

GREEN ENERGY IN KAZAKHSTAN

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During the recent years, Kazakhstan has been positioning the renewable energy sources (RES) as one of the energy complex vectors. This is evidenced by the increased attention paid to the process of their implementation by the government and a number of business structures. However, the formation of a stable complex of the renewable energy sources in Kazakhstan stipulates significant financial and technological investments with the direct involvement of the government, without which the renewable energy remains at virtual zero.

The Renewable Resources. Kazakhstan possesses sufficiently large potential of renewable energy resources. For example, according to several studies, the gross hydro-potential of the Republic of Kazakhstan is roughly estimated at 170 billion kWh/year, technically possible to implement is 62 billion (economic - 29 billion, of them in use are 7.4 billion kWh/year). To date, the share of HES in the structure of generating capacities of Kazakhstan is only about 12.3%. This figure is significantly lagging behind the developed countries. Moreover, 68% of the hydroelectric power generating facilities have worked for over 30 years. The implementation of several largest HES projects will bring certain progress in the next few years: Moinak HES with the installed capacity of 300 MW, Kerbulak HES of 49.5 MW, Bulak HES of 68.25 MW. Despite the considerable potential for the development of large HES, Kazakhstan may well learn from the development of mini-hydro power stations, which were partially tested in the Soviet period. It is indicative that the economic potential of small hydro-power stations is estimated to reach around 7.5 billion kWh/year. On the basis of studies, the potential is possible to realize of at least 480 projects on small hydropower stations with 1.868 MW general introduction capacity (8510 GWh, average annual electricity generation capacity).

These cost and environmental concerns have been prompting many “green” energy initiatives. One initiative is for datacenters to either generate their own renewable energy or draw power directly from a nearby renewable power plant.

In turn, the wind energy potential in Kazakhstan is estimated to be from 0.929 to 1.82 billion kWh / year. Studies conducted in the framework of UNDP project on wind energy, show the presence of average annual wind speed at 6 m/s in some regions of Kazakhstan with a total area of 50 thousand square kilometers. This makes them attractive for wind power development. The most significant wind resources are in Zhungar corridor (17 thousand kWh / sq. m). It is notable that in March 2011 in Zhambyl region, Kazakhstan the implementation of major projects was launched, namely Zhanatasskiy (400 MW) and Shokparskiy (200 MW) wind energy systems (WES). The amount of investment in their construction will

account approximately \$1 billion. By 2014, the state-sponsored construction of the WES is assumed: in the Shelek corridor, the installed capacity of 51 MW, WES in the Zhungar gate (50 MW on the first stage), WES in Ulan area, East Kazakhstan (24 MW) and a few others. Potentially possible development of solar energy is estimated at 2.5 billion kWh / year. Despite the fact that Kazakhstan is located in the northern latitudes, the potential of solar radiation on the territory of the Republic is quite significant (accounting for 1.3-1.8 MW / h per 1sq. m. / year, the number of sunny hours per year is 2.2 - 3 thousand). In addition, solar energy can be used not only to generate electricity but also heat, which stipulates the possibility of introducing the point solar installations, including areas remotely located from the main electricity and heat supply.

Commissioning of the solar installations is envisaged by 2015 with the total capacity of 91 MW, mainly in Almaty region. At the same time, Kazakhstan is taking practical measures aimed at creating a manufacturing base to produce silicon and photovoltaic cells required for solar energy development. It should be noted that the use of bio-fuels possesses a certain reserve. In particular, up to 35 billion kWh / h of electricity and 44 million Gcal of thermal energy can be obtained annually through the processing of agricultural waste.

The paper provides a comprehensive empirical assessment of American stimulus policies aimed at renewable energy (RE) technologies.

Current Trends. In fact, the necessity to lower negative impacts of energy on the environment is the key factor of RES in Kazakhstan, as well as worldwide. In particular, in 2009, the data of the Ministry of Environmental Protection shows that emission of air pollutants composed 3.4 million tonnes, of which 85% are done by 43 large enterprises.

At the same time it is the share of energy that accounts for 87% of total national emissions of greenhouse gases, or 214.4 million tonnes of CO₂ equivalent. Recall that currently up to 85% of total electricity in Kazakhstan is produced by burning of fossil fuels, mainly, local coal, and of hydrocarbons to a lesser extent. About 10% of the country's emissions from stationary sources and the formation of a significant portion of toxic waste account on the enterprises involved in production of crude oil and associated gas. The overall reduction in greenhouse gas emissions from energy enterprises when using renewable energy sources can be from 500 thousand tons to 2.5 million tonnes of CO₂.

In addition to the environmental advantages, there are significant economic benefits. In particular, the use of renewable energy to generate and supply electricity to the existing energy networks may be cost-effective in energy-deficient regions of Kazakhstan. At the same time it is the renewable energy that can be the key factor in the development of remote regions. However, it is objective that the objects of renewable energy are much less profitable and more capital-intensive than the traditional ones. The private business is quite sceptical about the use of renewable energy sources, including due to lack of awareness and lack of experience in their use. This requires a selective approach to their implementation, while attaches particular importance to public sector support.

Despite the measures taken at the national level, the renewable and alternative energy sources (excluding large hydro power stations) are not developed in Kazakhstan. Until now, the Republic has not implemented a single major project in this area, despite several attempts of construction, in particular, of wind power systems. For example, according to the Ministry of Environmental Protection of the RK, the share of alternative energy sources to total electricity generation in 2010 amounted to only 0.03%, according to the Ministry of Industry and New Technologies of the RK it is 0.46% (including small hydropower systems). According to the Kazakh Research Institute of Energy named after S. Chokin the operating power of the renewable energy sources are mainly presented by several mini-hydro power stations. This is dramatically lower than the level fixed by the development of renewable energy in the developed world. For comparison, even in Russia, which is among the world's outsiders on the use of the advanced renewable energy sources, their share is fixed at 1% of total electricity production, while the share of thermal energy produced at their base is reaching about 3%. Given the energy produced by large hydroelectric power stations, the share of renewable energy sources in the energy of Kazakhstan is about 12.3%.

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