development and investment image of the country.

It became clear that if not to take urgently drastic measures to restore the rural power grid facilities in the coming years it would be impossible to supply electricity to large areas because of the inevitable mass damage in distribution networks. All this had a negative impact on the rural population and rural economy as a whole. There was a need to make decisions in a new way on issues of social and economic stability of rural development in Kazakhstan in market conditions.

To solve these problems, the republic's authorities tried to support the village. More than one program to help the village was adopted to this end. So, the President Nursultan Nazarbayev in his annual address to the nation in 2003

announced the next three years as aul (village) renaissance. After that, a national agro-food program was developed and adopted in Kazakhstan for 2003-2005 [19]. The development of this program was caused by the need to revive the aul (village). It was necessary to take measures for effective development of rural areas and the development of optimal schemes of rural settlement. This would allow concentrating resources in economically promising areas and providing an acceptable level of income for rural population.

Therefore, the State Agro-Food program for 2003-2005 approved by the Decree of the President of the Republic of Kazakhstan, includes measures to intensify the agrarian economy, reduce costs through the use of science-based agricultural technologies, which will inevitably lead to an additional release of people employed in the industry in the future. To realize the state program of development of rural areas 121.6 billion tenge has been allocated. Of these, 40.5 billion tenge were allocated from the national budget, 53.8 billion tenge from local budgets and 27.2 billion tenge from other sources. These funds were used to construct or renovate about 4,200 community facilities and engineering infrastructure, gasify 94 settlements, repair more than 600 kilometers of roads and set 579 km power lines in the countryside. Energy supply increased by 17% [20].

To solve the problems of the agricultural sector in the country state programs for the development of rural areas of the Republic of Kazakhstan have been developed for 2004-2010, the program "Drinking water for 2002-2010", as well as State Program "Regional Development". In addition, measures for sustainable development of agriculture of the Republic of Kazakhstan for 2009 - 2011 years have been taken. The Ministry of Agriculture of the Republic of Kazakhstan developed a strategic plan for 2009-2011. The law on state regulation of the development of agriculture and rural areas, the concept of transition of the Republic of Kazakhstan to sustainable development for 2007-2024, the strategy of territorial development of the Republic of Kazakhstan until 2015, a comprehensive plan for socio-economic development of settlements surrounding the city of Astana for 2011 - 2013 and others were adopted.

The main purpose of the State Program for Rural Development is to create normal living conditions for aul (village) based on the optimization of rural settlement. The Program indicates that 3.5% of rural settlements of 265 of the total number in the country are not provided with electricity. Most non-electrified rural areas - 11.1% (out of 56) are located in the Karaganda region, 8.1% (out of 22) - in the Kyzyl-Orda region, 7.1% (out of 36) - in the Pavlodar region. The share of agriculture in gross domestic product is about 8.5% and may not change significantly in the short and long term. The projected increase in agricultural

production in accordance with the State Agro-Food program was over 10% at the end of 2006.

Less than 50 people live in more than 500 from 7660 rural settlements officially presented by the local government offices. There are numerous stations and sidings (257) there. There are villages included in the territorial boundaries of the cities (317), where the population is practically engaged in agricultural activities. The population living there is 579,540 people.

The results of monitoring socio-economic development of rural settlements for 2010 show the dynamics of growth of the number of rural settlements with high development potential. Thus, the number of rural settlements with high potential for development in the republic in 2010 compared with 2004 increased by 2.2 times and amounted to 2613. In 2010, the annual cash income of rural population was 217,183 tenge per capita that is 3.5 times more than in 2004. The number of rural settlements with centralized water supply increased by 782, and the number of villages using imported water decreased by 328 by January 2011 compared to 2004. The share of rural settlements with centralized water supply has increased from 29% to 41%. Thus, the villagers have access to high quality drinking water. The share of rural settlements provided with gas supply increased from 4.6 to 10.8%. The number of rural settlements provided with gas supply has increased by 306. The number of villages that are not connected to centralized power has decreased from 225 to 95, that is by 130. There are telephones in almost all rural settlements. [20]

For a specified period 1274 educational establishments, 784 hospitals, 516 institutions of culture, sports and tourism, 2,285 water supply facilities, 8325 power supply facilities, 442 gas supply and 1451 km of local roads have been reconstructed or rebuilt. At the same time, it was necessary to take into account that some investment projects were implemented within 3-4 years and in annual reports, they were mentioned as being reconstructed or rebuilt. During the period of the state program realization in the countryside 604 educational establishments, 424 health facilities, 579 water supply, 311 gas supply, as well as 182 cultural and sports facilities have been rebuilt.

Over the period of 2004-2010, 976.0 billion tenge have been allocated for the development of rural areas within the state, branch and regional programs from all sources of financing, namely from the republican budget - 436.9 billion tenge, from the local budget - 424200000000 tenge and from other sources - 114.9 billion tenge. In particular, in accordance with the action plan for 2004-2006, 2007-2009 and 2010 approved by the Government of the Republic of Kazakhstan

on August 20, 2003 № 838, April 11, 2007 № 286, and November 18, 2009 № 1874 on the development of rural areas of the country were allocated up to 704.2 billion tenges, namely from the republican budget - 315.5 billion tenges, local budgets - 369.7 billion tenges and other sources - 19.0 billion tenges.

The result of the implementation of "State Program for Rural Development for 2004-2010" approved by the Decree of the President of the Republic of Kazakhstan dated July 10, 2003 № 1149 was as follows:

- material and technical base of social and engineering infrastructure is markedly improved;
- increase of income level (3 times) [21] in rural settlements by improving entrepreneurial activity of the rural population and the expansion of economic activities;
- part of rural population with incomes below the subsistence level is reduced (in 2010 according to the Agency of the Republic of Kazakhstan on Statistics incomes below the subsistence level amounted to 10.5%, which is below the level of 2004 by 37.2%);
- production of gross agricultural output in the country as per capita per month in 2010 has been amounted to 15,800 tenges;
- unemployment rate in 2010 was 5.0%, which was below the level of 2004 by 2.1%;
- scope of livelihood of rural population has been further developed;
- level of provision of rural communities with high quality drinking water increased;
- electricity and gas supply has been improved in villages, etc.

Despite significant progress made in the implementation of this program, nevertheless there has been a huge amount of unresolved problems at the end. So even 189 rural settlements are imported water, 73 villages are not connected to the grid. Power lines and the equipment have been deteriorated over 85% in 1511 villages. The problem of stable power supply by alternative sources in sparsely populated villages is solved very slowly.

According to the Ministry of regional development, there are 6936 settlements where up to 7.6 million people live. Of the total number of rural settlements, 1310 correspond to high and 5192 settlements to medium development potential. According to the administrative division, 119 rural settlements are regional centers, and 2,182 settlements are centers in rural and village districts

Wherein more than half of the settlements have less than 500 people, that is with population of 9.7% villagers.

It should be noted that some regional programs have been developed in the country regarding the issue of providing sustainable energy services in rural areas. Thus, for example, a regional program has been developed for the development of rural areas in Mangistau region for 2004-2010, approved by the decision of the Mangistau regional Maslikhat dated December 10, 2003 № 2/21. In section 2.2 "The level of engineering infrastructure», it is noted that today all rural settlements of the region are provided with sustainable electricity from Ltd "MAEC-Kazatomprom". «Mangistau Electricity Distribution Company» («MEDC») provides transportation of electricity to rural areas. Rural settlements consume 366 million KW / h, including industry - 345,600,000. KW / h, social and cultural buildings - 0.6 kW / h, the population - 19.8 kW / h. The total length of electric networks, providing rural settlements with electricity, is 2059.5 km, including 0.4 kV - 489.7 km; 6-10 kV - 1569.8 km. 1704 km of electric lines or 82.7% of all existing are put into operation. Before 1990, and the rest - in 1990-1995. Today it is necessary to reconstruct 111 km of electric lines (5.4%); the state of other lines is satisfactory. 358 transformer substations (TS) of total installed capacity of 40.5 thousand kW are installed along power lines, of which 255 (71%) were put into operation until 1990, the others in the period of 1990-1995 [22].

Moreover, Section 4.3 "Development of engineering infrastructure, volumes and sources of financing," says that all rural settlements of the region are fully electrified; power outages are rare. Increased capacity and reconstruction of power transmission systems will be required in 2007-2010. This is connected with the growth prospects of production in rural areas and population growth, as well as with the development of social infrastructure. These activities will be carried out by "MEDC" as part of its production program.

It should be noted that as early as 2008 according to experts from Ltd "Institute" Kazselenergoeroekt" total cost of reconstruction of only distribution networks in rural areas will be about \$ 4.5 billion. However, these huge allocations are not at a time. They are required during the whole period of reconstruction [23].

An essential condition of sustainable energy services in rural areas is a reliable and trouble-free energy supply in rural areas. As noted in [24], the basic document for the development of electricity distribution networks of 220 kV and below should be regional Scheme of electric supply. The state scheme of power supply in market conditions is a highly effective tool implementing a unified state policy in the field of technical design and construction of facilities on the territory of Kazakhstan, including local sources of power generation. Currently, the Schemes of electricity distribution networks of 220 kV and below are developed for the period up to 2020 in all areas of Kazakhstan. These regional electricity Schemes will be useful for sectorial and regional programs, which are developed in accordance with the Decree of the President of the Republic of Kazakhstan "On the system of state planning in the Republic of Kazakhstan» № 827 dated 18.06.2009. The problems of modernization and construction of new electric grids will be solved by means of these power supply circuits, as well as questions of the feasibility of construction of any objects in the country.

Such an approach would not only be more purposeful to solve the problems of modernization and construction of new electric networks for energy supply in rural areas, energy and food security in Kazakhstan, but also ensure the provision of sustainable energy services in rural areas.

3.2.3. State support for renewable energy

Governmental incentives (support) of the use of renewable energy are provided in the country. It is extremely important that support measures are related to the generation of both electrical and thermal energy. As for biofuels, there is a separate legislation of the Republic of Kazakhstan "On state regulation of production and turnover of biofuels" (art. 2, par. 2).

State regulation in support of the use of renewable energy sources is carried out in the following areas:

- create favorable conditions for the construction and operation of facilities for the use of renewable energy;

- stimulate power generation and (or) thermal energy using renewable energy sources;

- provide investment preferences for individuals and legal entities engaged in the design, construction and exploitation of facilities in using renewable energy in accordance with the legislation of the Republic of Kazakhstan on investments;

- create favorable conditions for the effective integration of facilities for the use of renewable energy into the unified power and heating systems, as well as into electric and thermal energy market;

- promote the implementation of international obligations of the Republic of Kazakhstan to reduce greenhouse gas emissions.

For the purposes of the development of RES, the State provides to entities carrying out activities in this area, a wide range of benefits and privileges, the most important of which are described below.

As we have seen, the basic provisions of relations in supporting the use of renewable energy sources were first enshrined in the Law "On supporting the use of renewable energy" dated 04.07.2009 № 165-IV [25].

This law, based on a detailed analysis of the best international practices, is aimed at supporting both investors and ordinary consumers. In July 2013 the Law on renewable energy sources and a number of other legislative acts have been amended, which provide for changing the system of purchasing electricity from producers using renewable energy sources. These amendments have been introduced from 12 January 2014.

The decree of the Government of the Republic of Kazakhstan № 43 "On approval of the Action Plan for the development of alternative and renewable energy in Kazakhstan for 2013 - 2020" dated January 25, 2013 is aimed at supporting the use of renewable energy sources. Further, it has also been amended in accordance with Government Resolution of 28.07.14, № 835.

In addition, as part of the Law of the Republic of Kazakhstan "On supporting the use of renewable energy," a number of sub-legal acts were adopted, including the following:

- Rules for monitoring the use of renewable energy, approved by Decree of the Government of the Republic of Kazakhstan dated October 5, 2009 № 1529;

- Rules, terms and approval of feasibility studies and construction projects on the use of renewable energy, approved by Decree of the Government of the Republic of Kazakhstan dated 25 December 2009 № 2190;

- Rules of purchase of electricity from qualified energy producing organizations, approved by the Decree of the Government of the Republic of Kazakhstan dated January 16, 2012 №70;

- Rules for determining the nearest point of connection to the electrical or thermal networks and connecting objects using renewable energy, approved by the Government of the Republic of Kazakhstan dated January 19, 2012 № 119;

- On Amendments to the Resolution of the Government of the Republic of Kazakhstan dated November 29, 2012 № 1508 "On approval of rules of functioning of the balancing the market of electric energy", approved by Decree of the Government of the Republic of Kazakhstan dated December 28, 2013 № 1417;

- Law of the Republic of Kazakhstan "On Introduction of Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on supporting the use of renewable energy," dated July 4, 2013 № 128-V

- Organization of a financial center to support renewable sources of energy, Resolution of the Government of the Republic of Kazakhstan dated November 29, 2013 № 1281;

- Rules for determining fixed tariffs approved by the Decree of the Government of the Republic of Kazakhstan on March 27, 2014 № 271;

- Rules for determining tariff to support renewable energy, approved by the Government of the Republic of Kazakhstan dated 01.04.2014, № 290.

- On Amendments to the Resolution of the Government of the Republic of Kazakhstan dated December 25, 2009 № 2190 "On approval of rules, terms and approval of feasibility studies and construction projects on renewable energy", approved by Decree of the Government of the Republic of Kazakhstan dated April 29, 2014 number 418;

- Approval of the fixed tariff for solar electric stations projects using photovoltaic modules on the basis of Kazakhstani silicon (Kaz PV), to convert solar energy, approved by the Government of the Republic of Kazakhstan dated June 12, 2014 № 644;

- Approval of fixed tariffs, approved by Decree of the Government of the Republic of Kazakhstan dated June 12, 2014 № 645;

- Rules of centralized purchase and sale of power generated by using renewable energy by the financial center, approved by the Government of the Republic of Kazakhstan dated August 5, 2014 № 876;

- Standard purchase contract of the electrical energy by the financial center in power generation companies using renewable energy sources at fixed rates, approved by the Government of the Republic of Kazakhstan dated August 5, 2014 № 878;

- Standard purchase contract of electrical energy by the financial center in power generation companies using renewable energy sources at rates, that do not exceed the selling price established and agreed with an authorized or local executive organ, approved by the government of the Republic of Kazakhstan dated August 5, 2014 № 878;

- Standard selling contract of the electrical energy produced in power generation companies using renewable energy sources by the financial center in power generation companies using renewable energy sources, , approved by the Government of the Republic of Kazakhstan dated August 5, 2014 № 878.

To create a view of the potential of renewable energy in the country let us consider these support measures.

Getting the right to be engaged in activities of using renewable energy. Since 2012 production, transmission and distribution of electric and (or) thermal energy as the use of renewable energy have not been licensed activities. However, to purchase electric energy in order to supply the power a license is required [26].

Targeted assistance to individual consumers. According to the bill of Kazakhstan "On supporting the use of renewable energy sources", the state provides targeted assistance of 50% by purchasing renewable energy produced in Kazakhstan of no more than 5 kilowatts to individual consumers, who are in non-electrified area (a list of which is published on the website), and do not have access to electricity. Thus, the state will cover half the cost of installing renewable energy to customers from remote areas and rural settlements without access to electricity.

A mechanism for obtaining budgetary compensation is as follows: a consumer (household – an individual) buys an installation of RES and puts it into operation. After that, the applicant brings an application to the district administration. The Commission considers that application, attached documents (the act of commissioning), and checks whether the installation is really put into operation and then decides the question on the cash allocation. The cash is transferred to a second-tier bank at the consumer's bank account. If he does not

have access to the second-tier banks, he has the possibilities to obtain money by Kazpost [27]. In general, at the first stage of the bill realization, 71 million tenge are expected to be allocated from the state budget for the purchase of 32 units of the use of renewable energy sources in eight regions of the country: Almaty, Atyrau, East Kazakhstan, Karaganda, Kyzylorda, Mangistau and South Kazakhstan.

Provision of land for placing renewable energy facilities. Local executive bodies reserve and provide the land for renewable energy facilities site to investors in accordance with the plan of placing renewable energy facilities, approved by Ministry of industry and new technologies. It should be noted that the country defined limits on renewable energy projects up to 2020 by kinds and areas of consumption, which will allow placing facilities, connecting them to networks and providing land for their construction. Moreover, it is decided that when placing RES facilities the priority will be given to those regions where there is a shortage of electricity.

Connecting RES facilities- New and reconstructed facilities using renewable energy sources have the right to be connected freely and on a non-discriminatory basis to the nearest object on the REC infrastructure or a thermal energy transmission networks organization. Power transmission companies are obliged to provide suppliers free access to electric and thermal energy transmission networks. In this case, Suppliers are exempt from fees for connecting energy transmission organizations.

Dispatching electric power. Priority use is for electricity generation facilities using renewable energy sources.

Sale of electric and thermal energy.

Sale of electricity. It is provided a guaranteed purchase of full electrical energy generated by renewable sources for all payback project period, including the cost of generated energy into the tariff of a power supply organization. Regional electric companies are obliged to buy energy from renewable energy sources to cover up to 50% of their annual regulatory power losses while transmitting. KEGOC system operator has to buy the rest of electricity from renewable energy sources to compensate losses in electric networks.

Sale of thermal energy. Sale contracts for thermal energy from renewable energy sources are for all payback project period of facility construction for the use of renewable energy. The project payback period is defined in the feasibility study and construction project on the use of renewable energy sources developed by the investor. Then it is agreed with the state authorities. [26]

Operation and sale of electric and thermal energy.

Suppliers have the discretion to sell produced electric energy by one of the following options:

- ❖ accounting and financial center in support of renewable energy at a fixed rate, indexed for inflation in accordance with the procedure established by the Government of Kazakhstan;
- ❖ consumers at contract prices.

Electrical energy. Previously regional electricity companies, to power grids of which renewable energy facilities were connected, had to directly purchase the full electric energy produced by qualified organizations using renewable energy sources. Now since January 2014 an accounting and financial center will purchase energy from such suppliers. Under the law on renewable sources of energy, a contract on renewable power purchase has to be concluded for 15 years.

Thermal energy. Power supply organization of a village purchases all thermal energy from renewable energy sources supplied into the centralized heating system in this village. The cost of thermal energy from renewable energy sources are included in the tariff of power supply organization. While supplying heat energy Suppliers are released from payment services of power transmission companies [26].

Investment incentives and preferences for the construction and operation of renewable energy facilities. Investors may be provided with the following investment preferences:

- ✓ exemption from customs duties;
- ✓ state kind grants;
- ✓ benefits for land tax and property tax for legal entities implementing investment strategic projects;
- ✓ industrial benefits for entities implementing investment strategic projects in communities with low socio-economic development.

Selling price of electricity from renewable sources of energy. "The Law" On supporting the use of renewable energy ", adopted in 2009 [25], did not provide for fixed tariffs and did not give guarantees to investors for repayment of invested funds. In this regard, only a few small renewable energy projects were realized. There were no major investments, as there were no rules. It is known that the field of renewable energy requires high capital cost and without certain guarantees to attract investors in this area is difficult. Therefore, in May 2014 the government approved the tariff for power generated by renewable energy sources (Government regulation of the Republic of Kazakhstan dated April 1, 2014 №290) [28]. Now a normative base regulates the order of introduction of fixed tariffs, which will allow investors to reduce the risks of returning funds. According to international practice, fixed tariffs are approved for fifteen years for each type of renewable energy. Measures of annual indexation for inflation are enshrined as well.

The tariff per kilowatt-hour of electricity produced by wind turbines is set at 22.68 tenges, for solar power plants- 34.61 tenges, for small hydro power plants - 16.71 tenges, for biogas plants - 32.23 tenges [29].

In addition, in order to support domestic producers the tariff for electricity generated by solar power plants using photovoltaic modules based on Kazakhstan's silicon is set at 70 tenges, limited - up to 37 MW of installed capacity. [30]

To support the use of renewable energy in the country KEGOC set up "Accounting and Financial Center for renewable energy support." It is defined as a single buyer of electricity. The accounting and financial center purchases and sales electric energy produced by objects using renewable energy sources and supplied to the electrical grids of the united power system of the Republic of Kazakhstan.

In addition, it should be noted that within the project "Kazakhstan is Initiative of wind energy Market Development" a resource guide "On the procedure of preparation, coordination, approval and implementation of construction projects on the use of renewable energy sources in the Republic of Kazakhstan" has been developed in the country. It is designed to inform in detail potential investors and professionals in the sector.

All of the above documents pursue such basic objectives [31] as:

- expansion of power generation on the basis of renewable energy;
- support and creation of favorable conditions for potential investors in the implementation of renewable energy projects;

- increasing the transparency of RES-market and reducing bureaucratic barriers for participants.

Part 4. Placement of renewable sources of energy in rural and remote areas of the country

In order to implement the state policy in the field of renewable energy the following special centers for implementation of the Law "On Energy Saving" have been established by the order of the Ministry of Energy, Industry and Trade 6 from 18.03.1997: OJSC "Kazselenergoproekt" set up LLP "Kazselenergoproekt Institute", and CJSC "Kazgidroproekt" - LLP "Kazgidro". The centers have carried out a number of research projects, feasibility studies for windmills and hydroelectric power plants recently.

In 2007-2008, LLP "Kazselenergoproekt Institute" took part in the project of the Government of Kazakhstan and the United Nations Development Program for Research of wind potential on eight selected sites in different regions of Kazakhstan. In the first stage, OJSC "Kazselenergoproekt" proposed to consider the construction of windmills in 45 regions of Kazakhstan. The projects promise to be beneficial, and one can expect the addition of 3040 MW in the energy balance of regions.

Below there are projects made by LLP "Kazselenergoproekt" Institute" in chronological order, with a brief description of the projects [32]. It should be noted that many different RES projects performed by other organizations have been implemented in the country over the years.

1994

"Placement and construction of three experimental wind power units (3x30 kW) at the farm Kuktalsky in Ulyanovsk region of Karaganda district"

Customer - "Karagandainterwind." Windmills 3x30 kW.

Manufacturer - Karaganda factory "Karagandainterwind" AWE-30 wind turbine.

In this project, according to the task, AWE-30 wind generators operate autonomously. The main application area of electricity produced by wind turbines is heating and lighting residential or industrial buildings; some farms can be connected consuming up to 30 kW, lighting, heating, and pumping water.

Estimated cost of the project is 3727.91 thousand tenges.

***"Trial industrial and block-modular wind power plant based on experimental units AWE-30 at the site of the Scientific-industrial complex (SIC)"
Karagandainterwind" in Karaganda city***

Customer - "Karagandainterwind." Windmills 4x30 kW.

Manufacturer - Karaganda factory "Karagandainterwind" AWE-30 wind turbine.

In this project, four-wind power units are connected to the device of parallel operation, (lighting, heating). In the case of stopping the windmill, it can be switched to centralized power supply.

Estimated cost of the project is 10,595.53 thousand tenges.

1996

"Installation of 3 wind turbines in Yurt Camp to celebrate the anniversary of Zhambyl Zhabayev in Almaty region"

Customer - RSC "Almatyenergo." Windmills 3x30 kW.

Manufacturer - Karaganda factory "InterWind", wind turbine AWE-30-3.

The windmill is installed in Kokbastau canyon and is not connected to common power lines.

Estimated cost of the project is 9353.62 thousand tenges.

"Experimental wind power plant at the Nurly site in Almaty region"

Customer - Esick ES

Wind turbines 3 x107.5 kW; total power is 322 kW. Wind turbine - USW 56-100.

Manufacturer - "Windenergo LLP", Kiev.

Wind power plant is located on the eastern outskirts of Nurly settlement.

The cost of construction is 4931.4 thousand tenges. The cost of equipment is 357.750 thousand USD.

1997

"Feasibility study of the investment project for the construction of a 10 MW windmill in Arkalyk city"

Customer – Administration of Arkalyk thermal power plant (TPP).

Wind turbines of NW 40-500 models, "Nordwind" company, Germany, 20x500 kW. Electricity generation - 41.9 million KWh per year.

The windmill is located near industrial base of the Upper Ashutsk mine, 4.5 km south of the territory of Arkalyk TPP. Electrical power is given to the 35 kV bus of Arkalyk TPP.

Estimated cost of construction is 17572.6 thousand USD. According to two variants, the payback period is 12.5 / 16.5 years. Production costs, cent / kWh-3.1 / 2.67. Tariff, cent / kWh - 5.78 / 7.64.

2002

Feasibility Study "Construction of Ili- Shelek energy complex of 100 MW in Almaty region"

Customer - "Almaty Energopul."

Construction of 50 MW hydro power plant and 50 MW windmill.

Wind turbines of NM 750/44 model, NEG Micon Company, 67x750 kW, the capacity of 50 MW will be transmitted along the lines of 10 kV to the substation of 110 kV.

The windmill is located in Shelek Corridor in Enbekshikazakh district of Almaty region. Annual electricity generation -2.49 GWh.

The cost of windmill construction is 57697000 USD.

2004

"Installation of "Shymbulak" experimental wind power station with two turbines"

Customer - LLP "VetroEnergInvest."

Two wind turbines up to 20 kW with total capacity of up to 40 kW.

The site for the windmill is located on the Talgar Nek of "Shymbulak" sports complex.

Estimated cost of construction is 2.9 million tenges.

2010

Development of a feasibility study "Construction of Kordai 21 MW windmill in Zhambyl region"

Customer - JSC «Vista international».

The area for the windmill construction has wind potential with of long-term average speed of 6.6 m / s. The selected site for the windmill is located near Kordai Nek in the southeast of Zhambyl region at 30 km from the village of the same name Kordai on the border of Kazakhstan and Kyrgyzstan. The installed capacity of wind mill in Kordai is 21MW provided by 21 wind turbines of 1 MW each,

with a total output of "clean" electricity in the amount of 52.2 million. KW/ h per year. Sales volume, taking into account the cost of electricity for its own needs will be 49,59GW/h in average.

Estimated cost of construction is 6 362 650 000 tenges.

Since 2012, the project of windmill construction has been started. Completion of construction is scheduled for 2014.

Wind turbine	Nordex N - 54		
Term	1-st stage	2 – nd stage	3 – rd stage
Number of turbines	4 pieces	8 pieces	9pieces
Investments, mln. tenges	1996,04	1846,663	2026,44
Specific investments 1 kW, thousand tenges/kW	499,008	153,88	96,49
Average specific investment in 3 stages, th. tenges/kW	249,798		

2011

"Scheme of power generation by the windmill "Baydibek-1" of 210 MW planned for the construction in Zhambyl region" has been developed

Customer - TPF "NAR".

Specifications for a proposed windmill connection to the networks of JSC «KEGOC» were received in February 2013.

Full Feasibility Study «Construction of "Baydibek-1" windmill of 210 MW in Zhambyl region» has been carried out.

Seventy wind turbines, the capacity of each being 3 MW, are supposed to be installed on the site. Electricity is transmitted over lines to a step-up substation of 220/35 kV "Baydibek-1." Generated energy by the windmill is 799700000 KWh per year. Net electricity supply is 720.5 million KWh / year.

Estimated cost of the construction is 68 764, 69 mln tenges.

2012

"Scheme of power generation by "Sofiyevka" windmill of 100 MW in Akmola region" has been developed

Customer - «Central Asia Green Power».

Forty wind turbines, the capacity of each being 2.5 MW, are supposed to be installed on the site. Power from the wind turbines is transferred to a step-up substation of 220/35 kV having two transformers of 63 MVA.

Estimated investments for power supply from "Sofiyevka" windmill of 100 MW is 3 850 million tenges.

2013

"Feasibility study for the construction of wind power station in Shelek corridor of 60 MW with the prospect of increasing up to 300 MW"

Customer - "Samruk-Energo".

The wind power plant of 60 MW in Enbekshikazakh district of Almaty region is supposed to be put into operation in 2015.

The wind power plant (30 wind turbines x 2 MW). A substation with two transformers of 63 MVA each. Power lines of 110 kV, 90 km long. Cable lines of 35 kV, 17.4 km long.

Total cost of the windmill construction with the connection to the grid of 110 kV of JSC "AZhK" regional grid company is approximately 18 704 600 000 tenges.

2013

Construction of solar power plant of two MW in Kapshagai city in Almaty region

Customer - "Samruk-Energo".

Technological part of the engineering project is a unit consisting of 351 stationary modules. The installed capacity of the stationary modules is 1404 kW (351 x 16 x 0, 250). Estimated annual electricity output of the solar power plant will be 3.608 million kWh. It is connected to own substation of 0.4 / 10 kV with two transformers of 1600 kVA.

Total construction cost is 1,700,077 thousand tenges.

Construction of the first photovoltaic solar power plant (PVSP) of 2 MW in Kapshagai city in Almaty region

Completed in June 2013

Part 5. Recommendations to improve the efficiency of power supply in rural and remote areas and introduction of advanced technologies in the field of renewable energy

As mentioned above, Kazakhstan has significant potential for use of renewable energy. Currently, however, the use of renewable energy in Kazakhstan is at an early stage.

It should be noted that the legislative framework in the field of renewable energy in Kazakhstan is under intensive development. In addition, "green" tariff is already functioning in the country.

However, as the analysis of national programs implementation shows, outlined activities are not often fulfilled in specified volumes and are behind the practical implementation as planned, and the pace of development of renewable energy is not enough. This causes significant damage to the economy and further progress.

For the conditions of Kazakhstan, the most promising areas for using renewable energy should be considered decentralized plants in rural remote mountainous and desert areas. They are farms, cattle-breeding complexes, geological and mining enterprises, road maintenance services, hydro meteorological scientific stations, radio receivers and transmitters, tourist complexes, pumping stations providing water supply, forestry and hunting, objects located on the border, etc. The increased use of renewable energy sources will have a positive impact both on quality of population life, and on the employment. This will contribute to economic growth of the country [33].

Analysis of the motives of renewable energy in the country [34] showed that the main reasons for the use of renewable energy sources are:

1. Provide power supply in remote and inaccessible rural areas;
2. Decide socio-economic problems in rural and remote areas, where there is no electricity infrastructure;
3. Increase environmental and electric security of the country;
4. Reduce greenhouse gas emissions; prevent climate change and preserve the environment to meet the conditions arising from the ratification of the Kyoto Protocol;
5. Reduce power shortage in some regions of the country.

Obstacles

- Experience shows that one of the obstacles in practical use of renewable energy technologies is the lack of public awareness about the possibilities of these technologies and technical illiteracy during equipment installation and maintenance.

- Today there are no installation, design, and construction regulations, as well as specifications and a number of other regulatory documents. It makes it impossible to promote these technologies to market.

In order to improve power supply in rural and remote areas as well as introduction of advanced technologies in the field of renewable energy in the country it should be necessary to:

- ❖ Expand the development of scientific research in the field of renewable resources of energy.
- ❖ Ensure widespread use of plants using solar energy for heating water and buildings as simple, low-cost power plants for remote rural districts of the country and to organize production, as there is no local production of these plants in the country.
- ❖ Expand the preferential long-term loans for renewable energy for consumers in rural and remote areas.
- ❖ Organize the production of solar collectors for heat generation, which can significantly reduce the requirements for remote areas gasification and solve the strategic problem for Kazakhstan concerning economically inefficient networks in rural areas.
- ❖ Provide training for today's professionals in the use of advanced technologies in the field of renewable energy.
- ❖ Expand educational programs to disseminate information about the advanced technologies in the field of renewable energy.
- ❖ Organize practical training with equipment demonstration of engineering personnel able to solve organizational and technical problems associated with the use of renewable energy.
- ❖ Provide in regions training of local specialists able to design, construct and maintain simple in design micro hydro, solar, wind, and biogas plants.
- ❖ Review educational programs in technical and natural sciences, as well as programs of training and retraining specialists aimed at teaching them the techniques of advanced technologies in the field of renewable energy.
- ❖ Continue the development of international cooperation in the field of the use of renewable and alternative energy sources.

- ❖ Identify joint activities and ways of cooperation of the states in Central Asia on the implementation of advanced efficient technologies and renewable energy.
- ❖ Expand practical arrangements for Regional Cooperation in Central Asia in the field of advanced technologies in the field of renewable energy.

It is necessary to note that nowadays the state programs are developed and adopted in each country of Central Asia. These programs are aimed at using renewable energy. In each of these countries, the development of renewable energy sources is being carried out independently at different speeds and in different directions depending on the economic conditions in these countries with the use of equipment bought abroad. Naturally, this approach is wasteful for the budgets of these countries and hinders the use of renewable energy. However, the energy efficiency of their economies can be achieved through the joint efforts of the countries. The countries of Central Asia have not only historical community, geographic proximity to each other, common borders, but similarities in climatic conditions and economic way of life. Therefore, it would be advisable for these countries to solve the problem of cooperation concerning their joint production of various units using renewable energy technologies in remote rural areas, followed by the acquisition of these products for each of the countries.

Such an approach will ensure the promotion of advanced technologies in the field of renewable energy and the transition to a massive use of cheap renewable energy plants of relatively small capacity in each country. This will contribute to the solidarity of the countries of Central Asia, not only among themselves but also with the advanced countries of the world in the field of sustainable energy. With this approach, it would be possible in the future to create a single service center for construction, assembling and maintenance of these complex units. This will provide a synergetic effect for each country savings resources and budgets. For example, it is known that the development of solar energy is based on the environmentally safe production of solar grade silicon, including amorphous silicon, and organic solar cells as well. Kazakhstan has reserves of silicon. The republic established manufacturing facilities on this basis and a closed cycle for the production of solar cells (photovoltaics), as well as photovoltaic panels. In addition, the country produces wind turbines based on low-power vertical-axis turbine rotor. Moreover, Kyrgyzstan manufactures small hydropower stations ("OREMI" plant) and biological units of "Fluid" Public Fund with the reactor of 5 to 360 cubic meters.

It would be extremely beneficial if all other countries in Central Asia had the opportunity to use these facilities.

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