A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in part fulfilment of the Degree of Master of Science

Fate of Renewable Energy objects in Kazakhstan in new reality

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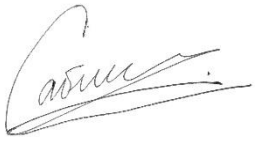
Authors declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.



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ABSTRACT OF THESIS

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Kazakhstan is the first CIS country introduced a policy of Renewable Energy development. It is challenging for a natural resource country. However, the government considers Renewable Energy projects as the instrument to reduce carbon emissions and set the goals to reach carbon neutrality by 2060. To achieve this goal, the Ministry passed relevant laws to attract RES investors and stimulate the local development of the RES industry. However, there are obstacles to developing a non-traditional energy resource generation industry in the energy system, gaps in the law, and population mindset. Moreover, the war in Ukraine put the country in a geopolitical crisis, creating additional problems for RES production. In this study, the author explores the development of renewable energy projects in Kazakhstan, considering the existing limitations. Such projects are important for national and international energy and climate policy and are worthwhile areas of attention for future research.

Keywords: Renewable Energy Sources projects, energy security, carbon neutrality, climate and energy policy.

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Fate of Renewable Energy objects in Kazakhstan in new reality

1 Introduction

Kazakhstan is rich in natural resources: coal, oil, gas, and uranium, and also there is a high renewable energy potential. Kazakhstan became the first country in Central Asia to introduce a renewable energy policy and actively develop non-traditional energy resources. It is a big challenge to adjust clean technologies in a natural resource-dependent country like Kazakhstan. However, the carbon-neutral orientated world policy and volatile oil prices make the government take a new direction to a green economy.

Kazakhstan promotes renewable energy projects at the legislative and technical levels to reach sustainability goals. The updated legislation helps to attract local and foreign investments to RES technologies. Today, there are all types of renewable energy projects, and the number is increasing annually. Despite the significant renewable energy resources and enthusiastic green aims, the current electricity generation from renewable energy facilities is less than 5%. However, some risks could significantly have an impact on competitive RES development.

Firstly, the depreciation of the energy system in the country limits the construction of RES plants to avoid a system crash. In addition, the extended power grid infrastructure requires a lot of investments. Secondly, the electricity loss makes the country cover the energy deficit from neighboring countries and puts electricity security at risk. Thirdly, low prices on energy tariffs make renewable energy projects unprofitable. Finally, the investment climate in Kazakhstan is changeable and uncertain, exacerbating conditions and attractiveness for investors.

Except for existing problems, just the country began to recover from the effects of the global COVID-19 pandemic, the war in Ukraine pushed Kazakhstan under economic and geopolitical risks, which has imposed additional problems on renewable energy projects.

At first glance, considering all inside and outside new challenges of the country, renewable energy could not be in policy priority. However, the country's energy system is too old, dangerous, and inefficient enough to satisfy local energy consumption. Moreover, to attract investments during the geopolitical crisis, Kazakhstan must assert itself in the global competitive market to attract investment. The research aims to learn the peculiarities of renewable energy transition in the resource-rich country in the new reality.

Objectives:

1. How renewable energy transition to renewable energy in Kazakhstan is proceeding?
2. What kind of financial resources of different banks exist and how the new conditions influence the Renewable Energy projects.
3. What kind of changes on the level of the state policy happened?

The thesis research is divided into five parts: the second chapter is the largest and is devoted to the Literature review. The first sub-chapter is about the Energy system in Kazakhstan, where the energy system is described, problems in the design, and the potential of renewable energy. The second sub-chapter is Legislation of Renewable energy in Kazakhstan, characterized by the accepted laws for developing renewable energy projects.
The third sub-chapter is about investment in the RES project. The third chapter is the methodology of the research. This chapter describes the conditions of taking the interview of experts. The fourth chapter is the results and discussion of expert interviews. The last chapter is devoted to a conclusion.

The research is based on the original findings to investigate the tendency of renewable energy development in Kazakhstan. This thesis will contribute to the analysis of renewable energy project development considering the country's current inside and outside energy crisis.

2 Literature Review

2.1 Energy system in Kazakhstan

Kazakhstan is one of the world's richest countries with natural resources (Karatayev 2014). According to the World Energy Council, Kazakhstan is one of the top twenty nations producing primary energy resources due to its significant fossil fuel reserves. The fossil fuel reserves: oil 3.9 billion t, coal 33.7 billion t or 2.4% of the world total, 3.5 trillion m3 of natural gas, and 4.8 billion t (BP 2021, IEA 2022). Despite high energy resource reservations, the country's electricity system is closer to an energy deficit (World Council 2022). The energy generation system and the problems are described in this chapter.

According to data from the System Operator (JSC KEGOC), Kazakhstan's installed power plant capacity was 23.9 GW as of January 1, 2022. The thermal power plants have consisted of the most significant part of the power energy generation (more than 82%), represented by coal (13.4 GW) and gas (6.0 GW) capacities. There are 68 actively working thermal power plants in Kazakhstan: 41 power plants provide thermal energy for the local population and industries, 15 gas turbines, and 6 gas pistons (Ibid). From the alternative energy resources: 47 hydroelectric power plants (HPP), 29 wind and 45 solar power plants (SPP), and 1 biogas plant (BGU) (KOREM 2021).

Based on the fuel generating types, the energy system in Kazakhstan is distributed into three regions: Northern and Southern energy zones joined by three energy lines with 500 kV, and the Western energy zone works independently (Figure 1) (Kazenergy Report 2021):

- The main oil and gas fields are located in the Western zone and gas is the central source of energy for local population. Part of the power station supply the energy only for oil and gas production and independent from the common electricity grid. Atyrau and Western-

Kazakhstan regions have direct connections with Russian energy centers (Astrakhan and Middle Volga).

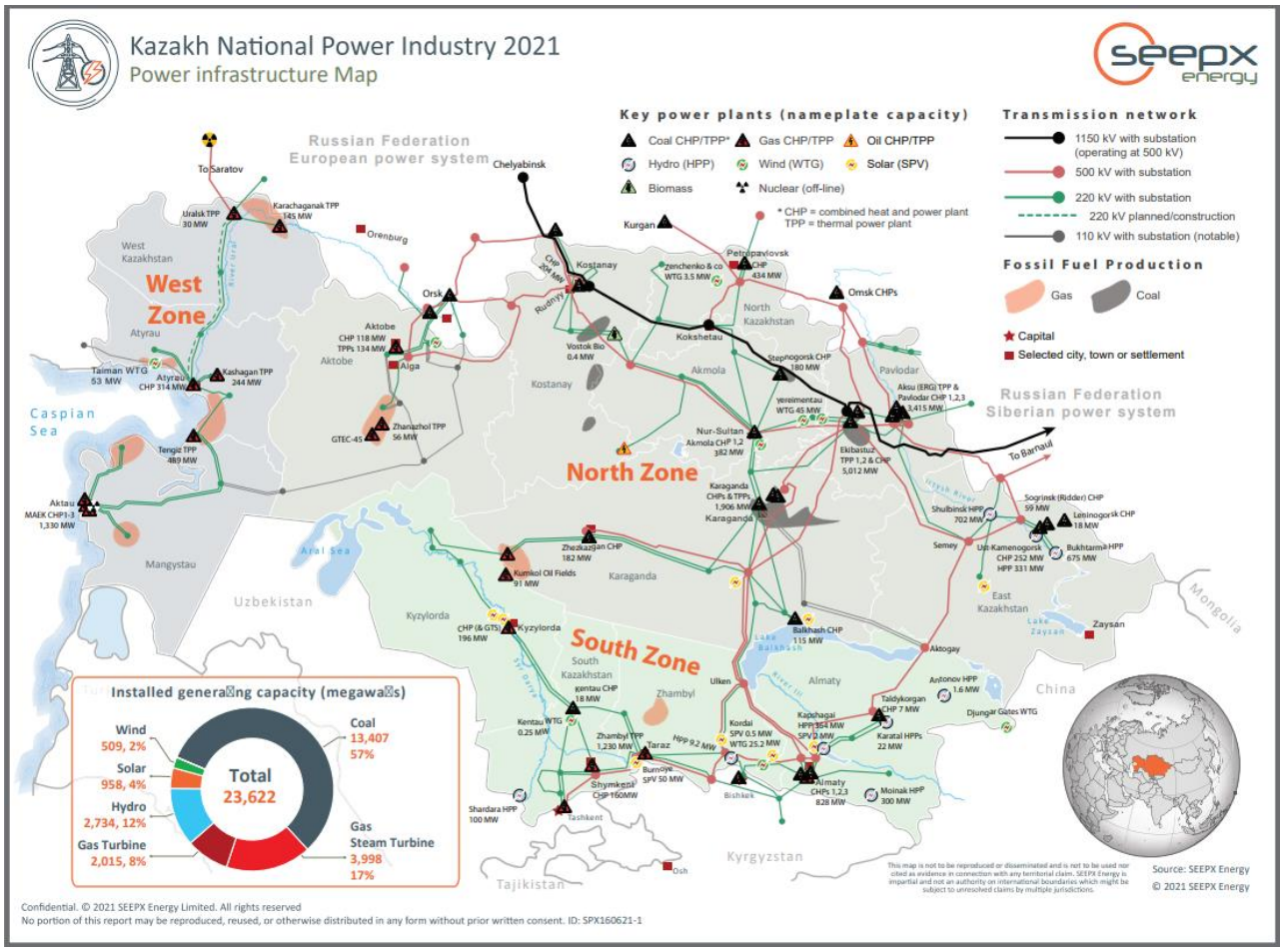
- In the Northern zone is concentrated 70% of generated energy power of the country. There are located the key coal deposits and the hydroelectric power station in the Eastern region. The advanced energy line (220-500-1150 kV) allows to deliver power to Southern Zone and exchange flows with the Unified Energy System (UES) of Russia (KEGOK).
- The southern zone is the most populated and less energetically developed. Also, the energy generation sources are the most diverse and represented by coal, gas, and hydro. Northern energy centers cover the energy deficit. A region is suitable for developing solar and wind energy sources. However, due to the underdeveloped energy sector in the region, there are difficulties in balancing renewable energy generators. Moreover, the reason for problems in the energy system is a power disbalance between Northern and Southern energy centers. Such as, the power of electro stations in the Northern zone is 15.89 GW, while the Southern zone`s station is about 4.2 GW. As a result of the various distribution, the power transit leads to power lines overload.

2.1.1 Problems in the energy system

Although Kazakhstan is an energy resource-rich country, there is a consistent energy deficit (Kerimray et al. 2018a). The reasons for the inefficiency of the energy system and what makes the country dependent on neighboring countries will be described in this chapter.

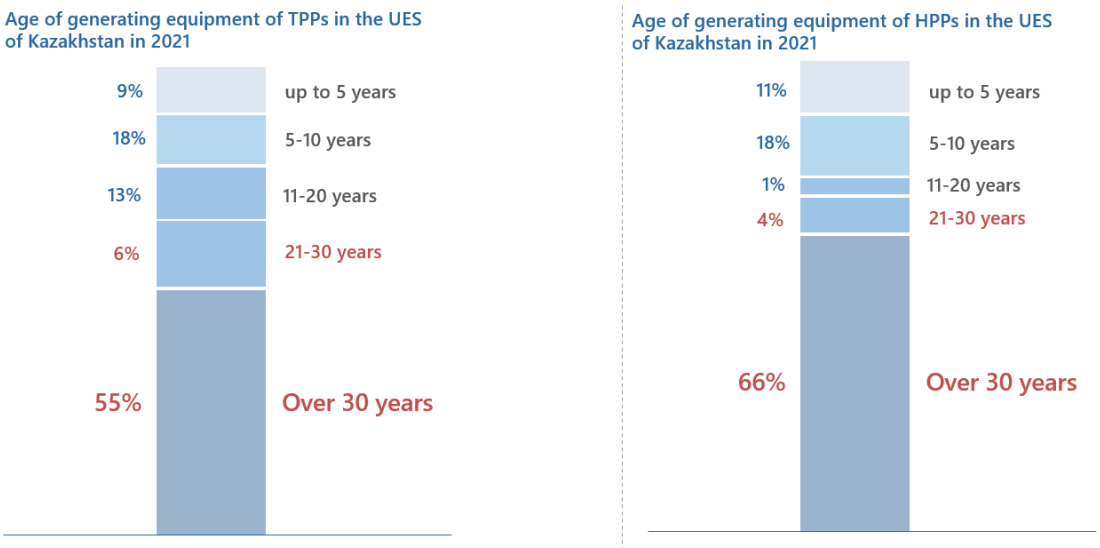
First the depreciation of the energy generating system (Akopiants 2011). Depreciation of heating systems constituted about 60% (KATO 2011). From Figure 2, it can be seen that about 10% of both types of generating equipment are less than 5 years; 18% work for 5-10 years; 1-13% operate for 11-20 years; approximately 5% of equipment have been exploited for more than 20 years and 60% are over than 30 years.

Figure 1. The energy infrastructure map.



Source: SEEPX Energy Ltd.

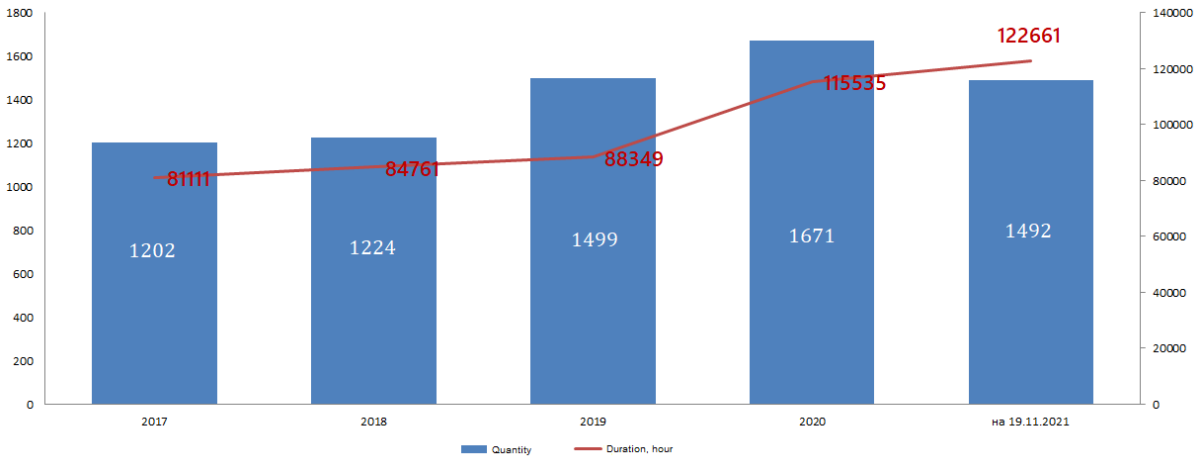
Figure 2. The ages of generating facilities.



Source: KEGOC

For this reason, the energy system has 30% losses (according to official statistics, about 17%) (Sarbassov et al. 2013). The heating network has 2-3 damages on every km, and this tendency escalates annually (Ibid). In 2020 the total volume of electricity transmission of AO "KEGOC" company made up 43.6 billion kWh, while REC delivered 43.32 billion kWh, the total energy losses constituted 7.51 billion kWh (Kazenergy 2021). The duration of emergency shutdowns as of 19.11.2021 exceeded the duration of emergency shutdowns for the whole of 2020. by 6% (KEGOC) (Figure 3).

Figure 3. Accident rate dynamics in UES of RK.



Source: Qazaq Green RES Association

Another reason of energy losses is associated with the extended power grid infrastructure (Table 1). Kazakhstan is the 9th largest countries in the world in terms of territory, and construction, as well as the transmission of electricity networks is relatively expensive (Assembayeva et al. 2018). To solve the disbalance of energy system in the country, Ministry of Energy considers to combine all three energy zones. However, even the shortest

connection between Atyrau-Aqtobe for 500 km requires a lot of investment (Kazenergy 2021). The length of national energy connection infrastructure of AO "KEGOC" is about 26,000 km with 500-220 kV with the regional electro companies' connections in 250,000 km with 220-10/6 kV (Ibid).

Table 1. The length of the network infrastructure of JSC KEGOC and part of REC

Voltage (kV)	**Length, km**	
	AO "KEGOC"	**REC**
1150 (in 500 kV mode)	1421.2	0.0
500	8288	0.0
330	1864.1	0.0
220	14694	1428.2
110	352.8	22857.2
35	44.1	27082.2
10	92.6	51315.9
6-0.4	18.7	47613.1

Source: Kazenergy 2021

The power system of Central Asian (CAPS) countries was constructed during the Soviet Union time and was built without considering the current national borders (Chikanayev 2022). After the collapse of the Soviet Union, due to a lack of confidence between nations,

the common system of Central Asia is currently not operating at its full potential (Ibid). However, the electricity network partially works in the energy interconnection of the CIS countries (Kerimray et al. 2018a). Therefore, those countries could sell or buy electricity from neighboring countries and, in that way, partially cover their demands (Kazenergy 2021). It brings neighboring countries economic benefits by saving the budget on the construction and maintenance of the electricity network (Ibid).

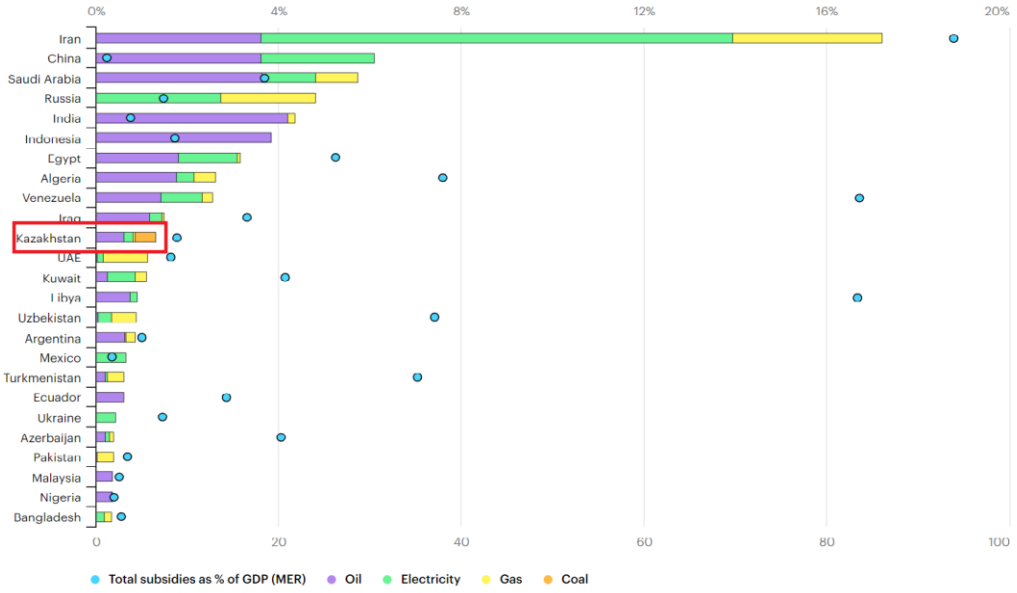
However, because of the high tariffs in Russia, Kazakhstan overpays money for electricity imports from Russia (Qazaq Green 2022). In 2021, the import of electricity to Kazakhstan from Russia constituted to 1 812 603.7 thousand kWh, export of electricity to Russia from Kazakhstan was made up to 1 326 596.2 thousand kWh (Ibid). Kazakhstan paid about 86.2 million USD, while exporting to Russia cost 20.1 million USD. Therefore, the difference of export-import electricity with Russia in 2021 is 66.1 million USD (Ibid).

As mentioned above, emergencies increase every year, and then it is necessary to cover these shortages with flows from neighboring countries (Kerimray et al. 2018a). Thus, Kazakhstan's energy dependence on neighboring countries will grow yearly (Ibid). Second, low tariffs compared to neighboring countries, due to which Kazakhstan overpays Russia for a partial energy shutdown (Qazaq Green 2022). Considering the current geopolitical situation, those issues raise questions about electric power security in the country (Ibid).

Because of the social significance of energy prices, the government deters the price increase on electricity tariffs (Atakhanova et al. 2013). The low prices on tariffs (OECD 2014) reduce the modernization of energy-efficient equipment and the payback period for energy-saving projects. If the established tariffs are equal to the cost of energy, then the producers have no budget left for the modernization of networks (Birol 2007). The deterrence of the prices is happened by energy subsidizing, which constituted approximately 6.6 billion USD or 3.6% of

GDP (2019) (Kazenergy 2021). According to the World Energy Agency, in 2019, Kazakhstan took 11th place in the volume of financing for energy resources. It became the first country in the world regarding the quantities of subsidies (Figure 4).

Figure 4. Subsidies for Domestic Energy Consumption in Oil and Gas Exporting Countries.



Source: Value of fossil-fuel subsidies by fuel in the top 25 countries, 2019 – Charts – Data & Statistics - IEA

2.1.2 Potential of Renewable Energy in Kazakhstan

The potential of renewable energy sources in Kazakhstan is constituted about 2 billion kWh/year. The theoretically feasible potential for usage in the production of energy is roughly 337 billion kWh/year, which is a substantial amount more than the nation's annual power consumption. At the same time, 322 billion kWh/year are generated by wind energy, 4 billion kWh/year by solar energy, and 11 billion kWh/year are generated by small hydropower plants. The technical potential of only wind energy is bigger than the amount of energy that is used in the country (Kazenergy 2021).

At the Summit in Paris in 2015, the government delegation of Kazakhstan signed Agreement to reduce greenhouse gas emissions by 2030 in the amount of 15% of the 1990 level as an unconditional and 25% as a conditional goal (Kerimray et al. 2018b). In the same year, the President of Kazakhstan Nursultan Nazarbayev approved those reducing greenhouse gas emissions goals as national commitments. The development of non-traditional energy sources is one of the ways to reach the climate goals. The government of Kazakhstan initiated the strategy to 2050, to reach the share of alternative energy in the local energy sector to 15% by 2030 and 70% by 2060 (Ministry of Energy).

In 2022 in Kazakhstan, there are 136 renewable energy sources (RES) with a total installed capacity of 2065 MW. The volume of electricity by RES facilities for 2021 constituted about 4,220.3 million kWh (Samruk-energy 2022). The increase in the total installed capacity of renewable energy facilities in 2021 (2010 MW) compared to 2020 (1634.7 MW) amounted to about 375.3 MW (primeminister.kz). Figure 5 there are illustrated the development of RES plants in the regions.

Figure 5. The development of RES projects in the regions.

Source: rfc.kegoc.kz

However, IHS Market report in their analysis that by 2050 the share of renewable energy in Kazakhstan is only 20%, which is due to the instability of renewable energy, difficulties in terms of high assessment in the energy system, availability of detections and costs, and also due to the discovery of results in identifying Nuclear power plant in the mid-2030s (PwC 2022).

2.1.2.1.Hydropower

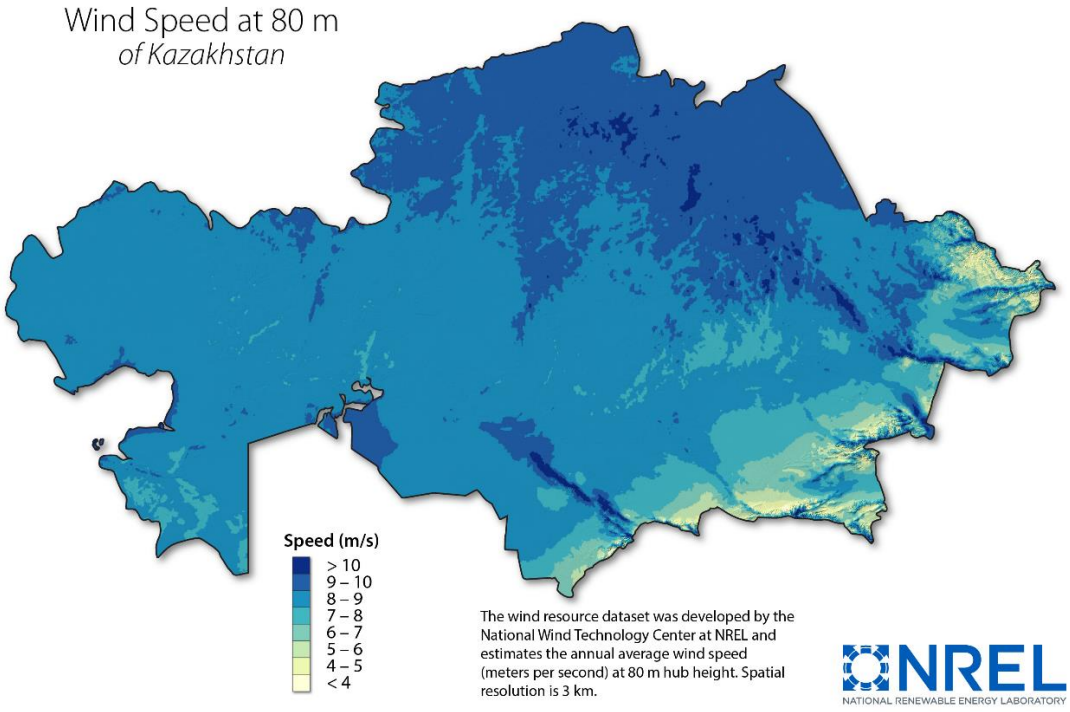
The potential of Hydropower in Kazakhstan is about 62 billion kWh. Hydropower constituted approximately 13% of the whole energy generation capacity. 15 large hydropower stations (>50 MW) (Natural Resource Governance Institute 2014) distributing relatively 7.78 TWh with capacity of 2.248 GW (ERDB 2011). The main hydropower stations amount to the Bukhtyrma (675 MW), Shulbinsk (702 MW) and Ust-Kamenogorsk (331.2 MW) stations are located on the Irtysh river, the Kapshagai (364 MW) station is on the Ili river, the Moinak (300 MW) station on the Charyn river and the Shardarinskaya (100 MW) station on the Syrdarya River (LLP 2018).

2.1.2.2.Wind Power

The steppe landscape in the country is relevant for wind energy generation, and the assessed wind energy potential for economic development is approximately 760 GW (UNDP 2011). In Figure 6, there is illustrated a map with the most wind potential regions. According to the map, the Northern part has the highest potential for wind energy development. Almost half territory of Kazakhstan is characterized by wind speed which is sufficient for energy production (7-8 m/s) (Figure 6), with the highest level of energy resources in the Fort Shevchenko (Caspian sea coast), Yerementau (Akmola region) and Korda (Zhambyl region) (Ibid). The locations with the strongest energy resources are in the Almaty region in the

Dzungarian Gate (17,000 kWh / m2), 600 km northeast of Almaty, close to the Xinjiang border, and the Chylyk Corridor 100 km east of Almaty (Karatayev and Clarke 2014)

Figure 6. The wind speed map in Kazakhstan.

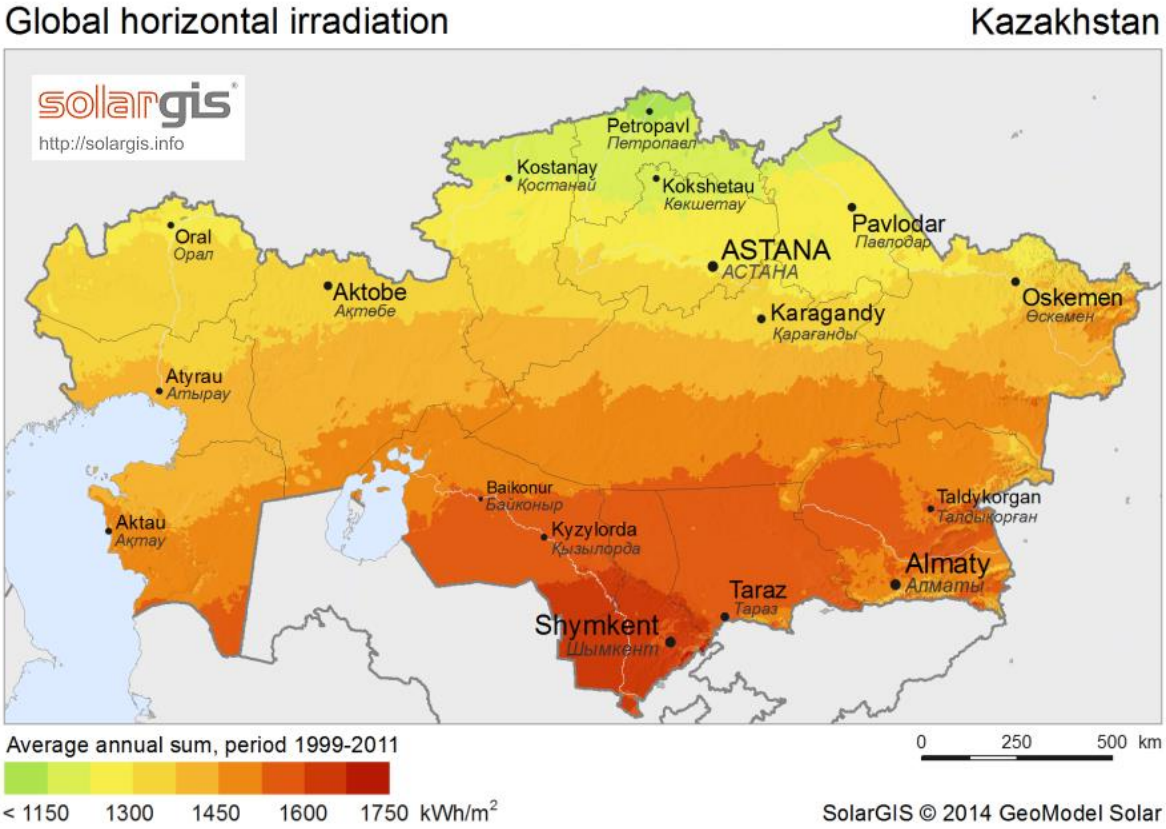


2.1.2.3. Solar Power

The territory of Kazakhstan has high level of insolation that could be exploited for solar power generation, especially the Southern part which have 2200 to 3000 hours of sunlight annually that amount to 1300 – 1800 kW/m^2 (KOREM.kz). It can be clearly seen on the Figure 7 where is identified the potential of solar energy development in the country. According to GEF-UNDP, only 10% of household in Turkestan region, including Shymkent city has solar energy potential equals to a large CHP plant with a capacity of 500-1000 MW (UNDP.org). The region is adoptable for solar photovoltaic (PV) and concentrated solar

thermal. According to KOREM, the electricity generation produced about 137.9 million kWh in 2018, this number is in a half higher than in 2017 (89.9 million kWh) (Kazenergy 2019).

Figure 7. The map of potential of solar energy in Kazakhstan.



2.1.2.4. Bioenergy

The agricultural land of Kazakhstan is about 76.5 Mha, the forest covers about 10 Mha, and 185 Mha is occupied by steppe grassland, which has a lot of biomass wastes that could be generated for bioenergy (Pala 2009). The potential of bioenergy is rated at 11.375 Mt of oil equivalent (475.52 MJ). This number equals 30% of the country's total energy consumption (Koshim et al. 2018). Although there is a high potential for bioenergy in the country, bioenergy generation is not popular among the population. Only one large biogas is in operation at Vostok village in the Kostanay region. The plant generates 3 million kWh of electricity annually (Karataev and Clarke 2014).

2.1.3 Doctrine of carbon neutrality of the Republic of Kazakhstan until 2060

The economy of Kazakhstan was damaged by the COVID-19 pandemic as countries of the entire world (Kazenergy 2021). In 2020, Kazakhstan had the worst recession in the last 20 years (Ibid). Because of the oil price volatility and continuous lockdown, the GDP of the country dropped by 2.6%, and this led to rising inflation (Ibid). In 2021, the Government designed for 3-years long anti-inflation program. On the base of the program, there are anticipated that the reforms will be directed at market economics and foreign investment stimulation, particularly in the energy sector (World Energy Council 2022).

The President of the country, Kassym-Jomart Tokayev, has noticed at the Council of Foreign Investors annual Plenary meeting that 60% of total foreign investment is over 60% in the non-resource sector (Aqorda). Therefore, climate change policy is the most significant challenge for the energy sector (Ibid). It means that the world trends stimulate Kazakhstan to develop green technologies.

Moreover, in 2023 European Union will introduce Carbon Border Adjustment Mechanism (CBAM) in Kazakhstan, which could significantly impact the export opportunities (EY). The country's economy is heavily dependent on the export of oil and gas, and the introduction of CBAM could influence the country's income (Doctrine 2021). The largest share of exports falls on the OECD countries: the European Union, South Korea, and Japan (Ibid). The Decarbonization policy has already brought some results, in 2019 the carbon emission decreased to 6% (Samruk-energy.kz).

One of the instruments to achieve commitments is to transit from coal to renewable energy to decrease emissions. The Doctrine to reach carbon neutrality in 2060 identifies the common view and strategic course of the state policy for the transformation of the economy. The doctrine of decarbonization considers six sectors: energy, industry, agriculture, transport,

housing, communal sector, and waste handling. The Doctrine provides for the replacement of obsolete equipment with "green" technologies instead of high-carbon ones. Such a total replacement will lead to the fact that the current 157 Mt CO2-eq. up to 0.1 Mt CO2-eq. in 2060. The remaining emissions are expected to be reduced by carbon capture and storage technologies. Table 2 represents how according to the Doctrine, carbon emission is going to be decreased. The total greenhouse gas emission will be reduced from 380 t in 2025 to 0 t in 2060.

Table 2. Target indicators for emissions and removals of greenhouse gases, Mt CO2-eq. (% of total emissions):

Types of emissions	**2025**	**2030**	**2060**
Greenhouse gases from the production and combustion of fossil fuels	314	230	10
GHGs from fossil fuels per capita (tCO2eq)	16	11	0
Other greenhouse gas emissions	78	78	67
Total gross greenhouse gas emissions	392	308	77
Absorption (-) / emissions (+) in land and forestry	-12	- 20	- 45
Other greenhouse gas absorption (-)	0	0	- 31
Total net greenhouse gas emissions (carbon balance)	380	288	0

Source: Doctrine of carbon neutrality by 2060

Most foreign partner companies have started their policy of climate mitigation. The total Investment to gain carbon neutrality for 40-year period from 2021 to 2060 at approximately $666.5 billion. Almost half of the Investment (46%) is required in the energy sector: 305

billion USD. The Investment in decarbonization is expected to be made by private and public industries, and the direct contribution of government is relatively low. The current investments in RES projects from local and foreign companies (partners) are represented in the third sub-chapter about Investment.

2.2 Legislation of Renewable Energy Sources in Kazakhstan

To achieve sustainability goals, Kazakhstan 2009 adopted a feed-in tariff system (Law of support Renewable Energy). The government adjusts the mechanism of the international regulation of feed-in tariffs (Cox and Esterly 2016) by allowing renewable energy investors to have a fixed tariff for all their produced electricity (Law of support Renewable Energy). Investors of RES projects could receive higher pay (36.72 – 17.72 tenge/kWh appropriately) than traditional energy centers (about 7 tenge/kWh) (Akayeva K. 2019). To manage the feed-in tariff system, the Renewable Energy Financial Settlement Centre makes the agreement on green electricity purchasing.

The Financial Settlement Centre (FSC) plays the role of intermediary between RE project investors and thermal power stations. The FSC, based on the Power Purchase Agreement (PPAs), concludes that, according to law, purchase all produced electricity. The FSC is the secondary energy power transition company KEGOC (Law of support Renewable Energy). To guarantee investors to keep the prices on renewable energy tariffs, the FSC signs PPAs with the investors of alternative energy projects for a fifteen-year duration. It should be noted that this law is spread only to investors that conclude PPAs with the FSC (Law of support Renewable Energy).

The fixed tariff is annual indexation according to the exchange rate of the National currency to foreign currencies (Law of support Renewable Energy). This commitment gives financial security in the instability of the currency in the time of geopolitical and economic turbulences

in the country (EY 2013). Renewable Energy investors receive financial incentives in connection. For example, during the line construction, the investor covers the minimum connection prices (the line connects the renewable energy installation). While the network company pays for the enforcement of the network line necessary during the additional connection of energy sources. Moreover, the payment for access to the network for the alternative energy sources is free (Law of support Renewable Energy).

2.2.1 The transition to auctioning

Despite the beneficial conditions for investors, the lack of flexibility in the systems blocks investment development and attraction. In 2015, the network companies rejected to connect of new objects because of technical and administrative limits (Kazenergy 2017). For process improvements, in 2018 Ministry of Energy, with the initiation of the UNDP-GEF program, introduced the system of the auction for improvement of climate investment (UNDP).

The mechanism of action allows participants to conquer based on 'equal, honest and open competition' (Ministry of Energy). The Ministry of energy, in cooperation with the Ministry of ecology, makes the full location assessment which provides the possible technical risks which influence the project price (QazaqGreen 2022). Annually the Ministry of Energy publishes the schedule of auctions by the type, power capacity, and region (Ministry of Energy).

The government limits support for the number of renewable energy projects annually and by the regions (Kazakh Minister of Energy 2017). In this way, the Ministry of Energy manages the stable work of the energy system and prevents system crashes in some regions. For instance, there is a high potential for solar energy in Southern Kazakhstan, but the shortfall in maneuverable capacity and depreciation in the energy system. The larger quantity of solar PV than the system could lead to the unstable work of the system (Kazenergy 2017).

Moreover, the system gives stability to businesses. Successful candidates agree on PPAs with the Financial Settlement Centre (Law of support Renewable Energy); the long-term agreement guarantees that the renewable energy plants will be paid off at the auctioning cost for 15 years (Kazakh Minister of energy 2017).

2.2.2 The results of the reform

There were planned 5 auctions: 2 for the small and 3 for the large. One project was canceled because of not enough participants in the auction (Hydrological large projects). In the auction, there had been participated 24 local companies. According to the public results from the Ministry of Energy, in 2021, the auction had posted about 200 MW of power capacity: Wind Energy 50 MW, Solar Energy 20 MW, Hydro energy 120 MW, Bioenergy 10 MW. The demand exceeded the supply three times. The projects of solar energy and hydro energy had exceeded the requests three times, but Wind Energy overpassed the expected number 10 times (Ministry of Energy).

According to the auction results in 2021, there had been a tendency of auction price reduction for projects: Wind Energy 34.6%, Solar Energy 24.11%, small Hydro energy 1.31%, Bioenergy 0.03%. This index proves the effectiveness of auctions (Ministry of Energy). For 4 years, 196 companies from 12 countries participated in the auction. Since 2018 the auction prices decreasing every year. For example, in 2020 (12.49 KZT/kWh*h), the prices of solar projects decreased by 64% in comparison to 2018 (34.61 KZT/kWh*h) (Table 3). The prices of wind energy projects declined to 30% in two years, while the costs of hydro reduced to 19%. This tendency is represented on the figures 8 and 9.

Table 3. Decrease in auction prices.

	2018	2020	Decline dynamics
Solar, KZT/kWh*h	34.61	12.49	-64%
Wind, KZT/kWh*h	22.68	14.08	-30%
Hydro, KZT/kWh*h	16.71	13.48	-19%

Figure 8. Auction prices for solar power plants, KZT/kWh*h (excluding VAT)

Figure 9. Auction prices for wind power plants, KZT/kWh*h (excluding VAT)

Source: Ministry of Energy of RK, KOREM

However, although renewable energy-generated electricity is decreasing, the current price is still insufficient compared to the cost of traditionally generated electricity (Akayeva 2019). In 2019, the price of the coal-fired power station in Ekibastuz GRES-1 with a 4,000 MW capacity sold up to 5.67 KZT/kWh (Kazakh Minister of Energy 2019). It means that the cost of RES project generation is still necessary to reduce to make it competent compared to coal-fired plant energy.

Currently, the auctions on RES projects are going in Kazakh national currency – tenge. The volatility of the Kazakh national currency is a risk for investors. According to the type of Renewable energy projects, there are specific deadlines: the construction for solar energy plants is going for 24 months, for wind power plants for 36 months, for hydro electro stations for 60 months. The facilities are instruments purchased abroad in foreign currency. The legislation proposes a tariff indexation mechanism to cover the currency volatility cost. The agency considers 30% of the impact of inflation and 70% of the impact of exchange rate volatility against the US dollar.

Once a year (October 1), projects with foreign loans are indexed, taking into account inflation and the exchange rate of the national currency to convertible currencies and starting after the project's commissioning. According to the investors, this indexation mechanism does not cover the risks investors. Especially during the current geopolitical crises and currency instability when the prices of technologies are increasing (Ministry of Energy).

2.3 The Investments

The first time the stimulation of alternative energy development was mentioned on the state level in the “About the Concept of transition of the Republic of Kazakhstan to sustainable development for 2007-2024”: «stimulating the rational use of hydropower resources, solar and wind energy facilities and other renewable resources and alternative energy sources». In

this decree of President Nursultan Nazarbayev, it was mentioned to develop an implementation plan for the concept realization period 2007 – 2009.

In 2009 Kazakhstan became the first country among post-Soviet Union countries which introduced renewable energy policy. Kazakhstan set a goal in the program "Strategy 2050" (2012) to reach 50% of total energy generation from renewable energy in 2050. In the program of "Green Economy" (2013) was announced that ¾ of investment will be allocated to the energy efficiency and renewable energy projects realization. However, it should be noted that all renewable energy projects are supported by investments and are not financed from the republican budget (Assembayeva et al. 2018).

Foreign investment is provided in the form of financial concessions. In the form of foreign development banks or funds, financial institutions provide products that mitigate climate change at a reduced market price (World Bank 2021). Loans, grants, and, to a lesser extent, equity investments are the most typical financial products used to offer concessional finance (Ibid).

The European Bank for Development and Reconstruction (EBDR), Asian Development Bank (ADB), and World Bank are the most popular development banks which invest in different projects in the country. The information of the investments had been taken from the official websites, except Word Bank. The staff of the organization provided the data of World Bank after contacting the official email (astana_office@worldbank.org). The budget of the projects had been presented in different currencies: EUR, USD, and KZT. To receive the same currency, I converted it to USD and adapted it to the year's exchange rate when the project was active on the website: https://fxtop.com.

2.3.1 Banks od Development

2.3.1.1 Eurasian Development Bank of Reconstruction and Development

The EBDR was founded to assist countries in reconstruction after the post-Cold War era. Since its establishment, the EBRD's main principle has been 'market-oriented economies and the promotion of the private and entrepreneurial initiative.' This guiding principle is still actual in the projects and will remain so despite new difficulties and the inclusion of additional nations into the EBRD community (EBDR). The EBRD works in Kazakhstan since 1992 and realized about 295 projects in different sectors: agribusiness, natural resources, finance, insurance, transport, equity etc. Green economy transition is one of the priority directions which include financing alternative energy and energy-efficiency projects.

The first project was in 1998 in Karaganda city; the program included the repair and improvement of the energy generation and power network. The aims of the project were lowering financial and technical losses, enhancing environmental performance, and increasing the efficiency of power generating and delivery systems. On the last project, the EBRD financed the construction and development of a wind power plant in the Akmola region (Central Kazakhstan) with a total installed capacity of 100 MW and the building of a double-circuit 110kV line to connect to the 220kV Shygys substation (EBRD). The project aims to increase renewable energy generation and decrease carbon intensity. The provision of the loan had constituted KZT 19.3 billion or USD 44.83 million. For 30 years of cooperation, there was allocated about USD 836 million only on sustainable energy projects; 30% of the budget has constituted the share on renewable energy projects (Chart 1).

The EBRD is the biggest investor in the energy projects (Koch and Tynkkynen 2021) in Kazakhstan and has already realized about 32 programs (Table 4), which is approximately 8% of all development projects. Of all realized projects, only 25 were completed (or still

active), 7 were canceled. 12 projects are renewable energy, 13 projects for supporting energy efficiency. In 2016, the EBRD was considered for financing the first renewable energy project to construct and develop the solar power energy station with 29 MW energy capacity in the Zhambyl region, Southern Kazakhstan; the project was canceled. However, in 2018 the project of constructing a solar energy plant with a capacity of 30MW in the Kyzylorda region, Southern Kazakhstan, was launched and completed successfully. Since 2016, the largest share of projects has been dedicated to the construction and development of renewable energy plants.

The allocated budget was invested not only in construction, development, or modernization projects but also in technical assistance. The technical assistance included the amendments in the legislation, project management, and promotion. The Kazakh government, together with EBDR, analyzed existing obstacles, different mechanisms, and legislation to develop the most favorable conditions for renewable energy development. The EBDR provided technical assistance in the feed-in tariff introduction to the legislation by providing modeling and mechanism. The organization has also supported the amendments in the legal and financial structure, such as Power Purchasing Agreement (PPA). New conditions and updated legislation could attract new national and international investors.

Table . The Eurasian Bank of Reconstruction and Development

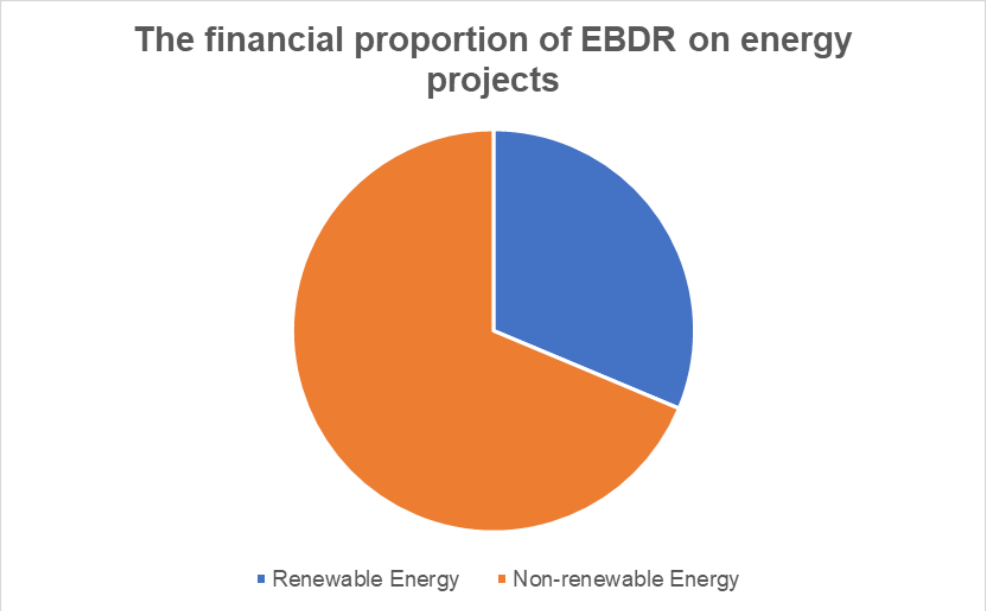
Project name	Initiation Year	RE/non-RE	Energy type	Financing type (grant/loan)	Budget (USD)	Acitivity
Almaty Power Consolidated Company Corporate Loan	1997	non-re	energy efficiency	loan	130,000,000	cancelled
Karaganda Power	1998	non-re	energy efficiency	loan	40,000,000	complete
KEGOC Power Transmission and Rehabilitation Project	1999	non-re	energy efficiency	loan	45,000,000	complete
KEGOC: North-South Power Transmission	2003	non-re	energy efficiency	loan	60,000,000	complete
Pavlodar Energo	2007	non-re	energy efficiency	loan	30,000,000	complete

KEGOC Modernisation II	2008	non-re	energy efficiency	loan	187,700,000	complete
Aktobe CHP rehabilitation	2009	non-re	energy efficiency	loan	40,000,000	cancelled
KEGOC Osakarovka Restructuring Loan	2011	non-re	energy efficiency	loan	166,000,000	complete
Shardara HPP Modernization Project	2012	non-re	energy efficiency	loan	78,600,000	complete
CAEPCO Energy Efficiency Project	2013	non-re	energy efficiency	loan	141,000,000	complete
Kyzylorda Electricity Distribution	2014	non-re	energy efficiency	loan	24,800,000	complete
Samruk-Energy transformation loan	2016	non-re	technical assistance	loan	177,168,947	complete
Gas Network Modernisation	2016	non-re	energy efficiency	loan	59,056,315	complete
Kulan Solar Power Plant	2016	re	construction, development	loan	24,000,000	cancelled
KAZREF - Nomad Solar Power Plant	2018	re	construction, development	loan	29,349,646	complete
M-KAT Green Solar Power Plant	2018	re	construction, development	loan	135,520,900	complete
SES Saran	2018	re	construction, development	loan	52,700,000	complete
Chulakkurgan Solar	2018	re	construction, development	loan	32,000,000	complete
Risen Solar	2018	re	construction, development	loan	22,000,000	complete
KAZREF - OZhT Distribution Network Upgrade	2019	non-re	energy efficiency	loan	13,740,000	complete
KAZREF - KZh Distribution Network Upgrade	2019	non-re	energy efficiency	loan	13,740,000	complete
Karaganda Solar Power Plant	2019	re	construction, development	loan	24,500,000	complete
KAZREF - Universal Energy Zhangiz Solar	2019	re	construction, development	loan	12,000,000	cancelled
KAZREF - Zhanakorgan Solar 1	2019	re	construction, development	loan	7,000,000	cancelled
Almaty Region Gasification	2019	non-re	energy efficiency	loan	26,035,594	complete
Kazakhstan Renewables Framework Phase II	2019	re	energy efficiency	loan	343,500,000	cancelled
KazTransGas: KazTransGas Solidarity Loan	2020	non-re	energy efficiency	loan	274,237,505	cancelled
VISP - Samruk-Energy Loan	2020	non-re	technical assistance	loan	55,964,370	complete
Karaganda Solar Phase II	2020	re	construction, development	loan	11,540,000	complete
KazRef II - Zhanatas Wind Farm	2020	re	technical assistance	loan	25,283,428	complete
Integrated Approach MREK II	2021	non-re	technical assistance	loan	11,634,238	complete
KAZREF II - Borey Wind	2021	re	construction, development	loan	44,830,000	complete
Total					**836,386,077**	

Source: EBDR.

For better visualization, the characteristics were highlighted by colors: the first and last lines – gray; non-renewable – pink; renewable – blue; completed projects – green; canceled projects – yellow.

Chart 1. The financial proportion of EBDR on energy projects



2.3.1.2 Asian Development Bank

The second largest investor is the Asian Development Bank. The ADB was established in 1966 as an Asian financial institution to help the poorest countries in food production and rural development. Then the aim has grown to 'achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific while sustaining its efforts to eradicate extreme poverty (adb.org). The cooperation of ADB with Kazakhstan started in 1994. For this period, ADB realized 198 projects in different sectors, and 14 of them are dedicated to energy division (Table 5).

The first project was realized in 1995 in Almaty city – the improvements of a power station. The financial help was allocated in the form of a grant, and the budget was made up to USD 556 million. The total budget of all projects constituted about USD 564,5 million. The last

project was launched in 2021, which was the investment of the local company's development in the construction and production of electricity from alternative energy sources (baikonyr-solar.kz). The project is co-financed with the EBRD and allocated about USD 11,5 million loans in tenge equivalent.

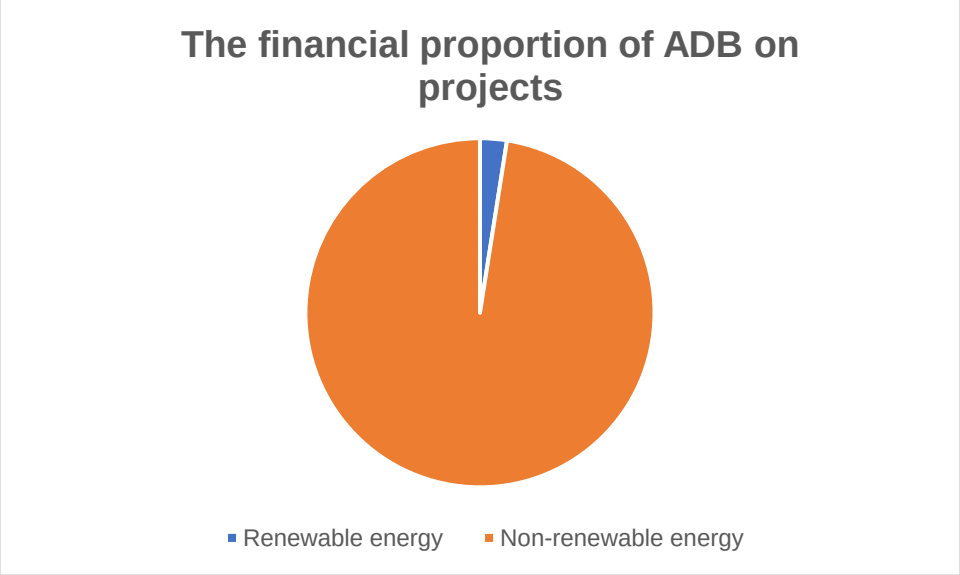
Interestingly, after completing the first project in 1995, the following energy projects were started only in 22 years. However, since that time, the ADB has constantly been realizing the projects almost every year. In comparison, to the other two banks, except for loans, the ADB allocates the financial grants. The general proportion of investments constituted USD 576 million. The share of renewable energy projects is made up 2.5% (Chart 2).

Table 5. The Asian Development Bank projects in energy

Project name	Initiation Year	RE/non-RE	Energy type	Budget US$	Financing type (grant/loan)
Rehabilitation and Environmental Improvement of the Almaty No. 1 Heat and Power Station	1995	non-re	Technical Assistance	556,000,000	grant
Samruk-Energy Green Transformation	2017	re	Technical Assistance	225,000	grant
Regional Cooperation on Renewable Energy Integration to the Grid	2017	re	Technical Assistance	1,500,000	grant
Fostering the Development of Renewable Energy	2017	re	Technical Assistance	1,000,000	grant
Kazakhstan Gas Sector Transformation Initiative Support	2019	non-re	Technical Assistance	225,000	loan
Preparing Sustainable Energy Projects in Central Asia	2019	non-re	Technical Assistance	175,000	grant
Gas Sector Development in Kazakhstan	2019	non-re	Technical Assistance	225,000	grant
Regional Cooperation on Increasing Cross-Border Energy Trading within the Central Asian Power System - Provision of Solutions to Bottlenecks to the Regional Power Trade	2019	non-re	Technical Assistance	3,500,000	grant
Total Eren Access M-KAT Solar Power Project	2019	re	construction, development	39,860	loan
Supporting Renewable Technology-Inclusive Heat Supply Legislation	2020	non-re	Technical Assistance	300,000	loan
Advanced Gas Metering Project	2021	non-re	energy efficiency	101,046	loan
Baikonyr Solar Power Project	2021	re	construction, development	11,500,000	loan
Total				**575,990,906**	

For better visualization, the characteristics were highlighted by colors: the first and last lines – gray; non-renewable – pink; renewable – blue; loans – green; grants – yellow.

Chart 2. The financial proportion of energy project by the Asian Development Bank



2.3.1.3 World Bank

The World Bank is the third largest investor in Kazakhstan. The World Bank was established in 1944 as the International Bank of Reconstruction and Development, but then the organization was associated with 5 institutions and changed its official name to the World Bank. The first mission of the Bank was to assist countries in reconstruction after World War II; then, the aim was changed from reconstruction to development. The Bank played an important role in fighting climate change, pandemics, and different social crises in the countries. Currently, it could help the country members to build sustainable development.

The cooperation of the World Bank in Kazakhstan started in 1992. The first project in the energy sector was realized in 1994. The Bank provided technical assistance in the scheme of Petroleum Technical Assistance and loaned USD 15.70 million. The loan of USD 23 million was allocated to the improvements of energy efficiency and technical assistance. For 30

years, the Bank loaned about 55 projects in the country, and 7 of them were dedicated to energy development (Table 6). All projects facilitated the non-renewable energy efficiency improvements.

Table 6. Energy projects by World Bank.

Project name	Initiation Year	End year	RE/non-RE	Energy type	Budget USD	Financing type (grant/loan)
Petroleum Technical Assistance	1994	2000	non-Re	technical assistance	15.70 million	loan
Uzen Oil Field Rehabilitation	1997	2007	non-Re	energy efficiency	109.00 million	loan
Electricity Transmission Rehabilitation	1999	2009	non-Re	energy efficiency	140.00 million	loan
North-South Electricity Transmission	2006	2011	non-Re	energy efficiency	100.00 million	loan
Moinak Electricity Transmission	2010	2013	non-re	energy efficiency	69.00 million	loan
Alma Transmission	2011	2015	non-Re	energy efficiency	200.90 million	loan
Energy Efficiency	2013	2022	non-Re	energy efficiency+technical assisstance	23.06 million	loan
Total					**657.66 million**	

As we can see from the results, the most significant number of programs in energy sectors had been realized by the EBRD, which played an essential role in the energy development sector. The renewable energy projects started being launched in the 2016 (EBRD) – 2018 (ADB) years and the number of such projects is increasing annually. The ADB, except for loans, allocated the grants to sustainable energy improvement programs. The proportion of financial support on projects dedicated to renewable energy development is less than for energy efficiency projects (EBDR: 30%; ADB: 2.5%). However, it could be explained that the policy on renewable energy support was launched later than the Banks started their cooperation in Kazakhstan.

2.3.2 The local investment

The Fund of Kazakhstan`s government JSC Samruk-Kazyna was based in 2008 with a mission to improve the national welfare. The group of companies is included the industries of oil and gas, transport-logistic, chemical and nuclear, mining and metallurgical complex, energy, and real estate. The asset amount of the Fund is constituted approximately 69 billion USD. The Fund actively started the decarbonization policy and considered the RES project as the instrument to diversify business (Koch and Tynkkynen 2021). During 2018-2019, the approach helped to decrease carbon emissions by almost 4%.

Today, the energy generation from alternative energy in 2020 constituted 8.7%. Since 2013, a number of RES projects have been realized: JSC Moinak HES with a capacity of 300 MW, the first wind station with a capacity of 45 MW, solar station with 2 MW. Before 2026, JSC Samruk-Kazyna is planning to implement five other projects, which are represented in the table 7.

Table 7. The RES projects by JSC Samruk-Kazyna

Name of project	**Capacity, MW**	**End year**
WES of Shelek corridor	60	2022
WES in Yerementau city	50	2022
Contr-regulated HES in the river Ili	40.5	2026
Construction of HES in Almaty region	70.1	2026
Modernization of HES of JSC AiLES	50	2025

Source: JSC Samruk-Kazyna

JSC Samruk-Kazyna, in collaboration with the other foreign investors, realized or planned to construct green energy projects. For example, in cooperation with EBRD, both organizations will build wind and solar stations with a power capacity of 1 GW. The other partner is the Mubadala subsidiary - Abu Dhabi Future Energy Company (Masdar) which signed both sides' memorandum about the research and development of renewable energy sources in Kazakhstan.

2.3.3 Foreign Investments

International companies also contribute to the renewable energy sectors. Such as, in 2017, Total Eren became the first international company to start developing green energy projects in Kazakhstan. In 2019, Total Eren launched the building of two photovoltaic solar power plants in the Southern region: Nomad (28 MWp) and M-KAT (100 MWp).

The world oil and gas companies started to diversify their business through developing renewable energy projects. For example, Arm Wind LLP, the daughter company of Italian oil and gas company Eni, started the construction of the second wind farm Badamsha 2, in the north-western region with a capacity of 148 MW. The wind turbines of Badamsha 2 are currently the largest ones installed in Kazakhstan. The size is rotor diameter 158 meters, hub 101 meters, and power of 4.8 MW each. They are anticipated to produce up to 200 GWh of energy annually, which is enough to power about 37,000 homes and save 173,000 tons of CO_2 annually.

The construction of the first wind project, Badamsha 1, was finished in 2018 with a capacity of 48 MW. The joint agreement of operation was signed with General Electric (GE) and the

Kazakhstan Ministry of Energy. In March 2020, Badamsha 1 began its commercial manufacture.

The Russian gold mining company Polymetal in cooperation with RES Association 'Qazaq Green' are planning the construction of the first solar power plants with a capacity 39.6 MW and one gas mobile station with an installed capacity of 40 MW to stable production of solar stations (Qazaq Green, 2022). The project is planned to be realized in Abay and Kostanay regions in 5 years and is expected to produce more than 80 MW of electricity per year. The total investment is constituted more than 90 million USD.

3 Methodology

The data in this qualitative study has been collected by interviews with different experts from the energy sector between June-July of 2022. The participated interviews are from international, national, and local levels in the renewable field or energy category. Participants were chosen for the interview based on several factors, including expertise in the energy field, knowledge of legislation and other documents, and how they operate (or don't) in practice.

The questions of the interview have a familiar character; the aim of the questions was to learn the opinions of experts. The focus of the interviews was on the interviewee's perception of how the world energy crisis will have an impact on the RES projects in Kazakhstan and their expectations of the development of this sector in the country. Taking into account the researcher's fluency in Russian, the interviews were conducted in that language. The interviews have been carried out both personally and digitally via the "Zoom" software and recording by this app. The interviews were conducted in length for about 30 minutes.

The participants represent one organization in energy sectors: the Ministry of Energy, an academic worker at British Business University; an advocate with experience in energy legislation in Central Asia; entrepreneurs in the renewable energy field; and a practical engineer in a National Engineering company (Table 8).

Table 8. The detailed information of interview participants

Name	Organization	Occupation
Speaker 1	Ministry of Energy	Head of the Low-Carbon Development Department of the Department of Climate Policy and Green Technologies
Speaker 2	Qazaq Green Asocciation	Chairman of the Board
Speaker 3	Henley Business School	Vise Dean, Professor Director of the Centre for Euro-Asian Studies
Speaker 4	GRATA International	Advocate, Partner The author of articles about energy legislation in Central Asia
Speaker 5	Central Asian Renewable Energy Resources LLP	CEU & Co-founder
Speaker 6	SolarWay	CEU & Co-founder
Speaker 7	National Engineering Company	Senior Engineer

Despite the relatively small number of interviewees, it was allowed to come to data congestion, which means that it is evident to the researcher that additional data was unlikely to produce any new conclusions. Therefore, data from interviews supplement data analysis for a thorough understanding of renewable energy policy and perspectives from several angles.

4 Results

4.1 The reasons to develop RES in Kazakhstan

In the beginning, the participants were asked the question that despite Kazakhstan being rich in energy resources, why is Kazakhstan needed to develop renewable energy sources? The experts named different reasons for renewable energy development. The first is national

obligations under international agreements like the Paris Agreement. The second is the energy deficit in Kazakhstan.

Speaker 5: “We are rich in resources, but these resources do not provide us with electricity, and this is a fact. We are rich in gas, but there is a shortage of gas in the country. At the moment, new gas pipeline branches across the country are being built, but gas exports from Turkmenistan are being considered. We export it completely abroad”.

As it was mentioned in the literature review, Kazakhstan is an energy resource country but experiences an energy deficit. This is due to several reasons. First, because of history, the energy system of Central countries was designed without considering the current borders (Chikanayev 2022). Currently, this energy system does not work a full capacity and causes an overload of the system. For example, in January 2022, there was a shut down in the power system, and the population of three countries of Central Asia (Kazakhstan, Uzbekistan, and Kyrgystan) was left without electricity for a few hours (Qazaq Green).

Second, because of the depreciation of the energy system, Kazakhstan has a significant loss in the energy system (about 7.51 billion Kwh every year). Moreover, the population, as well as electricity consumption, is growing every year. Even during the lockdown of the COVID-19 pandemic, electricity consumption was on the rise. Consequently, the number causes overload and crush accidents in the system. Renewable energy projects could balance the energy system and decrease carbon emissions.

The following reason for developing RES project in Kazakhstan is the investment attractiveness in the country. From the Investment chapter, we can see that the Banks of development make the greatest investment to develop non-traditional resource energy projects. Since 2017, investment from business corporations has also actively participated in

the green investment. The local oil and gas companies joined the RES project development investment. The number of these Investment projects is increasing every year.

The President of Kazakhstan Kassym-Zhomart Tokayev, in his speech at the 34th plenary meeting of the Council of Foreign Investors, noted the importance of developing renewable energy projects for developing the country's competition and improving the investment climate (Aqorda).

Speaker 1: “Kazakhstan cannot develop outside the whole world and be excluded not only in terms of the economy and in terms of other trends, including green trends. All this is interconnected, and climate issues have long become issues of the economy and economic development in general, so now that almost all financial institutions have refused to finance investment projects related to coal or gas, then, accordingly, Kazakhstan’s refusal to develop renewable energy sources will simply lead to Access to these financial resources will also be closed for obtaining cheap investments. These financial institutions include such institutions as the EBRD, ADB, the World Bank.

In general, large investors dictate policy and development trends for small investors. If large investors bet on green development, then, accordingly, these priorities will work for small investors as well. Therefore, if such a trend is already laid down for development, then this will lead to further large investments in renewable energy sources than the construction of new coal-fired thermal power plants”.

Speaker 6 noted the fourth reason is the low cost: “The cost of energy per kilowatt per hour is already comparable to solar energy.” In the Investment chapter, we could see that the decreasing prices on renewable energy technologies have impact on the auction prices. The installed capacity of renewable energy facilities has increased 11 times in seven years

Capacity chart from 2014 - 2021. At the same time, the price has decreased from 20-65% over the past three years (2018-2021).

Finally, all experts noted that the healthcare as the reason to construct RES project. Speaker 1: “When the final tariff is considered, it is usually always taken as an indicator that the external costs associated with the costs of the population and the state for health care. Due to renewable energy, emissions can be reduced and, accordingly, this all affects the health of the population. And the level of spending on health care is rising, with the level of spending rising, both public and private”.

4.2 RES as a solution of energy deficit in Kazakhstan

The second question is that as Kazakhstan is experiencing an energy deficit in the country, could renewable energy solve this problem? The answers of many experts are positive. Speaker 1: ”Yes, 100%. Especially the Southern regions, where there is a great potential for the development of renewable energy sources”. Thus, 10% of construction in the Southern region has potential equal to the CHP of 500-1000 MW capacity. Moreover, the landscape of Kazakhstan has a high potential for wind energy generation. The economic potential of wind energy in the country constituted about 760 GW (Potential of Renewable Energy Resources).

The lack of energy storage technologies in the country does not allow to development RES projects to solve energy problems in the system. Speaker 7: “RES will be able to close the energy deficit, but subject to storage electricity since RES is not a permanent source of energy.” Such technologies could be hard to implement because of high cost. Speaker 5: “now these (accumulative) technologies are still expensive and it will probably be difficult to implement these technologies in Kazakhstan because this will directly affect the tariff”. However, the government actively works to the direction of the development of energy accumulative capacities. Thus, the local and foreign investors are planning to launch the first

RES project with maneuvering capacities in two regions (Foreign investment sub-chapter). Unlike other members, Speaker 4 does not consider RES as a solution to the energy deficit and believes that first, it is needed to move from coal to other alternative energy like natural gas or nuclear energy: “No. Kazakhstan shall at least move first from coal to natural gas or nuclear energy to reduce emissions from coal as well as to provide the population and industry with the energy they need in the most cost-effective way”. Despite the ambitious aims, the IHS Markit predicts that the energy generation from RES projects in 2050 will constitute about 20% because of the high expenses of accumulative technologies and the expected commissioning of nuclear power plants in the mid-2030s (PwC 2022).

4.3 The impact of world energy crisis on RES plans and investments in Kazakhstan

The third question was how the military position in Ukraine will have an impact on the plans and investments in RES projects. All experts noted that it will not have impact on the current plans and the country continue to implement the plan. Speaker 2: «There is a plan of the Ministry of Energy for the construction of RES, it has not changed and continues to be implemented».

On the issue of investment, there are no direct answers at the moment, since, as Speaker 2 notes: “auctions are held at the end of the year and the real trend will be visible then.” However, all experts noted that there are problems in the equipment supply chain and logistics, which affected the increase in equipment prices, but there is no indirect effect. Speaker 7 notes: “It did not affect the attractiveness of investments. This will affect the mechanism of work of the RFC as a system operator. The work of the RFC is to buy up renewable energy capacities, but at the same time the state does not invest in it, it only gives technical conditions and guarantees that it will buy everything. The better the investment

climate, the more investors will invest in a particular area in Kazakhstan, including renewable energy».

However, Speaker 3 gives other scenario: «The problem is that few investors are willing to enter the outdated market, recognizing the concern that corruption, lack of transparency, mainly for project implementation. To this end, it is difficult to assess compliance with concession regulation in the energy sector. For example, the EBRD found that, in the past, Kazakh private partnership arrangements were artificial and did not involve private participation. This will remain an obstacle.

With the COVID-19 pandemic and the situation in Ukraine, investors have already lost a lot of money. If earlier Russia and Kazakhstan competed for investors, now this topic has already been closed. After the sanctions, now investors will not go there. This is good for Kazakhstan, investors can go, but will they go? They have doubts, as I said. They are afraid of the risk of instability, the risk that there is a technical side, as I already said, that there are no tools that are produced in Kazakhstan that are needed for a green economy, and it is also very expensive if we bring it somewhere to Kazakhstan».

4.4 The current tendency of RES in Kazakhstan

The sixth question is about the current tendency of RES in Kazakhstan, and how it was changed? Speaker 5: “When we started developing renewable energy in 2014-2015, there were a lot of opponents of renewable energy. However, today oil companies have taken the side of RES. From the Ministry of Energy, we see that the auction system is declining. There are too many renewable energy sources and this leads to an imbalance in the energy system”. Also, the positive trend is associated with agitation campaign. Speaker 6: «There is a positive trend. People have just begun to learn about renewable energy. Started with farmers, tens of

thousands of farmers received solar power plants, who were convinced of the benefits and simplicity of technology».

The opposite point of view expressed Speaker 4: “War in Ukraine and recent energy crisis showed that RES still cannot be considered as a reliable and affordable source of energy because of technology, so all countries, including in Central Asia, will likely reconsider their investment plans for gas and nuclear power plants.”

4.5 The motivation of organizations to develop RES in Kazakhstan

The fifth question was about the motivation of local and international companies (organizations) to invest in RES in Kazakhstan. The motivation of local companies explains by the requirements from the authority. Speaker 7: “Motivation for the construction of renewable energy projects by domestic investors, mainly, is the obligation to the state. For example, Samruk Energo has several subsidiaries that also build stations, but this is more dictated by the state”.

The motivation of international companies varies from goals. Some organizations aim to achieve green goals or to reduce carbon tax. Speaker 5: “The main motivation for international companies is the opportunity to reduce their carbon tax.” Other international companies develop RES as a business and benefit financially. Speaker 4 noted: “Chinese companies are interested as investors as they want to export their goods. IFIs (International Financial Institutions) are interested because they have a mandate to finance RES”.

4.6 Future perspectives on Renewable Energy Sources

The fourth question was asked about the future perspective of Renewable energy in Kazakhstan. Some experts gave the answer that the Renewable Energy will develop in the country, the other part of experts did not give the exact answer. However, both group of the

experts noted the obstacles on the RES development. The first it is a lack of maneuvering capacity. Secondly as noted Speaker 5 and Speaker 6 that "the state does not sufficiently support renewable energy in the private sector". Also, many experts noted that the mentality is not yet ready for the development of renewable energy. Speaker 3 said that Kazakhstan should also develop the traditional resources as it gives revenue which in the following could bring development to RES: "No matter how we say it, coal is the dominant source of energy in the country. Despite the optimistic scenarios that by 2030 the share of coal will decrease to 49%, it is not true to say that "overnight" Kazakhstan will be able to become green-technological. There is such a temptation here that we have oil and gas, and in the current situation, with external factors, with the military conflict in Ukraine (which negatively affect the prices of raw materials in Europe), it is very profitable to develop. This gives Kazakhstan income, which can later be realized for renewable energy. On the one hand, Kazakhstan must develop oil and gas, because it is revenue, and on the other hand, it must balance. This is such a big task".

4.7 Recommendations to develop RES projects in Kazakhstan

The last question was dedicated to base on the expertise on different levels and spheres, what kind of recommendations the experts could introduce. The experts gave the number of recommendations and many of them are coincided:

1) To introduce the main document about development of energy and Renewable Energy Source strategy in Kazakhstan;

2) To introduce maneuverable capacities or accumulative technologies;

3) Develop small scale projects and introduce green tariffs;

4) To increase electricity tariffs. Speaker 5: "For large RES projects, this is an increase in tariffs, this is a new tariff indexation system, a long-term development plan".

5) To develop RES hubs. Speaker 7: “Introduce a cluster approach. Define a kind of priority zone in Kazakhstan. We need to build RES hubs. To the maximum, exempt them from taxes, allow them to transport equipment without additional duties, introduce some kind of tax concessions for 10-15 years so that these companies can train their employees for free. So that local universities go in collaboration with science. Relieve the tax burden on these companies as much as possible and at the same time impose their social obligations, such as education, support for science, etc.”

5 Discussion and conclusion

The aim of the research was to explore the peculiarities of Renewable Energy projects development in Kazakhstan. Kazakhstan is not only rich with natural resource, but the landscape of the country has high potential for renewable energy development. The current energy is mostly generated by coal. It brings negative effect on climate, economics and public health. Renewable Energy is the instrument to reduce carbon emission to reach the obligations under commitments.

The war in Ukraine put the country to geopolitical crisis which heavily influenced the logistics and prices of RES technologies. Due to the short time period, there is no data and official statistics to see how the war in Ukraine will have an impact on the RES investments. However, those obstacles didn’t influence the plans and strategies in Renewable Energy policy of the country and the government intends to continue developing the renewable energy policy and create favorable conditions for investors.

The RES projects are totally supported by local and foreign investments and the less from the government`s contribution. Development Banks are the greatest investors in the improvements of energy system. It should be noticed, that the Development Banks contribute not only financially, but help by technical assistant to the legislation of energy system. The

global trend for renewable energy, as well as the solution to climate change, is forcing companies to head for decarbonization.

According to experts, despite the internal and external energy crisis in the country, the trend of RES development in Kazakhstan is growing. The development of renewable energy is facilitated by the climate commitments of the Paris Treaty, the introduction of a carbon tax by the European Union in Kazakhstan from 2023 and can also become a solution to energy problems in Kazakhstan.

Despite the ambitious goals of the state for the generation of renewable energy, according to the experts' opinions there are different systematic barriers to achieving these goals. The first is the imperfect energy system that was built during the Soviet Union, not taking into account the current state borders, and also the fact that most of the system has not been updated since then. Secondly, it is a weak investment climate in the country, which constrains the attraction of investors. Third, not the willingness of the mentality of the local population.

The experts gave the recommendations to Renewable Energy development in Kazakhstan. The first to introduce the strategy to develop energy system in the country. Secondly, to increase energy tariffs. Finally, to develop maneuverable capacity technologies.

Limitations of the research. Since the research topic is relatively new, little publications have been made on this topic. Basically, the data was taken from the official websites of organizations or experts shared data.

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