Initiatives to reduce climate impacts

GRI 3-3 The climate agenda remains a global challenge requiring coordinated solutions to reduce emissions and adapt to climate change. 2024 was the first calendar year to reach the critical warming threshold of 1.5°C[33], adopted by the Paris Agreement[34] as a target. Realising the seriousness of the consequences of warming, more and more countries are striving to develop low-carbon economies as it affects their security and competitiveness. Kazakhstan, for its part, has set a target of reducing greenhouse gas emissions by 15% by 2030 (from 1990 levels) and achieving carbon neutrality by 2060. To achieve these goals, the country has adopted the Strategy for Achieving Carbon Neutrality by 2060.

With the largest fossil fuel energy assets in the portfolio, reducing the carbon footprint is a significant challenge for the Fund as well. Nevertheless, we fully support Kazakhstan's climate goals and have identified the transition to low-carbon development as one of our strategic objectives to improve its sustainability and competitiveness. As the largest holding company representing the state's interests in sectors of the economy, we play a key role in implementing the Government's strategy.

DECARBONISATION

GRI 3-3
GRI 305-1
GRI 305-2
The Fund's Group is collectively responsible for about 33% of the total CO_2 emissions in the country. The carbon footprint (direct and indirect CO_2 emissions) of the Fund Group is estimated at 72.2 million tonnes of CO_2 by the end of 2021 (direct – 61.6 million tonnes of CO_2, indirect – 10.7 million tonnes of CO_2).

> Reducing our net carbon footprint by 10% from 2021 levels is our strategic goal until 2032.

[33] Source: https://wmo.int/ru/news/media-centre/doklad-vmo-dokumentiruet-narastayuschie-pogodnye-i-klimaticheskie-vozdeystviya
[34] Source: https://www.un.org/ru/climatechange/paris-agreement

To achieve this target, we continue to implement the Low Carbon Development Concept (the Concept) approved by the Board of Directors in 2022.

The Concept defines the vision, goals, as well as key areas and objectives to achieve carbon neutrality by 2060. We have analysed 3 key development scenarios. Taking into account the results of these scenarios, we focus on achieving the ambitious goal under scenario "Deep decarbonisation" and developing our business model with deep decarbonisation in mind.

Key low-carbon development scenarios

1.5°C

Deep decarbonisation

Key assumptions

Fast Transition, carbon taxes, RES

Expected impact

Increasing decarbonisation costs, green finance opportunities, reducing greenhouse gas emissions by 10 by 2032 and achieving carbon neutrality by 2060

Adaptation measures

Increasing the share of RES, CCUS, green bonds

2–3°C

Decarbonisation

Key assumptions

Irregular fulfilment of targets, export barriers

Expected impact

Moderate costs, partial loss of markets, keeping greenhouse gas emissions at 2021 level

Adaptation measures

Adaptation of export strategy, development of new markets

≥4°C

Business as usual

Key assumptions

Increased weather disasters, increased risks to infrastructure

Expected impact

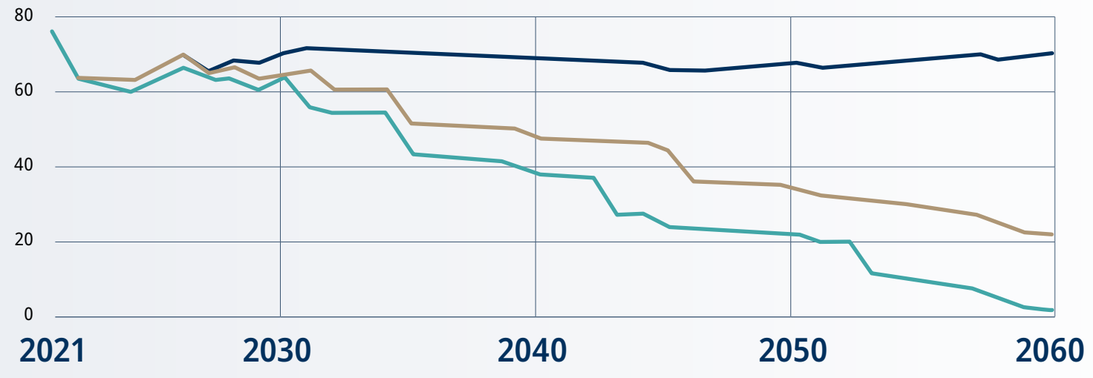
CAPEX growth on recovery, losses

A 19% increase in carbon footprint by 2032, from 57.8 million tonnes of CO_2 to 68.5 million tonnes of CO_2.

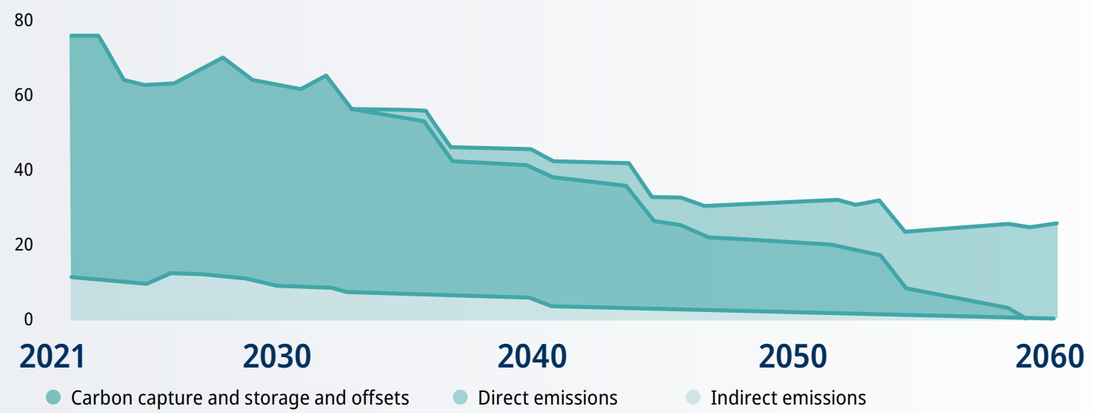
Adaptation measures

Insurance, investments in sustainability

Greenhouse gas emissions forecast, million tonnes CO_2 -eq.



Greenhouse gas emissions structure under a deep decarbonization scenario, million tonnes of CO_2-eq.



KEY AREAS OF LOW-CARBON DEVELOPMENT

GRI 3-3 We are committed to the principle that environmental security must be combined with reliable energy, avoiding abrupt divestment from coal and oil assets without meaningful alternatives. The key areas of our approach include four key areas.

Low Carbon Vision: Key areas of transition to a low-carbon model

1. Alternative energy

- Renewable energy sources
- Nuclear Power
- Hydrogen Power
- Conversion from coal to gas
- Other low carbon generation

2. Resource efficiency and GHG management technologies

- Clean coal technologies
- Resource and energy conservation
- Carbon dioxide capture and storage
- Compensation (carbon trusses and offsets)

3. Infrastructure and regulation

- Modernisation of NPG and implementation of Smart Grid
- Energy storage and accumulation systems
- Load-following generation
- Green transport

4. Effective carbon footprint management

- Carbon footprint accounting and reporting
- Digitalisation
- Environmental culture of the company
- ESG in relationships with partners and suppliers
- Green financing

AREA 1:
ALTERNATIVE ENERGY AND LOW-CARBON TECHNOLOGIES

Renewable energy sources

The Fund plays a leading role in promoting the green agenda in Kazakhstan. According to internal targets, by 2020 we were supposed to ensure 3% of generation from RES and about 10% by 2030. Already today, in 2024, the share of % RES and HPP in electricity generation is 18% (15% in 2023).

We are implementing 8 RES and low-carbon generation projects with a total capacity of 6.3 GW, which is about 80% of all green projects implemented in Kazakhstan. Samruk-Energy JSC plays a key role in realising this transition, with a portfolio that concentrates most of the RES projects within the framework of the ongoing Low Carbon Development Concept.

An important step in the transition to RES is the development of localised production of components for wind turbines, which will provide a significant incentive for investment in the development of wind generation in Kazakhstan and significantly reduce indirect CO_2 emissions associated with logistics (Scope 3). In partnership with one of the largest wind turbine manufacturers in the world we laid the foundations for a plant in the Zhambyl region to produce nacelles, hubs, towers and other key components for wind power plants. The plant is scheduled to start up by the end of 2025.

Together with Eni, a major Italian oil and gas company, we are implementing a project unique for Kazakhstan to build a hybrid power plant with a capacity of 247 MW in the Mangistau region. The project provides for the combined generation of electricity from renewable sources (wind and solar) and a gas-fired power plant. The 50 MW solar power plant is scheduled to be launched in 2025, and the gas power plant (120 MW) and wind power plant (77 MW) in 2026.

Nuclear power

The decision to build the first nuclear power plant in Kazakhstan plays a crucial role in decarbonising the country with growing demand for electricity. In October 2024, a referendum on the construction of a nuclear power plant was held, with more than 70% of voters supporting the construction of the plant. In early 2025, the Government of Kazakhstan has announced that the country's first nuclear power plant will be located in Zhambyl district of Almaty region. We have already held talks with South Korea's KHNP, discussing opportunities for co-operation between Kazakhstan and South Korea in the nuclear energy sector. France, China and Russia are also considered as partners in this direction.

Hydrogen energy

The development of hydrogen energy is considered as another vector in Kazakhstan's strategy of transition to a green economy. In 2024, the Concept of hydrogen energy development in the Republic of Kazakhstan until 2030 was approved.

We are currently at the stage of intensive scientific and technological research in the hydrogen energy, the potential of which we consider in the long term. We strategically position ourselves in the hydrogen production market as a promising low-carbon energy carrier. In 2024, the Fund was able to achieve significant results in this area, in particular:

- Feasibility studies of the potential for blue hydrogen, low-carbon ammonia and methanol production have been carried out.
- A Water Atlas was developed to assess the possibility of green hydrogen production in the western regions of Kazakhstan.
- A pilot project for the production and application of green hydrogen is being implemented.
- An analytical calculator for estimating the production cost of green hydrogen has been developed.
- The first laboratory samples of iron and titanium alloys for safe storage and transport of hydrogen were obtained.
- Pre-design work on the pilot project has been completed, an application for grant funding has been submitted, and negotiations are underway with international partners, including Green Spark.

Upon completion of the research, we plan to obtain low-carbon hydrogen transport technology for both domestic consumption and overseas supply.

Conversion from coal to gas

We are committed to a consistent transition to low-carbon technologies, where gas will play a key role for 10–15 years on the way to carbon neutrality to ensure energy security and stability of the country's economy. Its use enables the achievement of energy security, supports economic stability, and simultaneously contributes to reducing the carbon footprint.

We signed an Agreement on joint implementation of a project for the construction of a combined cycle power plant together with Power International Holding (PIH). A power facility with a capacity of 1100 MW is planned to be built in the Kyzylorda region. Implementation of the project will have a positive impact on the stability of the unified power system of Kazakhstan. The project will also contribute to improving the environmental sustainability of the country's energy system, making it cleaner and more efficient.

The second most important project in this area is the construction of a combined cycle power plant with a capacity of up to 930 MW in the Turkestan region. This project will be a key solution to eliminate the electricity deficit in the region. In 2024, the project has entered the active phase of implementation – construction works at the selected site are underway. Key technological solutions will be provided by the world's leading manufacturers from Germany, the Czech Republic, Italy and Kazakhstan.

We continue the conversion of Almaty CHPPs to gas, which will ensure a 73% reduction in CO_2 emissions and harmful substances in the atmosphere in the Almaty region by 2030 (compared to 2022), as well as increase the installed capacity of energy facilities, as well as the reliability of heating and electrification.

AREA 2:
RESOURCE EFFICIENCY AND GHG MANAGEMENT TECHNOLOGIES

Clean coal technologies

Along with the development of low-carbon energy sources, we will focus on improving technologies, introducing breakthrough solutions that improve the environmental friendliness of existing traditional fuel and energy facilities. In the context of the current energy deficit and the need to ensure energy security, we are implementing a project to build a load-following power plant based on clean coal technologies – the innovative GRES-3 in the Pavlodar region (construction of four power units). The project involves international financial institutions.

We also plan to build modern coal-fired combined heat and power plants in the cities of Kokshetau, Semey and Ust-Kamenogorsk, which will make it possible to cover the growing demand for electricity and heat, while avoiding the atmospheric impacts inherent in traditional coal-fired CHPPs. All CHPPs are planned to be commissioned by 2028.

In 2024, the reconstruction of Power Unit 1 at Ekibastuz GRES-1 with a capacity of 540 MW was completed. During the complete modernisation of the unit, modern boiler and turbine equipment meeting the best parameters in terms of energy efficiency was installed, modern electrostatic precipitators were installed, which will significantly reduce pollutant emissions into the atmosphere.

Resource and energy conservation

Minimising the consumption of energy and resources by increasing energy efficiency and switching to efficient, resource-saving and environmentally friendly technologies is one of the key instruments in achieving the Fund's carbon neutrality targets. Within the framework of this direction, Samruk-Kazyna JSC is implementing the Energy and Resource Saving Programme until 2027. The implementation of the Programme is described in detail below in the subsections "Resource Saving and Energy Efficiency" and "Water Resources Management".

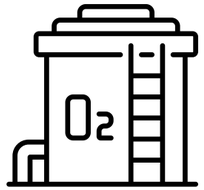
Reduction of flaring

Elimination of gas flaring is one of the key efforts to reduce direct greenhouse gas emissions in the oil and gas industry (except for the technologically unavoidable). Since 2015, NC KazMunayGas JSC has been supporting the World Bank's Initiative to stop regular flaring of associated petroleum gas by 2030 in an effort to minimise the volume of associated gas flaring.

Global Methane Initiative

In terms of resource efficiency in the oil and gas sector of the Fund, the key area of focus is the reduction of methane emissions. Since 2017, NC KazMunayGas JSC has been participating in the GMI Global Methane Initiative network, implementing projects to reduce methane emissions and providing relevant reporting. The Company is implementing methane management in partnership with international leaders Tetra Tech and Carbon Limited, and negotiations are underway on co-operation with General Magnetic Canada Inc. In 2024, a measurement campaign to detect, measure and reduce methane emissions using the LDAR (Leak Detection and Repair) system was carried out at two KMG production facilities. In the next three years, NC KazMunayGas JSC plans to conduct a complete inventory of methane leaks at its production facilities and establish a baseline level of emissions. This will enable effective monitoring and reduction of emissions at all stages of the production cycle.

In 2024 NC KazMunayGas JSC sent to the United Nations Environmental Programme (UNEP) its first report on the inventory of methane emissions, prepared within the framework of participation in the Oil&Gas Methane Partnership 2.0 (hereinafter – OGMP 2.0). In 2024, JSC NC QazaqGaz joined the OGMP 2.0 partnership. Within the framework of COP-29 JSC NC QazaqGaz and Carbon Limits entered into a memorandum, according to which the development of a strategy to reduce methane emissions and assistance in reporting OGMP 2.0 is envisaged.



Carbon dioxide capture and storage

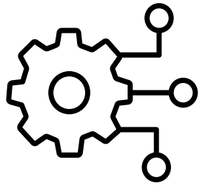
We are assessing the potential for additional areas of decarbonisation, including opportunities for carbon capture, storage and utilisation. We are implementing a pilot project in this area at fields in the Atyrau and Mangistau regions. As part of the project in 2024, we have developed a concept for a carbon capture and storage project with a capacity of 10,000–20,000 tonnes of CO_2 per year at the Integrated Gas Treatment Unit of the Prorva group of fields of EmbaMunaiGas JSC. A full-scale project with a projected injection volume of up to 412 thousand tonnes CO_2 per year. We plan to implement it after 2040.

Forest-climatic offset projects

Initiatives in this direction include projects aimed at absorbing greenhouse gases through afforestation, reforestation, landscaping. In particular, NC KazMunayGas JSC plans to implement 6 forestry projects within the framework of the internal low-carbon development programme until 2060. In 2024, a project to create a green zone around the city of Pavlodar on an area of 1,600 hectares was launched. Field studies and soil analyses were conducted to assess the potential for CO_2 emissions absorption and a Working Design for the creation of green areas was developed, which passed the state environmental expertise.

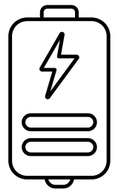
AREA 3:
INFRASTRUCTURE AND REGULATION

The development of low-carbon energy, with the corresponding development of electricity grid infrastructure and electricity storage and accumulation systems, is an important factor necessary to achieve the goals of transitioning to carbon neutrality. To integrate large-scale power generation, including from RES, into the grid to strengthen and stabilise power transmission in the south of the country, in 2024, we entered into an agreement with the Asian Development Bank (ADB) to implement a project to strengthen the power grid of the Southern Zone of Kazakhstan's UES. To integrate RES into the energy system and introduce digital substations, a memorandum was concluded with Hitachi Energy.



Modernisation of the National Power Grid (NPG) and implementation of Smart Grid

As part of the creation of the Smart Grid, we continue to implement projects to modernise the SCADA/EMS system and introduce a monitoring system based on synchronised WAMS technologies, which will improve the efficiency of management of the Unified Energy System (UES) of the Republic of Kazakhstan. In 2024, construction and installation works of the second stage of WAMS implementation have been started: it is planned to connect 59 monitored WAMS connections in 7 branches of the main power grids at 21 substations. The system will improve the efficiency of dispatch control of the UES of Kazakhstan by obtaining reliable data from additional devices of synchronised vector measurements, as well as to provide state assessment and monitoring of the UES stability margin.



Energy storage and accumulation systems

In 2024, we continued the implementation of the Introduction of Electricity Storage Systems in the UES of Kazakhstan Pilot Project to investigate the impact of electricity storage systems on the regulation of the UES during the integration of RES with China Power International Development Limited, China Power International Holding Limited and the Kazakhstan Renewable Energy Association. Under the Pilot Project, it is planned to install an electricity storage system with a capacity of 3.45 MW and a capacity of 7.72 MWh near the substation of the 500 kV Akmola substation.

Also in 2024, we completed working on the project Development of algorithms in the centralised system of automated frequency and power regulation (CS ARFM) for controlling electricity storage systems. The project aimed at the improvement of the reliability of Kazakhstan's NPS when integrating RES through the introduction of electricity storage systems (ESS). Within the framework of the project, we developed algorithms for controlling ESS as a separate type of facilities, taking into account their specific features and technical limitations.

Load-following power generation

The problem of peak loads and the need for load-following capacities to cover them relates to the peculiarities of the functioning of the energy system of Kazakhstan. One of the main directions for solving the issue of peak loads in the Concept is the construction of counter-regulating hydroelectric power plants (HPPs). Potential projects of the Fund Group on construction of HPPs can provide the energy system with about 500 MW of load-following capacity.

For example, in the reporting period, a project to increase the capacity of the Shulbinsk HPP on the Irtysh River in the Abay region from 702 MW to 1,050 MW is in the active phase of implementation; it is the third plant in the Irtysh HPP cascade and the largest in Kazakhstan in terms of capacity. When completed, this project will increase the HPP's power generation by a further 40%.

Green transport

Sustainable alternative fuels – biofuels and hydrogen have potential in aviation, shipping and heavy road transport where electrification is not currently possible.

We are working on organising the production of environmentally friendly SAF aviation fuel as an alternative to traditional aviation fuel, which will significantly reduce the carbon footprint of the aviation industry. In 2024, with the participation of the European Bank for Reconstruction and Development, JSC NC KazMunayGas-Aero and Air Astana, ICF SH&E Limited completed a study on the potential of SAF production in Kazakhstan: we identified key export markets, developed preliminary technological solutions and the capacity of the first plant – 40,000 tonnes of SAF per year with a demand for 72,000 tonnes of bioethanol. In early 2025, we plan to sign a tripartite agreement with the leader in SAF production technologies, the American LanzaJet, and the Kazakh agro-industrial holding KazFoodProducts LLP (KFP) to develop a feasibility study for the construction of a SAF production plant in Kazakhstan.

AREA 4:
EFFECTIVE CARBON FOOTPRINT MANAGEMENT

GRI 3-3 Technical decarbonisation measures alone are not sufficient to achieve the Low Carbon Vision. The International Energy Agency estimates that less than 40% of emission reductions will result from the deployment of low-carbon technologies, with a further 55% of emission reductions requiring a combination of low-carbon technology deployment and active consumer engagement. The remaining 5% of emission reductions will be attributable to behavioural changes and activities that result in reduced consumption of energy resources.

In the oil and gas sector, as part of the OGMP 2.0 initiative, methane emissions inventory initiatives are being implemented using the MIST programme. By conducting an inventory of methane leaks at our production facilities and establishing a baseline for methane emissions, we can effectively monitor and reduce emissions at all stages of the production cycle.

Companies in the energy, mining and refining sectors participate in the international Carbon Disclosure Project (CDP), providing data on greenhouse gas emissions, climate risks and opportunities, and analysing the full carbon footprint of their products.

CDP rating data	CDP A LIST 2023 WATER	CDP A LIST 2023 CLIMATE	CDP A List 2024 WATER	CDP A List 2024 CLIMATE
KAZATOMPROM		"B"	"C"	"B"
КазМұнайГаз	"C"	"C"	"B"	"B"
SAMRUK ENERGY		"D"	"C-"	"D"
QAZAQGAZ		"D"		"B"

Development of environmental culture

We are implementing Green Office principles including separate waste collection and recycling, reducing paper consumption through the introduction of electronic document management systems, reducing electricity and water consumption through the installation of LED lighting, motion sensors and sensor faucets.

20
Postamats/containers for separate waste collection

20
Training events and master classes

113,943
Tree targetting

200
Clean-ups across the Group

20
Workshops and webinars with environmentalists, activists and sustainability specialists

100
Environmental awareness campaigns, marathons, challenges (#carfreeday, #paperfreeday)

5
ECO NOMAD campaign with the participation of young specialists

In 2024, we worked on the creation of new green areas in cities and towns where the Fund's organisations operate, and planted trees on the territory of production facilities. The leaders were employees of the group of companies of NC KazMunayGas JSC, having planted 97,200 trees and bushes. In addition, we planted more than 4.5 million saplings of saxaul on an area of 15,000 hectares as part of the State's efforts to improve the ecological situation on the dried bed of the Aral Sea (ODAM).

Moreover, employees of NC QazaqGaz JSC, NAC Kazatomprom JSC and Kazakhtelecom JSC planted over 8,000 trees in Turkestan, Kyzylorda, East Kazakhstan, North Kazakhstan and Akmola regions, as well as in the cities of Almaty and Astana in 2024.

An important aspect for us is the development of a responsible attitude to the environment, understanding how an individual can contribute to the reduction of greenhouse gas emissions by changing his or her habits and way of life.

Therefore, in implementing the Concept, we also rely on our personnel, emphasising that each employee should contribute to building the company's image as a responsible player in the international market, whose work bases on the principles of sustainable development.

We are fostering a corporate culture focused on conscious consumption, environmental ethics, and individual contribution to building a sustainable future.

GRI 3-3

Green financing

In the Low Carbon Development Concept, the Fund considers the use of green finance instruments to realise environmentally friendly, energy efficient and low carbon projects.

As instruments of green financing, we use the issue of green bonds, the key aspect of which is a possible reduction of the coupon rate if the issuer achieves the set targets for reducing environmental impact. The portfolio company Samruk-Energy JSC has become a leader in this direction, where the Green Finance Policy is functioning, a working group on the relevant direction has been created and a debut placement of green bonds by public subscription on the stock exchange of the Astana International Financial Centre – Astana International Exchange in the amount of KZT 18.4 billion with a coupon rate of 11.4% per annum and a circulation period of 6.5 years has been carried out. The first green eligible project under the green financing was the Shardara HPP Modernisation.

Building the offset project portfolio

5.8 million tonnes of CO_2-eq by 2032

The Fund's portfolio of offset projects was as follows

489,700 tonnes CO_2-eq

In 2024, the Eurasian Development Bank (EDB) prepared for the placement of three-year KZT 50 billion bonds on the Kazakhstan Stock Exchange (KASE) to finance the Almaty CHPP-3 reconstruction. The placement of the bonds took place in February 2025 and attracted significant interest from investors – the volume of bids exceeded the offer by KZT 9 billion. The reconstruction of CHPP-3 provides for a switch from coal to natural gas, which will significantly reduce emissions of harmful substances, improve air quality in Almaty and increase the reliability of energy supply. We realise the project within the framework of sustainable financing, where the bond issue complies with international ESG standards.

I-REC certificates

International Renewable Energy Certificates (I-RECs) are an internationally recognised instrument documenting that electricity is generated by using renewable energy sources (RES). In 2024, the first trades of I-REC certificates took place on the Astana International Financial Centre (AIX) exchange. The first deal was concluded between Samruk-Energy LLP, a subsidiary of Samruk-Energy JSC, and Valor Carbon, a London-based trading firm. Within the framework of the exchange transaction Samruk-Green Energy LLP sold 1000 I-REC certificates to the British company Valor Carbon.

In 2024, NC KazMunayGas JSC acquired 10,000 units of certificates for 10 million MWh, which corresponds to the average annual electricity consumption by the Corporate Centre of this portfolio company in 2024. NAC Kazatomprom JSC acquired I-REC certificates, which allowed reducing indirect greenhouse gas emissions (Scope 2) in 2024 by 18.4% compared to 2023.