Approved by the resolution of

“Samruk-Energy” JSC Board

of Directors

dated April 1, 2022

Minutes No. 03/22

The changes to the Program

were approved by the

resolution of “Samruk-Energy”

JSC Board of Directors

dated October 28, 2022

Minutes No.13/22

**“Samruk-Energy” JSC energy transition**

**program for 2022-2060**

**Public version**

|  |  |
| --- | --- |
| **The document owner** | “Energy transition and Digitization” Department |
| **Edition** | 1 |
| **Year** | 2022 |

Astana city

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# **Terms and definitions**

|  |  |
| --- | --- |
| **Term | abbreviation** | **Definition** |
| **AIX** | Astana International Exchange, AIFC stock exchange |
| **CBAM** | Carbon Border Adjustment Mechanism – |
| **CCS** | Carbon Capture & Storage |
| **ESG** | Environmental, Social and Governance (environment, social responsibility, corporate governance) |
| **ESG-Rating** | Assessment of compliance of the internal policy and the company operations with sustainable development principles |
| **KASE** | Kazakhstan Stock Exchange |
| **SWOT-analysis** | Analysis of positive and negative impact of external and internal environmental factors |
| **APP** | “Almaty Power Plants” JSC |
| **RES** | Renewable energy sources |
| **WPP** | Wind power plant |
| **PSH** | Pumped storage hydropower |
| **GeoTPP** | Geothermal power plant |
| **Group of companies** | Collective name of “Samruk-Energy” JSC and its SA |
| **SDPP** | State District Power Plant |
| **HPP** | Hydropower plant |
| **Decarbonization** | The process of reducing carbon emissions into the atmosphere |
| **SA** | Subsidiaries and affiliates of “Samruk-Energy” JSC |
| **ЕU** | European union |
| **kWh** | Kilowatt-hour, unit of measure for electricity generation |
| **“Green” financing** | Financing of investments that provide environmental and climate benefits in the broad context of environmentally sustainable development |
| **“Green” bonds** | Any bonds, proceeds from the placement of which are used only for full or partial financing, or refinancing of new and / or existing "green" projects that meet the established requirements |
| **“Green” loan** | Any type of loan provided solely for the purposes of full or partial financing or refinancing of new and / or existing "green" projects that meet the established requirements |
| **CF** | Capacity factor |
| **LCDC** | The concept of low-carbon development of “Samruk-Kazyna” JSC, approved by Samruk-Kazyna JSC BoD dated August 25, 2022 (Minutes of the in-person meeting No. 200) |
| **CEP** | Comprehensive environmental permit |
| **AIFC** | Astana International Financial Center |
| **BAT** | Best available technology |
| **RI** | Research institute |
| **Company** | “Samruk-Energy” JSC |
| **CCGT** | Combined cycle gas turbine unit |
| **Energy transition program /**  **Program** | Samruk-Energy joint-stock company’s energy transition program for 2022-2060 |
| **RK** | The Republic of Kazakhstan |
| **SEGRES-2** | “Ekibastuz SDPP-2 Plant” JSC |
| **Conventional generation** | Electricity production using fossil fuels |
| **TPP** | Thermal power plant |
| **CHP** | Combined heat and power |
| **Carbon offset** | Reduction of greenhouse gas emissions and / or increase in greenhouse gas removals achieved as a result of activities or activities in any sectors of the economy in the Republic of Kazakhstan aimed at reducing greenhouse gas emissions and / or increasing greenhouse gas removals |
| **Fund** | “Samruk-Kazyna” Sovereign Wealth Fund” JSC |
| **Electricity** | Electricity |
| **ESDPP-1** | “Ekibastuz SDPP-1 named after Bulat Nurzhanov” LLP |
| **EV charging station** | Electric vehicle charging station |
| **Energy transition** | A global structural change in the energy system, whereby transition from fossil fuels to renewable and low carbon energy sources occurs. |
| **EPO** | Energy producing organizations |
| **ES** | Energy system |

# **Introduction**

Today, the global energy industry faces a major challenge of finding the appropriate balance between the components of the energy trilemma: the economic affordability of electricity, the reliability of supply, and environmental sustainability. At this, the priority of balancing the components of the trilemma, as a rule, is largely determined by the country’s development level and thus shifts from the economic availability of electricity in the case of emerging markets, and in case of developed states to environmental sustainability.

World development and the need for balancing within the energy trilemma shape global energy trends, including the Energy Transition.

The priorities of the Energy Transition Program define the level of development and resource availability of the country's economy.

Kazakhstan, like the whole world, is embarking on the stage of the 4th energy transition to the widespread use of renewable energy sources. The key features of this stage are decarbonization, diversification and digitization aimed at addressing the global challenges facing the world community in providing economies and populations with affordable energy resources, strengthening global energy security, and reducing man made impact on the environment.

The main drivers of the energy transition have been global trends in combating climate change, including:

1) The Paris Agreement, adopted in December 2015 at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), designed to give an incentive to states around the world to reduce greenhouse gas emissions and thereby contribute to curbing the rise in the temperature of the earth's atmosphere not higher than 2℃.

2) International and carbon regulation and the introduction of a cross-border carbon mechanism "Carbon Border Adjustment Mechanism" (CBAM) in the EU under the "European Green Deal". This mechanism will have significant implications for EU trading partners, including Kazakhstan. If successfully implemented, after the initial introduction on January 1, 2023, CBAM will be the first example of the introduction of border charges for greenhouse gas emissions.

3) Tightening of the RK Environmental Code from July 1, 2021, under which the requirements for greenhouse gas emissions into the atmosphere were strengthened and the system of emissions trading of the Republic of Kazakhstan was introduced.

4) The next annual Address to the people of Kazakhstan dated September 1, 2021, in which the Head of State Qassym-Zhomart Toqayev noted the global trend towards the greening of industry and the economy and set the goal of achieving carbon neutrality by 2060.

At the same time, considering that the energy sector is the largest source of emissions in Kazakhstan, producing about 80% of all greenhouse gas emissions in the country, and “Samruk-Energy” JSC share is 14% of total emissions, addressing the issue of companies’ assets decarbonization today is a challenge. When developing the Company's Energy Transition Program, it is very important to strike a balance between achieving the goal of reducing the carbon footprint, ensuring reliable supplies of electricity to consumers at affordable prices, and maintaining jobs in the regions where the Company operates.

"Samruk-Energy" JSC includes three large energy generating organizations, EGRES-1, SEGRES-2 and AlES, which produce electricity using traditional fuel (gas, coal), as well as one of the largest enterprises in the world that mines open-pit coal - Bogatyr Komir.

Coal is a strategic resource, the most accessible, inexpensive and, accordingly, the most demanded source of energy. The country's coal industry ensures the generation of about 70% of electricity in Kazakhstan, and completely satisfies the fuel needs of the population and the domestic sector.

In the coming decades, traditional energy sources will still play an important role in the country's energy system. Given the prevailing share of traditional generation in the Company's assets, reducing CO2 emissions from the use of fossil fuels will be a key area of ​​the Company's activities.

Recognizing the importance of power industry’s impact on the environment, “Samruk-Energy” JSC supports the government endeavors in achieving carbon neutrality and at this stage is committed to maintaining the share of conventional generation, upgrading of existing plants and reducing carbon footprint by implementing renewable energy projects, deploying the best available technologies, as well as the development of alternative energy.

The development of “Samruk-Energy” JSC Energy Transition Program is impossible without the deployment of large-scale scientific research in the field of developing promising technologies, levels of greenhouse gas absorption by ecosystems and data verification.

As of today, the Company has developed the Energy transition program. The implementation of “Samruk-Energy” JSC Energy Transition Prog will require expanding the competences of the concerned ministries and the expert community in coordinating and substantiating decisions in the field of environmental policy of the state, which are of a long-term nature. The energy transition program has not only domestic but also international significance.

In the future, the Program should be supported by many concrete decisions and actions. Now, the main directions of development have been formed, considering the scenarios. At the same time, the development of technologies, new eco-trends, and the receipt of new information on changes in legislation (calculations of carbon offsets, cross-border carbon tax, taxonomy, etc.) will contribute to updating the Program in the future.

This Program has been developed in accordance with the approved Development Strategy of “Samruk-Energy” JSC for 2022-2031. (Minutes of the Board of Directors No. 11/21 dated October 29, 2021) and is a document that sets out the directions, goals, and objectives on the way of the Company to switch to the use of efficient, resource-saving, environmentally friendly technologies and achieve carbon neutrality by 2060.

# **Analysis of current situation**

According to the statistics, as regards absolute values ​​of CO2 emissions, Kazakhstan is among the top 30 countries in the world in terms of CO2 emissions (364 mln.tons for 2019). The leaders in CO2 emissions are China, the USA, India, and the Russian Federation.

The greenhouse gas emission intensity of Kazakhstan is 0.65 kg CO2 per unit of GDP. Kazakhstan ranks 7th (for 2020) in the world ranking of countries when it comes to carbon intensity of GDP and is also in the top 15 countries in terms of CO2 emissions per capita.

The largest source of emissions in Kazakhstan is the energy sector, producing about 80% of all greenhouse gas emissions in the country. Of these, the production of heat and electricity accounts for 31%. The high level of emissions is because the major share of the energy system of the whole country is represented by thermal plants, which accounted for 88% of the total production in 2020, while the share of RES was only 3% and the share of hydro plants was 9%.

As of 2021, the Company holds over 30% of share in the domestic electricity market with an output of more than 35.6 bn. kWh. At the same time, about 92% of the Company's generating capacity is conventional generation. The Company’s total emissions in 2021 amounted to 33.5 mln. tons of CO2/year.

Given the importance of global trends to limit climate change and the risks associated with activities based on conventional generation, “Samruk-Energy” JSC will make every effort to reduce its negative impact on the environment until 2060, achieving carbon neutrality and the level of a high-tech operating company with high social and environmental responsibility.

The Company is performing a comprehensive work to improve energy conservation and energy efficiency of production, and as part of the Program implementation, this work will continue along with new tasks aimed at reducing carbon footprint, such as: further expansion of the use of renewable energy sources, transfer of assets of the southern region to gas, application of best available technologies in carbon capture and storage, development of energy storage technologies, forest climate projects, study of geothermal and hydrogen energy, as well as research and development of alternative sources of electricity.

**3.1. SWOT analysis of energy transition program**

On the way to achieving the goal of energy transition and carbon neutrality, the Company faces both new opportunities and several external and internal challenges. A SWOT analysis of the Program was prepared (Table 1) using the analysis of the internal and external environment.

Table 1. SWOT-analysis of the Energy transition program.

|  |  |
| --- | --- |
| **Strengths** | **Weaknesses** |
| * Vast experience in implementation of RE projects; * Presence of RE assets in the Company's portfolio; * Low level of depreciation of RE facilities in comparison to general level of depreciation of facilities in the RK; * Support from the state and the Fund; * Strong potential for development and implementation of RE facilities in the RK because of the vast territory of the country and various climatic conditions. | * Large amount of debt exposure; * Imperfect regulatory and legal framework required to promote the use of RES; * Unstable supply of RE electricity; * Low cost of electricity produced by traditional methods in relation to the cost of electricity generation by renewable energy facilities; * Poor knowledge and lack of certainty in the cost of investments in the introduction of carbon capture and storage technology; * The need for significant financial investments. |
| **Opportunities** | **Threats** |
| * Development of generation using "clean" sources together with a strategic partner; * Use of "green" financing tools in the implementation of "clean" projects; * Trend towards electrification of economic sectors (motor transport, railway transport, etc.); * Expansion of market share owing to growing demand, securing competitiveness and, in the future, changing the market model; * Development of export potential; * Cooperation with international organizations in the field of study and implementation of carbon capture and storage (CCS) technology, etc. | * Tougher international climate change policy; * Tightening the environmental legislation of the RK; * Instability of the geopolitical situation in neighboring countries; * Increase in the cost of large investment projects as a result of the weakening of the national currency; * Release of jobs in case of reduction of traditional generation volumes. |

**4. Goals, objectives, indicators of the implementation of the Program**

The goal of the Program is to reduce the Company's net carbon footprint by 2060.

1. **Alternative energy**:
   * RES;
   * HPP;
   * Solar energy;
   * Geothermal energy;
   * Hydrogen energy;
2. **Conventional energy:**

* Transfer from coal to gas;

1. **Grid infrastructure and regulation**:
   * Retrofit of grids and introduction of Smart Grid;
   * Electricity accumulation and storage systems;
   * Maneuverable generation;
2. **Waste management:**
   * Enrichment and gasification of coal;
   * Carbon capture and storage (CCS);
   * Energy efficiency and resource saving;
   * Green transport
   * Carbon polygons and carbon offsets
3. **Supporting activities**:
   * Carbon accounting and digitization.
   * Changes in the regulatory environment;
   * Green finance;
   * Compliance with ESG criteria

Achievement of the Program goal is measured by the following targets presented in table 2.

Table 2. Target indicators of the Program (according to deep decarbonization scenario).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **№** | **Target name** | **Meas.unit** | **2021\*\*** | **2031** | **2060** |
| 1 | Net carbon footprint\* | mln.tons | 33,4 | 23,1 | 0 |
| 2 | Reduced net carbon footprint by 2021 | % | - | -30 | -100 |
| *\* taking into account carbon offsets and ongoing activities.*  *\*\* actual* | | | | | |

# **Development scenarios**

The Company has formed three scenarios for the Company's development. To achieve the goal of reducing the Company's net carbon footprint by 2060,

1) **Business as usual** - a scenario of development when there are no substantial technological changes or policy measures aimed at achieving carbon neutrality, considered as a benchmark for comparing scenario results.

2) **Deep decarbonization** - the scenario involves active development of renewable energy sources and alternative energy followed by gradual closing down of power units of coal-fired power plants, considering the termination of their service life.

Putting into operation new facilities implies the development of alternative reliable energy sources, and the study and development of carbon capture and storage technologies at existing coal-fired power plants and the implementation of forestry projects to compensate CO2 emissions.

3**) Changing the business’s structure** - involves the reorganization of the Company's assets by creating a subsidiary that combines the "green" assets of the Company. This scenario offers a subsequent undertaking an IPO by the "green" company and the use of available "green" financial instruments, which will raise the required additional funds that can be used to retrofit, diversify and decarbonize production, adopt new renewable energy sources, while ensuring the sustainable operation of the UES.

The Company has chosen the Deep Decarbonization scenario as the main scenario for its development.

# **Description of main directions of the Energy Transition Program**

This section describes the strategic objectives and directions of the Company's development on the way to achieving carbon neutrality.

## **6.1. Alternative energy.**

*6.1.1. Development of electricity generation through renewable energy sources.*

The company regularly works towards increasing the share of renewable energy sources in the generation structure. Meeting the carbon footprint reduction target and the growing demand for electricity will require the implementation of a number of new wind and hydro projects with a total capacity of about 6 000 MW.

6.1.2. Development of solar energy.

Solar energy is an alternative energy direction based on the direct use of solar radiation to produce energy in any form.

Technological progress and massive market growth worldwide have greatly contributed to reducing capital expenditures of electricity generated by new solar plants over the past decade. Since 2019, the cost of solar installations has become lower than ceiling operating costs of many existing coal-fired power plants. Bearing this trend in mind, the Company plans to implement solar power plants projects with a capacity of 200 MW.

*6.1.3. Geothermal energy*

The development of geothermal energy is also a new promising direction for the Company.

The advantages of geothermal energy are (1) complete safety for the environment, (2) minimal CO2 emissions into the atmosphere, (3) inexhaustible resources, (4) independence from external conditions and time of day.

Today, GeoTPPs are widely developed and used for the needs of consumers in the USA, Russia, Japan, Iceland, China, and other countries. The United States is an undisputed leader in this direction, which produces more than 18 billion kWh electricity from GeoTPP annually.

Studies conducted in Kazakhstan have shown that the country has considerable resources of geothermal water with medium and low temperatures (from 80 to 170C). The main geothermal reservoirs are found in the south and southwest of Kazakhstan. In these areas, the average temperature is above 120℃.

*6.1.4.Hydrogen energy*

Qassym-Jomart Toqayev, the RK President emphasized the priority importance of using renewable energy sources and reducing carbon dependence in the country's economy and turned his attention to the study of hydrogen energy.

Hydrogen power industry is an industry based on the use of hydrogen as a means for accumulating, transporting, producing, and consuming energy.

Hydrogen is an ideal source of energy and an environmentally friendly fuel. The heat of combustion (1.17 GJ/kg) is almost three times that of oil and four times that of coal or natural gas.

A key area of ​​hydrogen research as part of the energy transition is the use of energy produced by RES in electrolysis to produce green hydrogen. Green hydrogen can be used in the future in chemistry, in fuel cells to produce electricity and the drive of vehicles, the only exhaust emission of which is water.

The company will proactively work in this direction and study new promising technologies aimed at reducing the carbon footprint.

* 1. **Conventional energy** 
     1. TPP gasification

Reducing GHG emissions can be achieved, among other things, by using natural gas instead of direct combustion of coal.

Currently, the Company is implementing gasification projects in Almaty:

1) Expansion of Almaty CHP-1 with construction of a CCGT unit with a capacity of 200-250 MW will ensure the reliability of district heating and electricity supply in Almaty city.

2)Modernization of Almaty CHP-2 including the construction of a CCGT unit with a capacity of up to 600 MW in order to reduce the adverse impact of the plant on the environment of Almaty city and Almaty region.

3) Reconstruction of Almaty CHP-3 with construction of a CCGT unit with a capacity of up to 450 MW will partially cover the shortage of flexible capacities in the southern zone of Kazakhstan.

The implementation of the above-mentioned projects on gasification of Almaty assets will ensure the reduction of emissions of harmful substances from the energy sources of APP into the atmosphere of the Almaty region, enhance the capacity, reliability of heating and electrification.

However, due to scarcity of gas, construction of gas-fired power plants will require a guaranteed tariff to attract investors.

## **6.3. Grid infrastructure and regulation.**

*6.3.1. Retrofit of grids and introduction of Smart Grid*

Smart Grid (smart power grid) is a basic technological element, the foundation of a "smart" or digital grid - an intelligent electricity metering system designed for rapid delivery of a reliable volume of services, multi-tariff metering, monitoring of power quality and other functions. The introduction of Smart Grid will allow solving several issues, such as power regulation, errors in the operation and repair of equipment, reducing grid losses, etc.

The introduction of intelligent technologies of the "smart grid" will considerably improve the reliability and quality of energy supply, the efficiency of the use of primary energy resources, reduce the costs of production processes and the impact on the environment using renewable energy sources and storage systems.

*6.3.2. Electricity accumulation and storage systems.*

The company is considering implementing energy storage systems as a means of reducing the impact of integrating variable renewable energy on the power grid.

Electricity generation through RES is unstable, and electricity generation volumes depend on the season and weather conditions. The development of energy storage systems is an integral part of the transition to electricity generation from renewable sources to ensure the regulation of daily and seasonal fluctuations in the energy system based on RES, as well as providing a regulation reserve to compensate for sub-hour deviations.

*6.3.3.Maneuverable generation*

As of 2021, Kazakhstan’s energy system needs circa 1000-1500 MW of flexible capacities. The construction of a pumped storage hydroelectricity will help addressing the shortage of regulating capacity in the power system, cover the most difficult peak load, thereby increasing the stability of the power system. To address the issues related to shortage of flexible generation, the Company plans to implement projects in this direction.

## **6.4. Waste management.**

*6.4.1. Enrichment and gasification of coal*

Deployment of innovative technologies at the existing conventional generation facilities of the Company will reduce the level of CO2, ash and nitrogen oxides emissions, thereby reducing the negative impact on the environment from the Company's operations.

The Company is implementing a pilot project on preparation of Ekibastuz coal. The introduction of a dry coal preparation plant will allow engaging the discovered reserves in mining, ensure the shipment of coal to consumers with the required ash content and calorific value, reduce operating costs for coal mining and ensure the completeness of extraction of balance reserves.

The company continues to work on the study of coal gasification technologies at the seams of the Bogatyr Komir open-pit mine. Further comprehensive studies are planned to substantiate the rational parameters and economic feasibility of underground gasification.

*6.4.2.* C*arbon dioxide capture and storage*

One of the most important projects in the Program is deployment of carbon storage and capture technology at the Company’s coal or gas-fired power plants.

CCS is considered as an option included in measures aimed at stabilizing atmospheric concentrations of greenhouse gases. Large-scale application of CCS will depend on the technical maturity, cost, overall potential, diffusion, and ability to apply the technology to traditional assets, regulatory aspects, environmental issues, etc.

*6.4.3. Energy efficiency and energy conservation.*

The Company’s one of the priority tasks is to reduce the carbon footprint of its operations and cover the growing demand for electricity is the transition to efficient, resource-saving and environmentally friendly technologies. The Company will be committed to use resources wisely, including fuel, energy, and water resources. Up-to-date technologies and innovative solutions are planned to be introduced to reduce per unit use of resources.

The Company works continuously to improve energy efficiency and reduce the energy intensity of its production facilities. With a view to implement the Program, this work will be continued by taking actions aimed at efficient and economically feasible use of fuel and energy resources and ensuring savings in total fuel and energy resources.

*6.4.4. Green transport*

Kazakhstan considers the development of eco-technologies in transport as an important direction since it meets the target for "greening" the economy. However, due to the lack of a developed necessary infrastructure and proper financial preferences, this type of transport has a low competitiveness compared to vehicles running on traditional fuels.

For the Company, the development of the electric vehicle industry is possible in the following areas:

- use of RE at EV charging stations;

- partial transfer of the Company's transport to electric vehicles.

*6.4.5. Carbon polygons and Carbon offsets.*

Carbon offset is an activity aimed at reducing greenhouse gas emissions or increasing greenhouse gas absorption in any sector of the RK economy.

The implementation of offset projects can solve two problems during energy transition. On the one hand, this is the implementation of measures to decarbonize the economy by capturing, storing, or processing carbon. On the other hand, it is the receipt of economic benefits from the possibility of trading in carbon units.

To obtain carbon offsets, the Company plans to develop renewable energy sources and a forest climate project.

**Forestry project.**

Forests are one of the most important carbon stores on the planet. By absorbing carbon dioxide, trees play a vital role in climate change mitigation.

Restoration and creation of new afforestation is work that is carried out across the globe, including in Kazakhstan. The RK President in his latest Message dated September 1, 2021, instructed to plant more than 2 billion trees in the forest fund and 15 million in residential areas within 5 years, that is, work in this direction will only be strengthened.

As part of the implementation of the Program, by 2031 it is planned to plant greenery on an area of ​​500 hectares, and the total area of ​​greenery within the framework of the Program will be 1,800 hectares. Tree planting will significantly facilitate decarbonization by offsetting CO2 emissions through absorbing them.

## **6.5. Supporting activities**

*6.5.1. Carbon accounting and digitization.*

Digitization is now one of key trends in power sector development, integrating traditional production and operations with smart digital technologies.

The deployment of smart technologies at the Company is underway, which will significantly improve the reliability and quality of energy supply, the efficiency of the use of primary energy carriers, cut operating costs and reduce environmental impact, as well as ensure compliance with best corporate governance practices in terms of information disclosure and data validation and verification tools .

*6.5.2. Changes in the regulatory environment*

To effectively address decarbonization tasks, it is necessary to further improve the regulatory framework to resolve issues that hinder the development of renewable energy in the country. Proposals aimed to improve the regulatory environment should cover such issues as tariff regulation, measures to support renewable energy sources, improving the mechanisms for distributing quotas and encouraging the decrease of electricity consumption, creating an efficient system for trading offset units, etc.

*6.5.3. Green financing*

The trend towards investments in green projects (green financing) provides new opportunities for attracting additional sources of financing for the development of renewable energy projects.

Green bonds, green loans on preferential terms and subsidies for green projects are main green finance instruments. At this, green bonds represent more active sector.

Kazakhstan has established the required legal framework for issuance of green finance instruments, including:

1) As part of the new RK Environmental Code, the Taxonomy of "green" projects has been determined for the first time, and the definition of "green" financing was presented, which includes "green" bonds, "green" loans, and other "green" financial instruments. Projects to be financed through Green Bonds and Greens are determined according to the taxonomy of green projects.

2) The Agency of the Republic of Kazakhstan for regulation and development of financial market has developed the rules for registering the issue of "green" bonds. Thus, the placement of "green" bonds became possible on the KASE and AIX exchanges. At the same time, the AIFC Green Finance Center is developing mechanisms to support issuers in preparing for the issuance of green bonds on the Exchange, including mechanisms to subsidize an external review - an independent assessment of the compliance of green bonds with recognized standards and principles in the field of “green” funding.

As part of the implementation of the Program, “green” financing instruments can be used to implement future and ongoing projects, including refinancing of SA loans. Therefore, the Company has developed a Policy in the field of "green" financing, aimed at ensuring the transparency of processes of attracting investments using "green" financing tools, and performed debut placement of green bonds on the AIFC stock exchange.

*6.5.4. Compliance with ESG criteria*

Sustainable development management system focused on ESG standards will be advanced at the Company, commitments, and best practices. Compliance with ESG factors is an essential element of the Company's assessment since the risks of these factors may directly or indirectly affect the Company's investment attractiveness.

The company structures its operations in three areas that are in line with sustainable development concept and ESG:

• environment – ​​decarbonization of the economy, including growing the share of electricity generation based on RES, boosting the support for clean technologies, gasification, implementation of energy conservation and energy efficiency programs;

• social area – provision of social guarantees and social stability, development of internal competencies.

• corporate governance and economic development – ​​application of best corporate governance practices, effective risk management and more.

In the future, it is planned to conduct diagnostics and analyze the Company's compliance with ESG criteria and participate in ESG ratings on an ongoing basis.

# **The Program risks**

The most probable and significant potential risks in terms of their impact on the Program were identified as part of the study of scenarios for development of the Energy Transition Program.

**1. Risks associated with the tightening of international policy in the field of climate change.**

Introduction of CBAM, which involves the sale of certificates for carbon-intensive products imported into the EU according to the established list by a specially established authorized body. The cross-border carbon tax in the EU will be introduced gradually from 2023.

Such global initiatives will put pressure on exportable sectors of the economy, which in turn will look for opportunities to reduce their energy intensity, become more environmentally friendly and consume electricity from clean energy sources. The corresponding demands of the economy will potentially be extended to the entire power industry, where demand for energy sources with a low carbon footprint will increase.

**2. Risks associated with increasing legislative pressure.**

Pursuant to Paris Agreement, the RK aims to reduce greenhouse gas emissions by 15% by December 2030 compared to 1990. In this vein, the RK Environmental Code established stringent requirements for reducing greenhouse gas emissions. It also established requirements for introduction of BAT and a gradual increase in tax rates for emissions into the environment in case of non-application of BAT, as well as exemption from payment for emissions into the environment when introducing BAT.

Therefore, the Company plans to implement activities on introducing BAT.

**3. Risks of ongoing/future investment projects as part of implementation of the Energy Transition Program.**

Untimely or poor-quality execution of investment projects and investment programs of subsidiaries and affiliates resulting from the absence of funding, changes in the exchange rate, may lead to worsening of performance of existing facilities and failure to deliver planned benefits due to obsolescence of equipment.

There is a risk of changes in the timing of project implementation and / or an increase in the cost of projects, which may be influenced by several factors, including high cost of projects, poor study of CCS technologies and the possibility of their application to the Company's TPPs;

To mitigate these risks, a comprehensive study of new technologies with the involvement of research institutes and international organizations, attracting a strategic investor for projects, carrying out awareness raising activities among population and control over implementation of projects (technical supervision and with respect to safety) are required.

**4. The risk of a threat to the energy security of the country.**

The current assets of the Company, operating on traditional fuel, form the basis of the country's energy system, providing the economy and the population with stable, reliable, affordable electricity. The conservation of thermal power plants and the sale of traditional assets with the transition to full decarbonization and renewable energy sources brings to the fore the issue of stabilizing the energy system. Electricity generation by renewable energy facilities is unstable, so the main challenge facing the energy industry is to create sufficient reserve capacity to stabilize the system.

Actions aimed at minimizing this risk include the implementation of renewable energy development projects, the development of storage technologies, the reduction of CO2 emissions into the atmosphere, which contributes to the further safe operation of assets using traditional fuels with minimal negative impact on the environment, such as carbon capture and storage and coal gasification.

**5. Risks associated with the growth of electricity consumption until 2060**

The country’s electricity consumption demonstrates a stable annual growth. As of today, electricity consumption is approx. 100 bn. kWh, and the annual consumption growth is at the level of 1%. Consumption growth is influenced by the energy intensity of production, the trend towards electrification of industries, the introduction of digital technologies, an increase in the population, and the development of mining.

To cover the growing demand for electricity in the future, the Company is constantly working to improve energy efficiency and reduce the energy intensity of its production facilities and introduce new generating capacities.

**6. Limited energy resources.**

RK’s vast territory has a wide variety of climatic zones and has a great potential for the use of water, solar, wind and geothermal energy. The growing demand for electricity and the decommissioning of conventional power plants will require the construction of a significant number of new facilities. By keeping the share of renewable energy generation within the framework provided for by the decarbonization baseline scenario, there is a possibility that renewable energy sources will not be enough to cover demand.

In this regard, research, and implementation of projects in the field of alternative energy can maintain a balance between the use of clean energy and the reliable supply of increasing demand for electricity.

**7. Social risks.**

Meeting the requirements for decarbonization of production may require the conservation of conventional thermal power plants and a reduction in coal production, which will inevitably affect the well-being of both workers of these enterprises and entire infrastructure created around city-forming objects.

To improve the social stability of the region, it is necessary to implement a set of measures aimed at considering the issues of possible reskilling of workers to further employ them at new facilities, cooperation with local governments to jointly develop a program for the development of the region.

**8. Risks of human resources of the Company's group**

The absence of training programs and development plans for employees can lead to staff turnover, loss of qualified specialists, a decrease in the social stability rating as a whole and the failure of the Company to achieve planned targets.

Training and development in accordance with an individual employee development plan, creation and development of a talent pool and a succession plan for key positions.

**9. Currency risk**

RES projects require considerable capital investments and most of these projects are funded by borrowings in US dollars. Considering the steady trend towards changes in the exchange rate of the national currency and the high level of dependence on the cost of imported equipment (a large share of the cost of equipment in the cost of projects), there is a high currency risk, which can significantly increase the cost and pose a threat to the implementation of current and prospective projects.

Prevention of raising loans in foreign currency, constant monitoring and timely adjustment of the Program are those actions that may reduce the risk.

# **8.References to regulatory documents**

|  |  |
| --- | --- |
| **No.** | **Title of the document** |
|  | The current Environmental Code of the Republic of Kazakhstan |
|  | Samruk-Kazyna JSC low-carbon development concept |
|  | Samruk-Energy JSC development strategy |
|  | Green finance policy |