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QazaqGreen

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QAZAQ GREEN Association

KONRAD ADENAUER STIFTUNG

2022
№ 1–2 (05–06) May

REDUCTION OF CARBON FOOTPRINT:

Kazakhstan and Central Asia

QAZAQ GREEN

UNITED PLATFORM
for Kazakhstan and international players
in the field of renewable energy sourses

AIM – SECTOR CONSOLIDATION
to bring together actors in the field of renewable energy sourses
in order to create favorable conditions for development of the sector

MISSION:
formation of a holistic position of association members to
obtain attractive conditions for investing in the projects
of renewable energy sources

Nur-Sultan,
Esil microdistrict, BC Ansar, Syganak,43

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KONRAD ADENAUER STIFTUNG

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NURLAN KAPENOV

Chairman of the Board of Directors QAZAQ GREEN RES Association

Dear readers and friends!

This year began with great trials for our country: the tragic events of January cut short the lives and destinies of our citizens, caused great damage to small and medium-sized businesses, exposed the problems of socio-economic development of our country. A tense situation has developed in the international arena, which affected our economy and resulted in increase of volatility of the national currency, acceleration of inflationary processes, rise in prices for goods and services.

The difficult situation in the country's electric power industry. A blackout in January, the collapse of one of the pipes at the Petropavlovsk CHPP-2, which caused the death of an employee, an accident at the Stepnogorsk CHPP, which left residents of the city without heat and hot water – a continuing series of wake-up calls that had arisen in the power system in the autumn last year. The underlying causes of this situation are of technical and economic character. The obsolescence of generating equipment, increase in the volume of emergency shutdowns directly depends on the inability to modernize the country's energy facilities due to low tariffs and low level of investment in the industry.

Of course, all this directly affects the renewable energy sector. During recent years, the vector of RES development has formed three clear directions:

– Implementation of large-scale renewable energy projects through an auction mechanism;

– Development of small-scale renewable energy for the needs of the population, farms, small businesses; and

– Development of B2B renewable energy projects to cover own electricity needs of enterprises of the real sector of the economy.

Unfortunately, I must state that all three directions today have run into a wall of problems and tasks that need to be solved quickly, proactively, through making high ground decisions.

As to development of large-scale renewable energy projects, it is necessary to directly peg auction prices to the US dollar exchange rate, and ideally, to conduct auctions in hard currency, to abandon marginal auction prices that do not reflect reality, to introduce the practice of bidding with an open price, to introduce a tariff indexation mechanism for the construction of renewable energy facilities, to develop an auction schedule for medium-term period. Qazaq Green is receiving more and more appeals from investors that the renewable energy market in the country is not attractive, and

THE WELCOME SPEECH OF NURLAN KAPENOV THE CHAIRMAN OF THE BOARD OF DIRECTORS QAZAQ GREEN RENEWABLE ENERGY ASSOCIATION

implementation of projects with very high currency risks, non-functioning indexing mechanism, as well as the lack of indexing for construction period practically nullifies all business attempts to work in the market. In this regard, Qazaq Green has submitted relevant proposals to the Ministry of Energy of the Republic of Kazakhstan. Failure to adopt such proposals will lead to stagnation of renewable energy sector, refusal to implement projects based on the results of recent auctions and potentially technical defaults of existing RES plants. The overstated technical requirements for implementation of energy storage systems developed by the System Operator KEGOC JSC also raise questions.

Amendments to the current legislation and targeted assistance to the population on implementation of such projects are necessary for further development of small-scale renewable energy sources. There are developments and solutions in this direction through the UNDP-GEF project "Reducing the risks of investing in renewable energy", and instruction of the President following the meeting on development of the electric power industry and renewable energy, held on May 26, 2021. To implement the above measures, the Republican Budget Commission should take a decision on allocation of targeted assistance to individual and net consumers, making amendments to legislation on support for use of renewable energy sources, on natural monopolies, and development of subordinate regulatory legal acts. However, things are still where they started... and the deadline for execution of Presidential order is June 2022.

Considering the problem of integration of RES facilities, the System Operator came up with the issue: what technical requirements should be put forward for RES facilities being built by industrial enterprises for own needs? There are examples when such projects do not involve a network connection at all. Today, these requirements include either the construction of a regulating capacity next to a renewable energy facility, or the installation of energy storage systems with a capacity of at least 50% of plant capacity and a battery capacity that allows electricity to be supplied during 4 hours. Of course, no company will be able to afford such a luxury – to build a gas installation next to renewable energy stations or to purchase expensive batteries. Although, it must be acknowledged that our country's commitment to carbon neutrality was supported by business enthusiastically, and implementation of such projects is not only good for image of the country, but also has a substantial component – a contribution to the decarbonization of the country.

Getting back to the problems of the electric power industry, I cannot but note the appeal of the country's largest energy companies to the President of the Republic of Kazakhstan in early April 2022. The companies stated the following key systemic reasons in this situation:

– the need for uniform and consistent state regulation of the energy industry;
– the need for strategic planning in the industry;
– power shortage, electric power market;
– tariff formation and current tariff regulation;
– lack of investment attractiveness in the industry;
– low level of salaries in the industry;
– environmental and climate initiatives in the energy sector.

In this regard, I want to comment only on the last point related to climate initiatives and the development of renewable energy sources. Some stations are working for survival, not to mention investing, upgrading and reconstructing, or raising the low level of salaries in the industry. And today, when the stations are in critical condition, new environmental requirements regarding BAT, reduction of emission quotas, etc., are falling on them like a cold shower. At the same time, personally knowing the heads of all energy companies who appealed to the President, I can say with confidence that stations running on traditional fuel are not against renewable energy, not against BAT and other environmental measures. They are against continuing to work at such a low level of tariffs and demanding the impossible from them – ensuring the smooth operation of outdated equipment! Bees don't mind honey. Bees are screaming that if you don't feed them sugar in winter, they will all die out and there can be no question of honey.

Therefore, the accumulated problems are to be solved right now, delay is tantamount to death.

Kazakhstan's "green" transformation: building post COP26 energy policy and sustainable economic growth

MS KATHY LEACH, Her Majesty's Ambassador to the Republic of Kazakhstan

SUMMARY

COP26 concluded in November 2021 with 197 Parties agreeing the Glasgow Climate Pact to 'keep 1.5 alive': net zero commitments now cover 90% of the world's economy, up from 30% two years ago. But we now need to turn pledges into actions, and continue to ratchet up ambition – with a particular focus on the UK's Presidency priorities: coal, cars, trees/land use and, of course, the finance to pay for it. Glasgow increased the funding for developing countries to $100bn a year by 2023 and outlined special partnerships including a £6bn deal with South Africa for funding a 'just transition' from coal. To mobilise finance from international investors and development banks at the scale required to meet its ambitions and commitments, Kazakhstan needs to have a detailed energy plan, including on upgrading its electricity grid: an incentivising policy framework which puts an increasingly tough price on carbon and supports green energy; and the transparent measurement tools and ESG reporting framework to get carbon neutrality and sustainability into the bloodstream of government, business and consumers. The government also needs to invest in its own capability, with e.g. every relevant ministry having a dedicated climate change team, and budget line to promote sustainable development; and expertise at the centre of government to coordinate and advise. Finally, every Akim should be given financial incentives for developing sustainable, local solutions on energy, energy efficiency, water, transport, and waste.

THE WELCOME SPEECH OF MS. KATHY LEACH, BRITISH AMBASSADOR TO KAZAKHSTAN

COP26 in November 2021 concluded with 197 Parties to the UNFCCC agreeing the Glasgow Climate Pact. This Pact is just about enough to "keep 1.5 alive" – that is, to keep the prospect of global warming to under 1.5 degrees – but only if all commitments are met and indeed increased over the next crucial decade. Thanks to everyone's efforts net zero commitments now cover 90% of the world's economy, up from 30% two years ago. At Glasgow we also made progress in gaining support for our Presidency priorities, with many countries (including Kazakhstan) making new pledges to phase out coal; to accelerate zero-emission cars; to save and replant our forests; and of course to mobilise the finance to pay for an ambitious green transition – $100bn a year for developing countries.

The task now is to turn the COP26 pledges into action. We are very grateful to Kazakhstan for its 2060 Net Zero pledge and other commitments, including signing up at COP26 to the Presidency declarations on Forests and Land Use, on Youth and Education, and on a Just Transition from Coal. I believe President Tokayev is committed to the principle of Net Zero. The President has tasked the Ministry of National Economy, in coordination with other Ministries, with developing the detailed plan on how to achieve it – the Carbon Neutrality doctrine.

This is all the more important because at Glasgow Kazakhstan did not yet publish any further detailed policy roadmap to explain how it will achieve its – 15% National Defined Contribution by 2030. Nor did it give more than some headline targets in its Long Term Strategy to reach Net Zero. Setting out a detailed policy roadmap for Kazakhstan's energy sector is an absolutely critical next step if Kazakhstan is to attract the investors, multilateral development banks and entrepreneurs who will need to build and finance Kazakhstan's next generation energy infrastructure, at the scale and pace required.

And I say that very well aware that decarbonising an economy like Kazakhstan's is a hugely challenging prospect, even more challenging today. The January events showed how sensitive the issue of energy tariffs is – Kazakhstan's energy prices are currently among the cheapest in the world. And Russia's invasion of Ukraine has exposed Kazakhstan and the wider region to serious geopolitical and economic risk.

These circumstances might lead people to think that a green transformation is no longer something Kazakhstan can afford. I would suggest the contrary – Kazakhstan cannot afford to put it off any longer. Why?

First, because Kazakhstan's existing energy infrastructure – its Soviet-era grid and coal-fired power stations – is already too old, too accident-prone, too dangerous to the health of our children, and is failing to meet demand. Energy dependence on neighbours – for electricity and gas – will only increase. Under any scenario, after years of under investment, investment has to be made right now in infrastructure – energy, water, connectivity, waste management – to lay the foundation for diversified economic growth.

Moreover, if Kazakhstan is to attract investment, it urgently needs – at a time of acute geopolitical risk – to distinguish itself in a competitive global market for capital. I believe Kazakhstan has a great opportunity to position itself as an ambitious, future-oriented, modernising country, with sustainability and equity at the heart of its economic strategy. The President's vision of a New Kazakhstan, outlined for the first time in his speech on January 11, offers this promise.

But a vision by itself is not enough. To mobilise finance at the scale required, Kazakhstan's energy plan needs urgent work in 3 areas.

Second, a detailed long-term energy transformation plan, including, as a priority, a plan to upgrade the electricity grid, improve access to energy to rural communities through renewables, and improve connectivity across Central Asia, to provide resilience. This must also include a credible long-term plan to create a real electricity market, based on realistic tariffs.

Third, an incentivising policy framework for domestic and foreign investors. In the UK and Europe, we have had 20 years of experience in developing policies to attract investment and create an electricity market for the renewables sector. Such a framework must, at a minimum:

- put an increasingly tough price on dirty electricity, through policies like emissions trading, a carbon tax, and reduction targets for methane;
- support both energy efficiency, through incentives and penalties, and renewable energy, with appropriate subsidies.

I particularly want to stress the importance of energy efficiency. Energy investment will require

energy tariffs to become more expensive. Therefore it is essential that steps are taken right now to start developing the right policies, technologies and – most importantly – the mindset and commitment of consumers and businesses to saving energy.

And on renewables, policies must be designed carefully to make sure they are attractive for investment. Existing renewables contracts, priced in tenge, are at huge risk of no longer being economically viable if the exchange rate suddenly changes. Kazakhstan should consider a recent Asia Development Bank report, and Uzbekistan's experience, of pricing renewable electricity contracts in a way which will not put all currency risk on the investor.

Fourthly, Kazakhstan needs to invest in deepening its measurement and verification expertise on emissions monitoring, and a strengthen a transparent, obligatory ESG (Environment, Social, Governance) reporting framework in line with international standards for financial institutions and businesses. This is already starting to happen – the Agency for Financial Regulation is doing great work – but it needs to be speeded up. Kazakhstan needs to get carbon neutrality and sustainability into the DNA of government, business and consumers.

Fifthly, the financial architecture to support a green transition and leverage funds from foreign investors needs expanding. For example, Kazakhstan could create a Green Bank – perhaps this could be the new purpose of the Development Bank of Kazakhstan – and issue sovereign sustainable development bonds. In Glasgow, 95 banks with 43% of global banking assets, committed to achieve carbon neutrality by 2050 – this means that international investors will be looking for projects which meet their tough ESG criteria. Efforts should also be considered to accredit a Kazakh institution so that it can receive funds directly from international funds such as the Green Climate Fund or Adaptation Fund. Currently, all funds can only be received via multilaterals with relevant accreditation, such as EBRD.

We know all too well that it takes time, and expertise, to build a great, detailed plan, to build consensus among stakeholders, and then to deliver this plan at an acceptable cost. The UK has spent the last 20 years building its green energy policy. Over that time we have learnt as we have gone along, making mistakes, changing policies that weren't working or were too expensive, but continuing to drive forward our green transformation.

The headlines speak for themselves: in 2008, 80% of our electricity came from fossil fuels. Renewables generated just 6% of electricity. Electricity demand had been rising for decades. But since 2008, we have cleaned up our electricity faster than any other world economy. Our energy mix has shifted from 40% of coal in power generation to around 5%. Over 50% of our electricity is low-carbon – renewables and nuclear. Sometimes – on a particularly windy day – renewables even make up 50% of electricity. We have also reduced electricity demand by about 25% per capita, despite our rising population and growing economy, through huge improvements in energy efficiency in homes and household appliances, by setting targets for business, and by some increase in prices.

The UK's low carbon economy is now worth more than £200bn, almost four times the size of the country's manufacturing sector, with growth expected to accelerate in the coming years. More than 75,000 businesses from wind turbine manufacturers to recycling plants employ more than 1.2 million people in the green economy.

We have developed, with international partners, many initiatives where we try to share the policy lessons we and other international partners have learnt, to support countries like Kazakhstan: the Powering Past Coal Alliance, the Green Grid Initiative, the Clean Green Initiative, Zero Emission Vehicle regional dialogues, the Race to Zero, the C40 cities initiative. We would love to get Kazakhstan's Ministries, oblasts, cities, businesses, NGOs and entrepreneurs involved in some of these schemes. And of course we have some brilliant companies – Hive Energy on solar and green hydrogen transport, Independent Power Company, Rolls-Royce for small modular nuclear, the National Grid, and engineering companies like Worley and Wood Mackenzie, to build green infrastructure – just to name a few. All have experience and expertise to share.

Let me finish with a couple of final suggestions. To reorient Kazakhstan's economy and to convince foreign investors you are serious, another lesson the UK has learnt is that you also need to put the right structure and resource into government itself. A few thoughts to consider:

– Make energy policy a separate national project of its own under the Agency for Strategic Planning.

– Put commitments into law. We passed the Climate Change Act in 2008, putting our climate targets into law, and set up the Climate Change Committee, a specialist independent body, to provide annual guidance and advice on whether government plans were sufficient to meet our targets.

– Invest in expertise. Every relevant Ministry should develop a specialist climate change team. As a bureaucrat I can tell you – if it is not 100% of your job, the critical long-term issue of climate change will never be urgent enough compared to the short-term issues of today. You might also consider developing a specialist coordinating and crosscutting body or

agency, whether in the Ministry of National Economy, or in the Presidential Administration or office of the Prime Minister, with expertise from government, industry and academia and a budget for research, consultancy, conferences and publicity. In the UK, for example, in 2008 we created the Department of Energy and Climate Change, bringing together the energy team from the Department of Trade and Industry, and the climate change team from the Department of the Environment. This was transformational.

– Promoting sustainable development needs to run through government from top to bottom. I am told the Ministry of Information has a budget of billions of tenge, but no budget line to promote sustainable development.

– Every department should have a budget line for sustainability – and should be communicating the importance of "greening Kazakhstan". Governments have to bring the people along with them on this journey, demonstrating the value of cleaning up their environment and investing in the high-tech jobs of a green economy.

– Work bottom up as well as top down.

– Empower rural akim to develop sustainable development strategies, with financial incentives.

– Introduce green bonds for regional akimats. Promote small scale renewables in rural communities. One final example – in 2008 we had around 2,000 small scale renewables, largely roof top solar. In the last 14 years we have had around 1.2m installations – in remote places such as the Orkney Islands, 20% of the population have renewable energy. With the right government support, it is one of the answers to fuel poverty.

Kazakhstan's achievements over the last 30 years in building a prosperous, modern state, educating its young people and being a responsible global citizen have been hugely impressive. But history teaches us that economic growth is not inevitable – every country must continue to invest in new technology and new skills for its young people, if it is not to lag behind in the global race for development.

As the Presidency of COP26 until November this year, I feel a particular responsibility to help Kazakhstan find its "green transformation" pathway, building the next generation of infrastructure, technology and skilled jobs, which will ensure Kazakhstan's continued prosperity and security over the next 30 years.

FUELLING THE FIRE THAT IS NOT QUENCHED

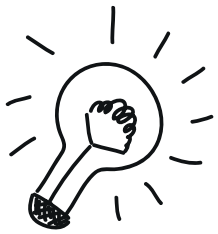
In the National Grid of Kazakhstan, an extremely tense situation remains associated with accidents at power plants.

On the one hand, this problem is related to the depreciation of generating equipment. Thus, the age of more than 55% of the generating equipment of thermal power plants is more than 30 years, for hydroelectric power plants this indicator is more than 66%.

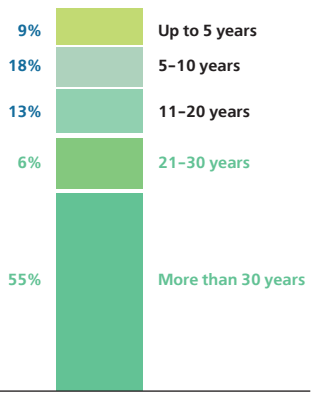
66%

As of the end of November 2021, the operating life of the park resource is over 100%, for boilers is 26%, for steam turbines – 44%, for gas turbines – 3%, and for hydraulic units – 50%. The volume of emergency repairs in the system is growing from year to year. Due to shortage of electricity and power, the equipment is practically working to the maximum.

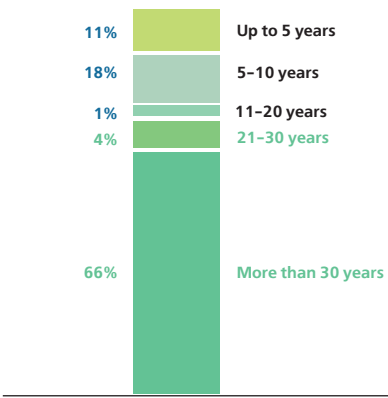
THE NUMBER OF MAIN GENERATING EQUIPMENT WITH MORE THAN 30 YEARS OF SERVICE IS 55% FOR TPP AND 66% FOR HPP.



The age of generating equipment of TPP in National Grid of Kazakhstan in 2021



The age of generating equipment of HPP in National Grid of Kazakhstan in 2021



Source: KEGOC JSC

Thus, on January 18, power unit No. 2 at Ekibastuz GRES-2 was shut down in an emergency.

At the same time, according to the System Operator, emergency repairs continued at the same time at power unit No. 1 at Ekibastuz GRES-2 and power unit No. 5 at Ekibastuz GRES-1. On the same day, power unit No. 2 at Ekibastuz GRES-1 was shut down in an emergency.

Already on January 19, K-4 A building at power unit No. 4 of the Eurasian Energy Corporation (EEC) was also shut down in an emergency. In those days, KEGOC JSC reported that the current situation could lead to unacceptable power deviations at the border with the Russian energy system, with overload of interstate power transmission lines and the threat of a system accident.

Fiat lux!

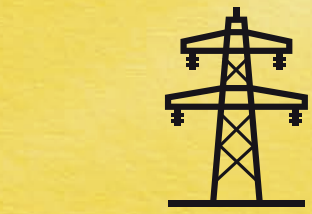
Let there be light! Day of Reckoning!

KAZAKHSTAN PHYSICALLY EXPORTS
MORE ELECTRIC ENERGY THAN **IMPORTS**
HOWEVER POWER EXCHANGES WITH RUSSIA PROMPT
TO OVERPAY FOR EXPENSIVE RUSSIAN ELECTRIC ENERGY

The situation occurred in the second decade of January in the National Grid of the Republic of Kazakhstan seems to have been resolved, such emergency shutdowns have already occurred in the system in October-November 2021. Here we must pay tribute to the professionalism of the dispatch center for operational work of the team. However, just a week later, on January 25, a blackout occurred caused by an accident in the power system of Uzbekistan, where 6 power units at the Syrdarya thermal power plant were disconnected due to a short circuit, with a total loss of generation of more than 1,500 MW. The resulting shortage of power in the power system of Uzbekistan led to an unauthorized extraction of power from the power system of Kazakhstan, connected to parallel operation with the power systems of Uzbekistan and Kyrgyzstan. As a result, there was a "surge" of power for the 500 kV transit "North-East-South of Kazakhstan" with its subsequent overload.

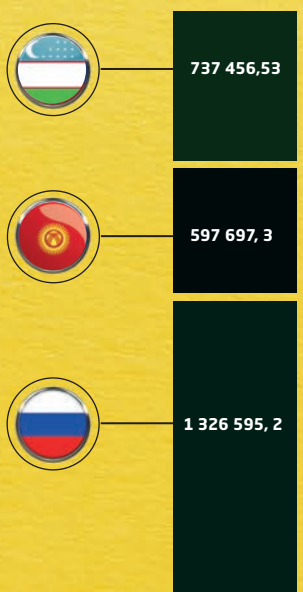
In order to prevent damage to the power equipment and complete blackout of the southern regions of the country, the automatic operation divided the transit with the transfer of Almaty, Zhambyl, Turkestan and Kyzylorda regions to isolated work.

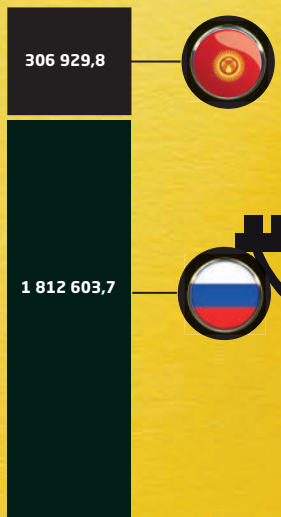
Export-import of electric energy for January-December 2021, thousand kWh



EXPORT
2 661 750,03

IMPORT
2 119 533,5





Thanks to the correct and timely operation of emergency automation of KEGOC JSC, all power plants in the southern regions remained in operation, continuing to supply electricity and heat to consumers with a total capacity of about 1,500 MW. Thus, the complete blackout of consumers of the southern zone of Kazakhstan was prevented.
Due to the lack of transmission of capacity on transit 500 kV "North – East – South of Kazakhstan", forced restrictions amounted to about 1,800 MW.

At the same time, the complete blackout occured in power systems of Uzbekistan and Kyrgyzstan with the shutdown of all power plants and consumers. In the power system of Uzbekistan, the disconnected load was about 9,600 MW (100% of consumption), in Kyrgyzstan about 2,600 MW (100% of consumption).

On the same day, at 15:50 (Nur-Sultan time), restrictions on electricity supply to consumers in Almaty city, Almaty, Turkestan, Kyzylorda regions and Zhambyl region were completely lifted, except for Kazphosphate LLP and TMP LLP. At 20:41 p.m. all restrictions on the southern zone, including the Zhambyl region, were completely lifted. The normal operation of National Grid of Kazakhstan was restored.

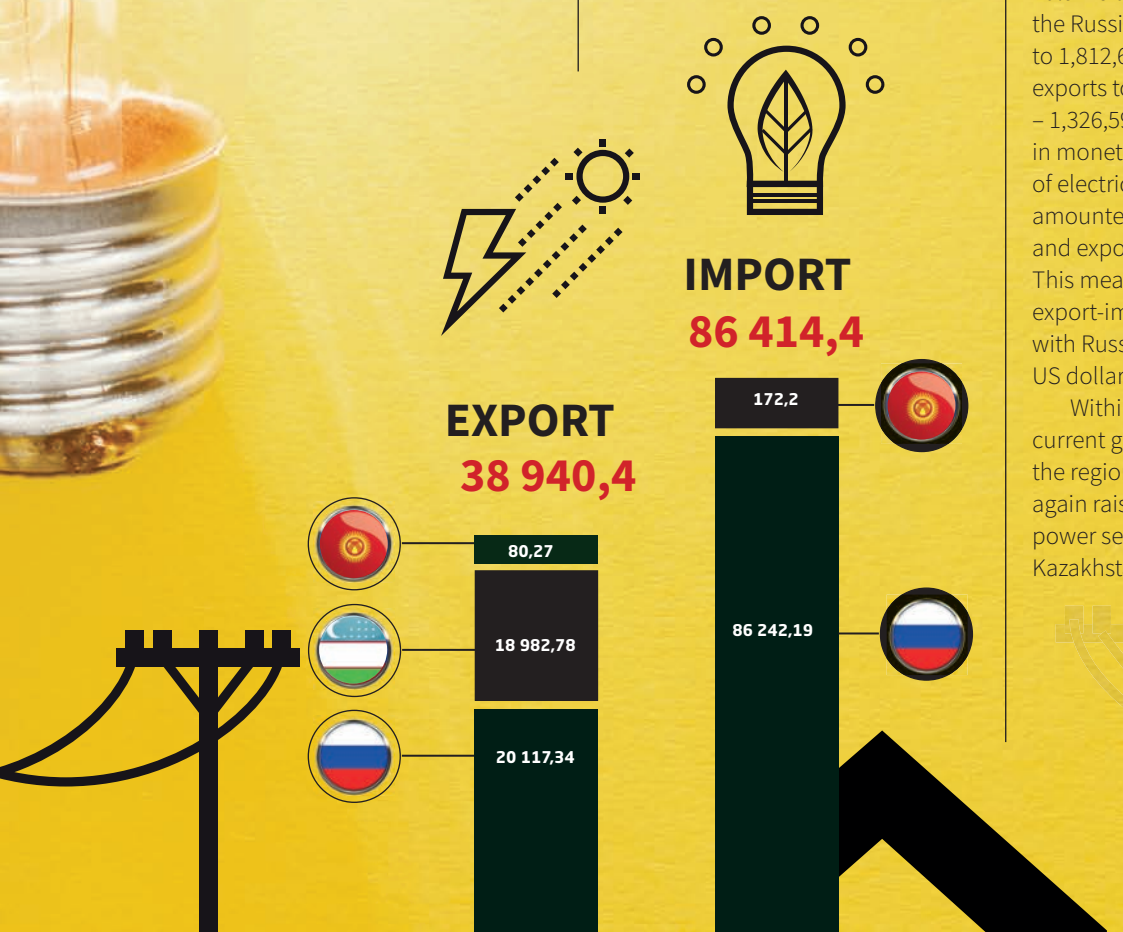
Currently, the National Grid of the Republic of Kazakhstan operates in parallel in the power pool system of the CIS countries and other countries connected by intersystem power transmission lines and united by a single technological regime. This gives enormous economic benefits for each country. Parallel operation allows selling or buying excess electricity in neighboring countries, which brings economic benefits to all systems.

Parallel operation of adjacent power systems allows reducing the cost of construction and maintenance of network infrastructure, generation reserves due to the fact that parallel operating power systems partially cover their needs for electricity transmission, reserve generating capacity at the expense of neighbors.

At the same time, it should be noted that due to current situation in the electric power industry, our country has to overpay for expensive Russian electricity. Thus in 2021, the volume of electricity imports from the Russian Federation amounted to 1,812,603.7 thousand kWh, and exports to the Russian Federation – 1,326,596.2 thousand kWh, and in monetary terms, the volume of electricity imports from Russia amounted to 86.2 million US dollars, and exports – 20.1 million US dollars. This means that the balance of export-import of electricity in 2021 with Russia amounted to 66.1 million US dollars.

Within the framework of the current geopolitical situation in the region, this dependence once again raises the issue of the electric power security of the Republic of Kazakhstan.

Export-import of electric energy for January-December 2021, thousand USD



MINING GAMBIT

According to the official position of the Ministry of Energy of the Republic of Kazakhstan, the shortage of electricity in the National Grid in the autumn-winter period of 2021 – 2022 was formed due to the rapid growth of consumption by digital mining. In particular, the System Operator reported that the main factors of the deficit were high accident rate at power plants and significant increase in electricity consumption, which over the past year exceeded 6%, i.e. 3 times more than in recent years. For reference, in 2020, the increase in electricity consumption was 2%, in 2019 – 1.9%.

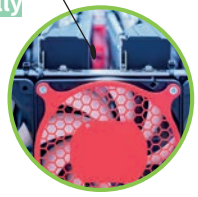
In conditions of electricity shortage, in order to ensure uninterrupted power supply to the population and the economy of the country, KEGOC JSC, together with power plants and energy supply organizations, in accordance with the requirements of the current regulatory legal acts of the Republic of Kazakhstan, took measures to reduce planned electricity supplies to mining data centers.

In particular, for example, KEGOC JSC reported complete cancellation of planned electricity supplies to persons engaged in digital mining (full restriction from 00:00 to 24:00 Nur-Sultan time) in the period from January 24 to 31, 2022. Earlier it was reported that half of all mining farms, which account for about 1,000 –1,200 MW of electricity consumption, are "gray" miners.

In November 2021, it was reported that only

50

mining farms were officially legalized in Kazakhstan.



Kazakhstan has become a haven for numerous miners, forced to look for new places for their farms after the Chinese authorities banned any use of cryptocurrencies in the country, and then investments in cryptocurrency. Many Chinese mining companies sold equipment very cheaply because they were completely out of the game. As a

result, most of the machines settled in the gray mining zone of Kazakhstan.

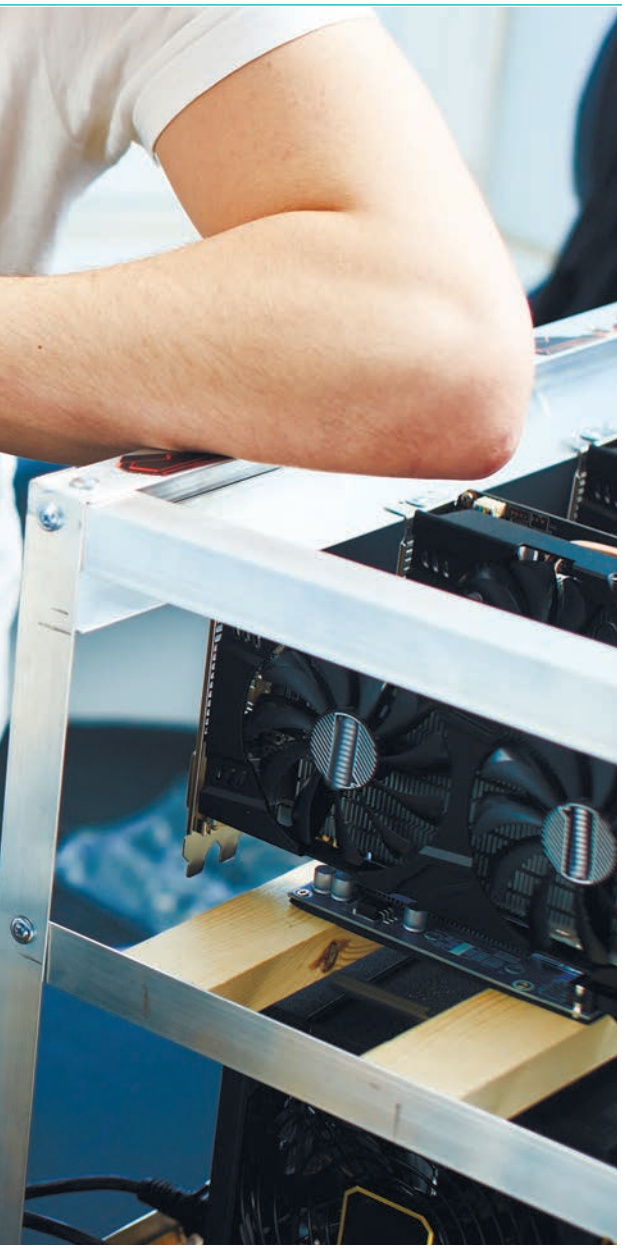
In order to remedy the situation, the President of the Republic of Kazakhstan

K.-J. Tokayev instructed the Financial Monitoring Agency to identify all mining farms in Kazakhstan by March 15, increase the tax on cryptocurrency mining tenfold, and the Government of the Republic of Kazakhstan to provide a package of solutions for further regulation of the sphere by April 1 this year.

In order to fulfill this instruction, the Government of the Republic of Kazakhstan initiated amendments to the Code of the Republic of Kazakhstan "On Taxes and Other Mandatory Payments to the Budget" (Tax Code), according to the draft of which, the fee rate is determined:

- in the amount of 10 KZT per 1 kilowatt-hour of electric energy when using the electric power resources of the Republic of Kazakhstan;
- in the amount of 3 KZT per 1 kilowatt-hour of electric energy when using renewable energy sources of the Republic of Kazakhstan (with the exception of hydroelectric power plants);
- in the amount of 5 KZT per 1 kilowatt-hour of electric energy when using electric energy from the power systems of neighboring states.

According to the developers, this measure will increase budget revenues from mining, as well as reduce uncontrolled electricity consumption by mining farms.



Measures to search for "gray" miners were not long in coming. For example, in five days in mid-February, thirteen mining farms with a total capacity of 202 megawatts were identified in eight regions of Kazakhstan. In the Karaganda region, the fact of digital mining activities with a total capacity of 31.3 megawatts was revealed, in the Pavlodar region – 22 megawatts, in the Turkestan region - 3.28 megawatts, in the Akmola region – 1.03 megawatts, in the Kostanay region – 0.82 megawatts, in the capital – 1.8 megawatts, in Almaty – 3.5 megawatts, Shymkent – 4 megawatt.

However, at the beginning of this March the Ministry of Energy of the Republic of Kazakhstan initiated a draft order "On amendments to some orders of the Minister of Energy of the Republic of Kazakhstan". The draft of this Order includes important amendments regarding the development of legal digital mining in Kazakhstan. As is commonly known, the President of the Republic of Kazakhstan K.-J. Tokayev, speaking at an expanded meeting of the Government of the Republic of Kazakhstan on February 8, 2022, noted that the state is not against "white" mining. At the same time, those who want to work in this field must have an appropriate license, receive electricity at adequate tariffs, declare income and pay taxes, and launch green energy projects.

The draft Order under consideration assumes measures aimed at reducing restrictions on the planned supply of electric energy for companies engaged in legal digital mining of cryptocurrencies, putting forward a number of criteria, such as ownership of equipment, registration with tax authorities, connection to grid through an energy transmission organization, informing the authorized body in the field of information security, availability of technical connections to the networks agreed with the System Operator, the availability of documents for the customs declaration of imported equipment.

It is necessary to understand that companies engaged in legal digital mining are participants in the energy system, which consume electricity constantly, as well as many other business entities. Taking into account the instructions of the President to increase the mining tax, these companies, in addition to creating highly qualified jobs in the regions, will also contribute to the budget in the form of tax deductions, which are likely to grow in the near future.

However, taking into account the current situation with the shortage of electricity, the restriction of electricity supplies to mining data centers, investors are making active efforts to find accommodation in countries with different tariffs, but lower investment risks, such as the USA, Canada, South American countries.

The issue regarding the construction of renewable energy capacities for mining farms also remained debatable, since such facilities need uninterrupted generation of electricity 24/7, which RES cannot provide for now. At the same time, miners are asking a question that they cannot yet get an answer from official sources: "Are miners the cause of the electricity shortage in Kazakhstan?" and they complain that in order to reduce the deficit and reset consumption in the system, they decided to sacrifice digital mining.

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THE BIG atomic issue

Taking into account the current situation in the electric power industry, the issue of the need to build a nuclear power plant has been actively raised recently. In November 2021 President of the Republic of Kazakhstan K.-J. Tokayev, at the meeting with representatives of the financial sector in Almaty, noted that taking into account signs of a shortage of electricity, in the future it would be necessary to make a tough decision on construction of a nuclear power plant, summarizing that this was the task of the leader.

At the beginning of February 2022, at an expanded meeting of the Government of the Republic of Kazakhstan, K.-J.Tokayev said that it was urgently necessary to solve the issue of the country's energy security and without clean nuclear energy there are risks of losing the economy, investment and regional leadership. At the same time, the President noted that responsible persons avoided answering questions and did not explain to the population the importance of building such a station.

The reaction of the Ministry of Energy of the Republic of Kazakhstan was not long in coming. On February 15, at a meeting of the Government of the Republic of Kazakhstan, Minister of Energy of the Republic of Kazakhstan Bolat Akchulakov announced the need to build a nuclear power plant. In particular, in the developed energy balance of the country until 2035, the level of electricity consumption is projected at the level of 153 billion kWh. At the same time, there is a gradual decrease in the generation of existing power plants from 108 billion kWh in 2020 to 88.6 billion kWh in 2035.

It is proposed that the scenario "Green with nuclear power plants" be adopted as the basis for the development of the industry, which involves the introduction of 17.5 GW of electric power and an emphasis on the development of green energy sources, gas and nuclear generation.

"Taking into account the upcoming shortage of electricity, it seems that need to reduce dependence

In particular, in the developed energy balance of the country until 2035, the level of electricity consumption is projected at the level of 153 billion kWh.

on coal generation due to the global environmental agenda, the deterioration of production capacities, as well as the huge potential of Kazakhstan in the development of nuclear energy in the country, the construction of a nuclear power plant is the most promising solution" – Bolat Akchulakov summed up.

A few days later, answering the questions of journalists in the lobbies of the Senate of the Parliament of the Republic of Kazakhstan, Vice Minister of Energy of the Republic of Kazakhstan Zhandos Nurmaganbetov noted that the decision on the construction of a nuclear power plant should be made in 2022.

As mentioned above, the scenario "Green with nuclear power plants" in the Forecast balance until 2035 provides introducing the nuclear generation in addition to increasing capacities in the system. In particular, the creation of such a facility is envisaged in the Southern Zone with a capacity of 1,200 MW in 2032 and 1,200 MW in 2035. The total share of NPP electricity in the country's energy balance will be 12%.

Taking into account the information vacuum around the issue of the construction of nuclear power plants in Kazakhstan, the society splitted down the middle: for and against.

It should be noted that the development of the Forecast Balance until 2035 is not the only attempt to model the development of the country's energy system. As part of the development of a Strategy (doctrine) to achieve carbon neutrality of the Republic of Kazakhstan until 2060, Zhasyl Damu JSC (a subordinate organization of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan) also conducted a modeling of the energy sector. In particular, then the feasibility of Kazakhstan's international obligations was assessed using the following modeling tools:

- TIMES (optimization energy model)
- CGE (macroeconomic model)
- System Dynamics (5 modules have been built for the most sensitive industries to the decarbonization policy (primarily in terms of socio-economic consequences);
- An integrated model based on the dynamic CGE model that links with two other models, TIMES and System Dynamics.

Analysis of changes in the structure of electricity generation by types of primary fuel and energy resources used until 2060 showed that nuclear energy will remain uncompetitive until 2060 in Kazakhstan and modeling in the TIMES does not offer it.

As it seems, the divergence of opinions regarding the construction of nuclear power plants exists not only among the citizens of our country, but also at the level of experts, economists, and power engineers. In our opinion, in the system of state planning there should be no difference in the methodology, modeling and calculations on the issue of forecasting the development of the country's electric power industry for both the medium and long term. It is necessary to adopt a single unified model of the energy balance and put it into strategic documents.

Taking into account the information vacuum around the issue of the construction of nuclear power plants in Kazakhstan, the society splitted down the middle: for and against. The protagonists of the NPP construction are, as a rule, energy experts who understand the current situation in the electric power industry, the obligations of our country and see the NPP as a "saving" generation for the power system. The antagonists, represented by environmentalists and ordinary citizens of our country, are guided by considerations of the potential danger to health and the environment caused by the construction of a nuclear power plant.

The European Commission's decision to approve the classification of clean energy sources, where both the atom and gas got into, added confusion to this issue.

However, on the understanding that in its current form, they will be forgotten in the coming decades. According to open source information, refusal to recognize them as green would seriously complicate

obtaining permits for the construction of new nuclear and gas power plants and increase the cost of attracting financing for these projects. The question here is that Europe is the leader in "greening" the economy and the second economy after the United States in the world. Therefore, the European classification of clean and dirty economy could potentially turn out to be the gold standard for the rest of the world.

According to the Ministry of Energy of the Republic of Kazakhstan, currently 31 countries operate nuclear power plants. As of February 2022, there are 439 power reactors in the world with a total capacity of about 390 GW, 52 reactors are under construction in 19 countries around the world. Nuclear energy accounts for 10% of the world's total electricity generation.

Taking into account the complexity, ambiguity of the issue, the polarization of opinions on the construction of nuclear power plants in Kazakhstan, we believe that the most acceptable format for making a decision is to hold a nationwide referendum on the construction of nuclear power plants. At the same time, it is already necessary to carry out information and explanatory work with the population of our country, for which, apparently, our state bodies are not ready yet.

So far, the media coverage of the construction of nuclear power plants includes the appeals of the President on the need for information and explanatory work and the expression of positions by authorized state bodies and the situational reaction of these state bodies.

KEGOC Strategy:

RES development amidst threats and risks

Against the background of the current situation in the electric power industry and important issues that are being discussed today in the company, the fact of the publication of the updated Development Strategy of KEGOC JSC for 2022–2031 remained unnoticed.

This document is a long-term strategic document, which defines the vision and mission of the System Operator to achieve strategic goals and strategic directions of development of KEGOC JSC for the long term. Developers explain the need for a new Strategy by the influence of global trends related to the energy transition, especially decarbonization and changes in the country's macroeconomic environment.

The Strategy of KEGOC JSC clearly defines the current trends in the global energy agenda that affect the state of our country's energy system. Thus, it is noted that as a result of climate policy, the energy sector is undergoing major changes from a unidirectional system with several large power plants and passive consumers to a fragmented and bidirectional system that includes both large-scale and small intermittent renewable generation facilities and small, flexible electricity consumption assets. Grid companies and system operators around the world are facing new types of "off-grid" confrontation and competition from non-traditional energy suppliers. At the same time, grid companies and system operators play a leading role in ensuring the energy transition, taking on the main problem of integrating renewable energy and the reliability of the power system, ensuring the quality and reliability of power supply to various sectors of the economy and consumers.

There are four key trends (megatrends) that affect energy systems and energy companies in the world: decarbonization; digitalization; decentralization; instability of demand. Demand dynamics will have an increasing impact on energy systems. In the future, when there will be many players in the market and some of them will be very small, it will be necessary for all processes to work automatically. In turn, this will require significant investments in digital platforms and processes.

As part of the SWOT analysis, the developers of the KEGOC Strategy attributed the development of renewable energy to the category of threats and risks for the energy system. In particular, it is noted that the threat to the security of the energy system when integrating the growing volumes of unstable renewable energy sources, taking into account the reduction of stable energy sources (coal-fired power plants) in the conditions of Kazakhstan's commitments to reduce greenhouse gas emissions and processes to achieve carbon neutrality.

STRENGTHS

- KEGOC JSC is a backbone company of the electric power industry with unique experience and high managerial competencies.
- The significant role of KEGOC JSC for development of the country's electric power industry as a System Operator of the National Grid of Kazakhstan.
- Experience in implementing major projects for the construction, modernization and reconstruction of substations and 220–500 kV overhead lines covering all regions of the country with the involvement of funds from international financial institutions (EBRD, IBRD) and Development Bank of Kazakhstan JSC.
- KEGOC JSC has professional and experienced management.
- KEGOC JSC has achieved high standards of corporate governance, an Integrated Management System (IMS) has been implemented.
- As a result of the introduction of advanced solutions in the field of business process automation and the long-term development of existing systems (SCADA, ACEMS, ERP, etc.), KEGOC JSC has a prepared platform for the transition to new generation technologies within the framework of building an intelligent power system.
- The availability of its own Competence Center in the field of ITK.
- Technological equipment of substations is comparable with technological equipment of the similar leading companies in the world.

WEAKNESSES

- The condition of the overhead lines of the NEPS of the Republic of Kazakhstan is characterized by significant wear (for 2020, the length of the 110-1,150 kV overhead lines, which have worked for more than 30 years, is 74.8% of the total length).
- Poor electrical connection between the Northern and Southern zones, which, with the growth of electricity consumption in the long term, limits the possibility of covering the energy deficit of the Southern zone from northern energy sources, limits the transit and export potential of the NEPS of Kazakhstan.
- Lack of electrical connection to the Western Zone.

OPPORTUNITIES

- Improvement of reliability and efficiency indicators through the introduction of advanced technologies, application of the best world practices in terms of equipment operation, staff development.
- Process optimization, opportunities for digitalization of production processes.
- Diversification of business and obtaining additional profit, including from the provision of high-speed channels on the FOCL to third-party entities, the provision of additional system services.
- Further improvement of corporate governance, support from Samruk-Kazyna JSC.
- The availability of interstate electric networks provides an opportunity to increase export and transit potential.
- Conduction of electricity imports from Russia in the conditions of a medium-term shortage of electric energy (subject to amendments to the current legislation).

THREATS AND RISKS

- Wear of ETO equipment and power transmission organizations can lead to a decrease in reliability and the occurrence of emergency situations in the National grid of Kazakhstan.
- Failure of production assets of the National Grid of Kazakhstan.
- Most of the generation structure is represented by coal-fired generation.
- The emergence of a shortage of electric energy and power in the Republic of Kazakhstan in the medium term due to an unpredictable increase in loads (including due to digital mining).
- Unavailability of the National Grid of Kazakhstan to work in an isolated mode due to dependence on frequency and power regulation provided by the National Grid of Russia due to the lack of its own maneuverable generating capacities.
- Risks of consumers' failure to pay for the financial settlement of electricity imbalances.
- Currency risk and, as a result, the rise in the cost of large investment projects.
- The threat to the security of the energy system when integrating the growing volumes of unstable renewable energy sources, taking into account the reduction of stable energy sources (coal-fired power plants) in the conditions of Kazakhstan's commitments to reduce greenhouse gas emissions and processes to achieve carbon neutrality.
- Cybersecurity threats.
- The impact of coronavirus.

Source: KEGOC JSC Development Strategy for 2022–2031.

In this regard, it is extremely necessary to implement measures to introduce a new maneuverable generation.

Renewable energy facilities (solar and wind power plants), as is known, are characterized by typical instability of generation, which, in conditions of an acute shortage of maneuverable generating capacities in the National Grid of Kazakhstan, leads to the need for additional measures to ensure the stability and reliability of the power system. To ensure the balance reliability of the National Grid, all available reserves of maneuverable generation are already involved in the power system of Kazakhstan. With the growth of RES volumes in conditions of a shortage of maneuverable generation in the power system, the problem of ensuring a balance of power will worsen. In this regard, it is extremely necessary to implement measures to introduce a new maneuverable generation.

Moreover, in accordance with the requirements of the legislation on the support of the use of renewable energy sources, KEGOC JSC provides services for the transmission of electric energy without payment for ETO using renewable energy sources. In order to further ensure the leveling of losses of energy transmission organizations, the Company plans to provide an alternative compensation scheme at the legislative level.

According to KEGOC JSC, in order to ensure further safe integration of growing volumes of RES into the energy system and achieve the share of RES at the level of 15% by 2031, it seems necessary to adopt the following basic requirements for WPP and SPP projects:

- construction of hybrid RES (WPP + SPP + Energy storage systems);
- ensuring the predominant share of wind power pants compared to SPP (with ratio of installed capacity of WPP and SPP – 80% and 20%);
- gradual introduction of renewable energy capacity with the separation of the stages of commissioning by years;
- equipping renewable energy facilities (SPP and WPP) with energy storage systems;
- RES dispatching on a general basis (without priority);
- exclusion of free transit of electricity produced by RES;
- RES responsibility for imbalances within the framework of the introduced balancing power market;
- ensuring high-quality generation forecasting by equipping renewable energy facilities with forecasting systems and/or purchasing relevant services from specialized organizations;
- reducing dispatch planning horizon from 24 hours to 1 hour;
- other requirements to generating installations from renewable energy sources provided for by the legislation of the Republic of Kazakhstan.

"Qazaq Green" RES Association shared its opinion on a number of the above-mentioned initiatives, which are currently being legislated by the Ministry of Energy of the Republic of Kazakhstan. Thus, on the issue of eliminating priority dispatching, members and accredited observers of the Association expressed a negative opinion on this initiative. They note that in case of cancellation of dispatching for renewable energy facilities, the renewable energy market will not be able to continue to develop systematically. International financial institutions (EBRD, ADB, hereinafter referred to as IFIs) note that if this initiative is adopted, IFIs will not have reasoned justifications for providing financing for renewable energy projects. The companies noted the current lack of alternatives for priority dispatching of renewable energy facilities.

Regarding the cancellation of free transportation of renewable energy, the players of the renewable energy market note that in the wholesale and retail electricity market, ultimately, the consumer must pay for transportation. At the same time, the provision for free transportation should exist for contracts concluded with FSC of RE LLP. International financial institutions note that for the sector of corporate RES (bilateral contracts) in terms of electricity transportation, KEGOC JSC needs to provide a clear understanding of how this sector will be regulated, a broad picture of the mechanism of this regulation is needed.

Regarding the transition from daily planning of renewable energy generation to hourly, the renewable energy business community expressed a common opinion on supporting this initiative, which will entail more responsible planning and more accurate forecasts for the generation of electricity by renewable energy stations. In turn, this will reduce the negative impact on imbalances in the National Grid of the Republic of Kazakhstan.

In conclusion, it should be noted that the current state of the world economy and the geopolitical environment puts forward new strategic risks, including for the energy system of Kazakhstan. It seems that a redistribution of forces will take place in the energy market in the near future, and the European Union, as the leader of "green" development, will accelerate the processes of energy transition to renewable energy sources. The facts speak for themselves – at the beginning of this March The United States refused to import oil and gas from Russia, following this decision, the United Kingdom will abandon oil from Russia by the end of the year (this has already been done by the giant companies Shell and British Petroleum), and Italy announced that it will abandon Russian gas within 30 months. This is against the background of the problem of dependence of the National Grid of Kazakhstan on power exchanges from Russia. If earlier we talked about power exchanges for balancing purposes in the system, now the power exchanges are used to cover the electricity shortage.

In the whole story, probably, the most important thing is that now is the time for a change in the attitude of state bodies and the System Operator to the renewable energy sector, which, unfortunately, still consider renewable energy as a threat to the country's energy system.

Scenarios for development of the electric power industry (LCGP) and the balance of electricity and capacities of Kazakhstan until 2035

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The development of the energy industry largely determines the development of the country and should be implemented proactively, taking into account the long construction and commissioning of energy facilities. In this regard, forecasting of the development of the industry is carried out, which, depending on the goals and planning horizons, is divided into short-term, medium-term and long-term.

Short-term forecasting (1–3 years) assumes a detailed action plan for the period under review. The goal of medium-term forecasting (5–7

years) is to determine quantitative indicators and resource allocation plan. Long-term planning (more than 10 years) is carried out to make strategic decisions aimed at introducing political and technical innovations in order to better allocate resources, achieve goals and international commitments.

Thus, medium-term planning (7 years) in Kazakhstan is fixed by the Law of the Republic of Kazakhstan "On Electric Power Industry", whereby the forecast balance of capacity and electricity is compiled annually by KEGOC JSC and approved by the Ministry of Energy of the Republic of Kazakhstan. The forecast seven-year balance is compiled in accordance with the "Rules for development of forecast balances of electric energy and capacity" and allows identifying the period of onset and the size of the shortage of electricity and capacity.

The forecast balance of capacity and electricity until 2035 was carried out in accordance with the President's instructions given at an expanded meeting of the Government on January 25, 2021. The purpose of this long-term forecast is to consider options for covering the long-term shortage of capacity and electricity, taking into account the adopted energy development targets and the international obligations of the Republic of Kazakhstan on reduction of emission, and to assess the possible results of the decisions taken.

The forecast balance of capacity and electricity until 2035 was developed based on officially provided source data from relevant organizations, large consumers of electricity and government agencies, energy-producing organizations upon request:

- to the Ministry of Energy (DOE) of the Republic of Kazakhstan;
- to the Ministry of National Economy (MNE) of the Republic of Kazakhstan;
- to the Ministry of Industry and Infrastructure Development (MIID) of the Republic of Kazakhstan;
- to SWF "Samruk-Kazyna";
- to Samruk-Energo JSC;
- to Financial Settlement Center of RE LLP;
- to power plants;
- large consumers;
- to electric grid distribution companies (EDC);
- to local executive bodies (akimats);
- to special economic zones (SEZ), etc.

Within three months (April – July 2021), total of more than 240 requests were sent, with fulfillment of 80%. The data of public organizations, NCE RK "Atameken", the election program of the Nur Otan party, etc. were taken into account.

Planning the operation of the power system includes a large number of variables and constraints; therefore, in order to find the optimal scenario of development from all possible alternatives, it is necessary to use mathematical models. Optimization models, usually, assume high requirements to computational resources, therefore, when modeling complex systems, such as energy, a reasonable determination of initial positions and assumptions is required.

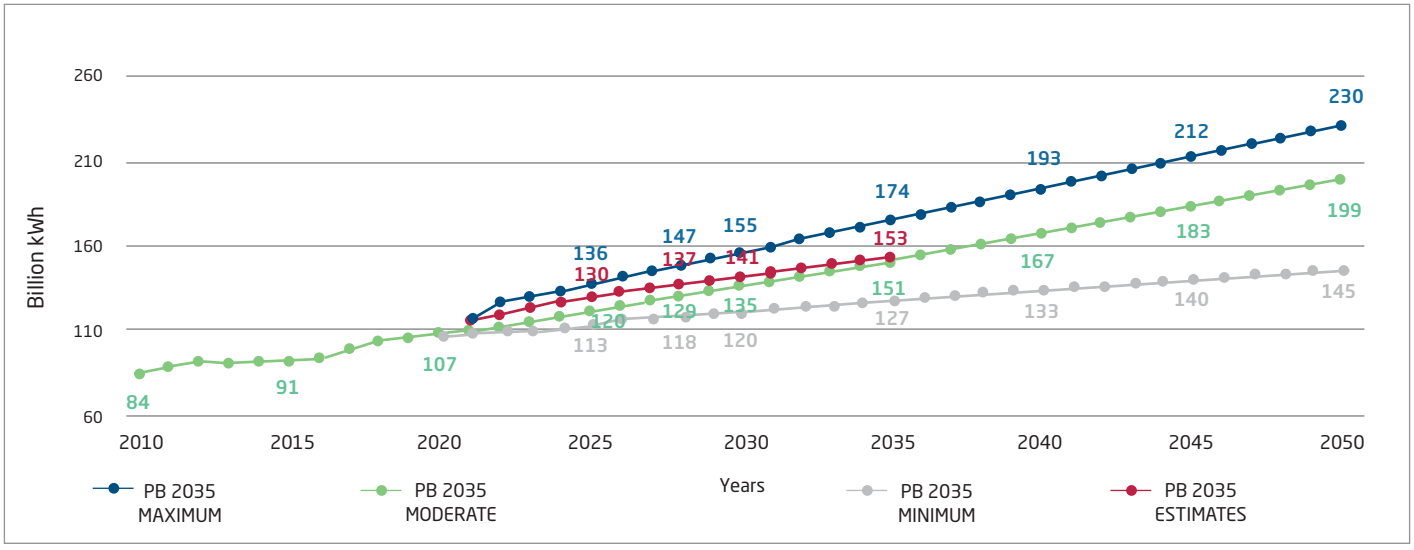
The forecast balance of capacity and electricity until 2035 was developed using the ORDENA software, which allows performing long-term forecasting of energy development at the lowest cost when the specified restrictions are met. The block diagram of modeling scenarios for the development of the power system is shown in the figure below.

This article will present the results of the simulation of scenarios for the development of the electric power industry of Kazakhstan (LCGP) and the resulting balance of electricity and capacity of the National Grid of Kazakhstan until 2035.

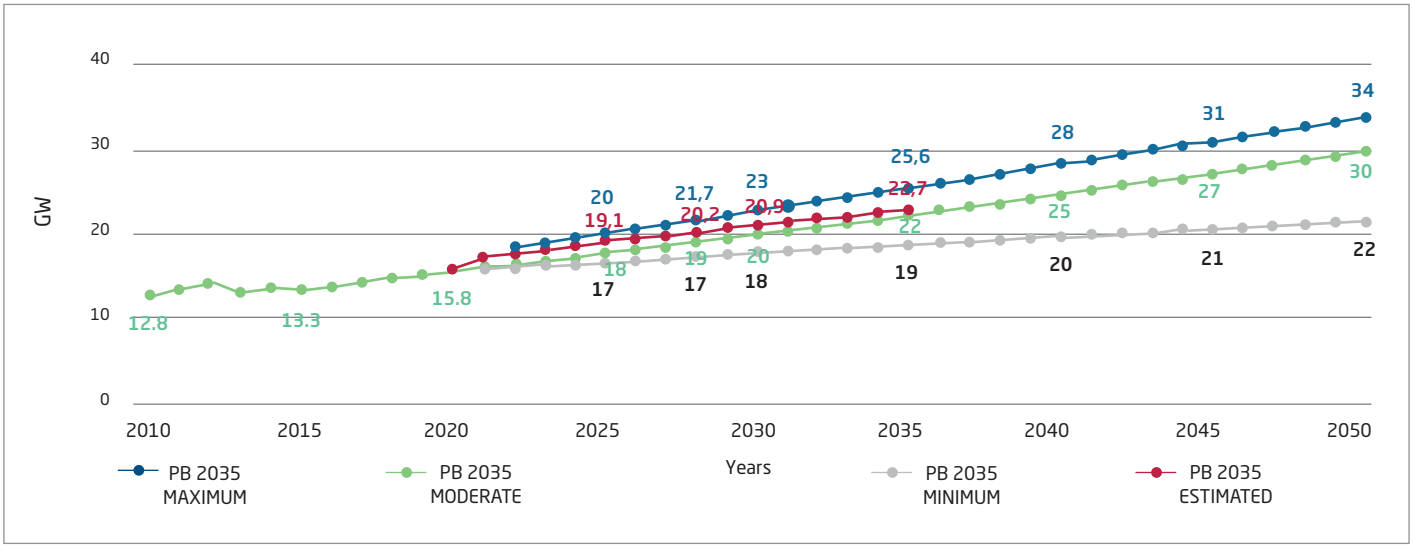
Traditionally, the development of balance begins with forecast of electricity consumption and electrical loads in the long-term, which was carried out according to three scenarios, while the "Estimated scenario" was taken as the basis according to which the electricity consumption in National Grid of the Republic of Kazakhstan would be 137 TWh in 2028 and 153 TWh in 2035. The total electric load of the National Grid of the Republic of Kazakhstan is projected to be 20.2 GW in 2028 and 22.7 GW in 2035, respectively.

In addition, based on the results of the review of the Concept and Doctrine of Low-Carbon Development (CDLCD), when analyzing the sensitivity of the results of optimizing the lean cost generation plan (LCGP), the Maximum scenario was additionally considered, providing active development of agriculture, electric transport, information technology (data processing centers) and a significant increase in the specific rates of municipal consumption.

ELECTRICITY CONSUMPTION IN THE RK

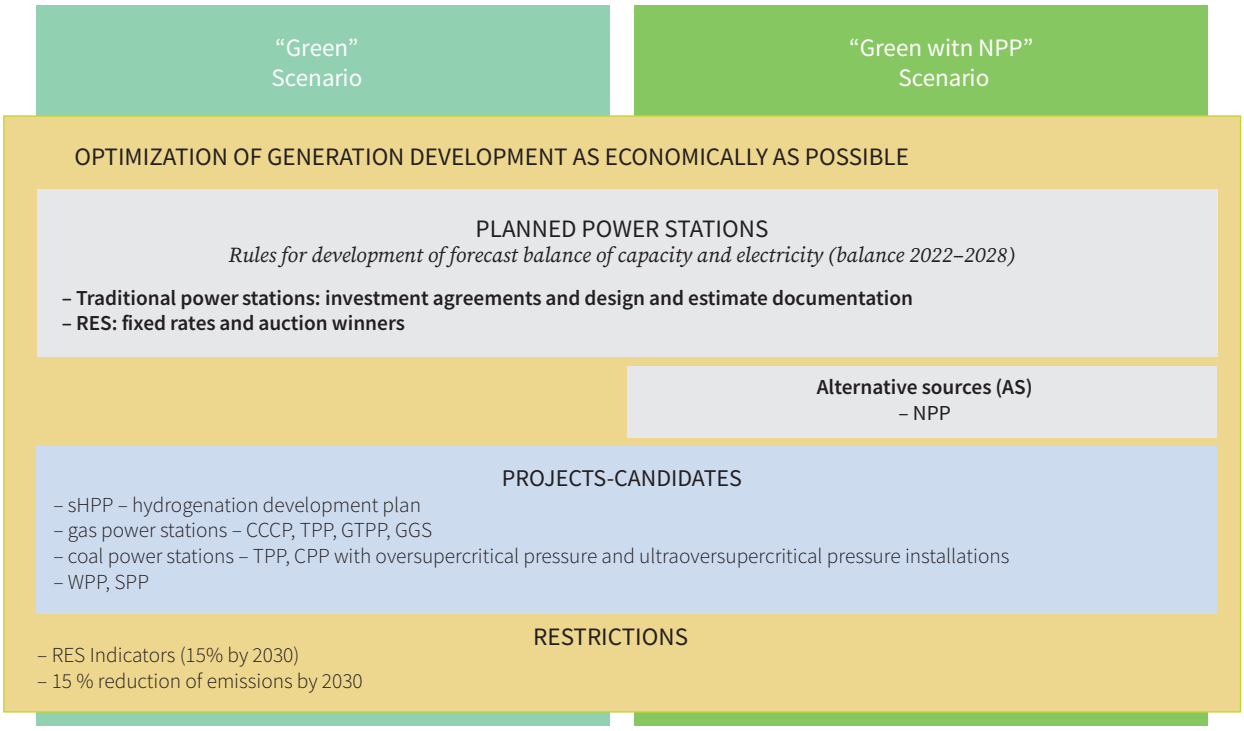


LEVELS OF MAXIMAL POWER LOADS IN THE RK

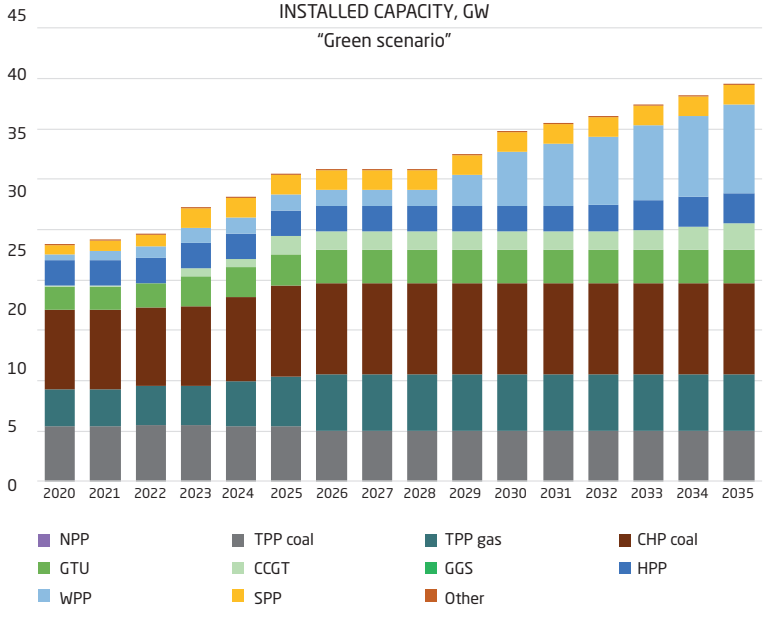


According to the existing condition (2020 report), the total electricity consumption for the National Grid of the Republic of Kazakhstan amounted to 107 billion kWh, and the peak load was 15,8 GW.

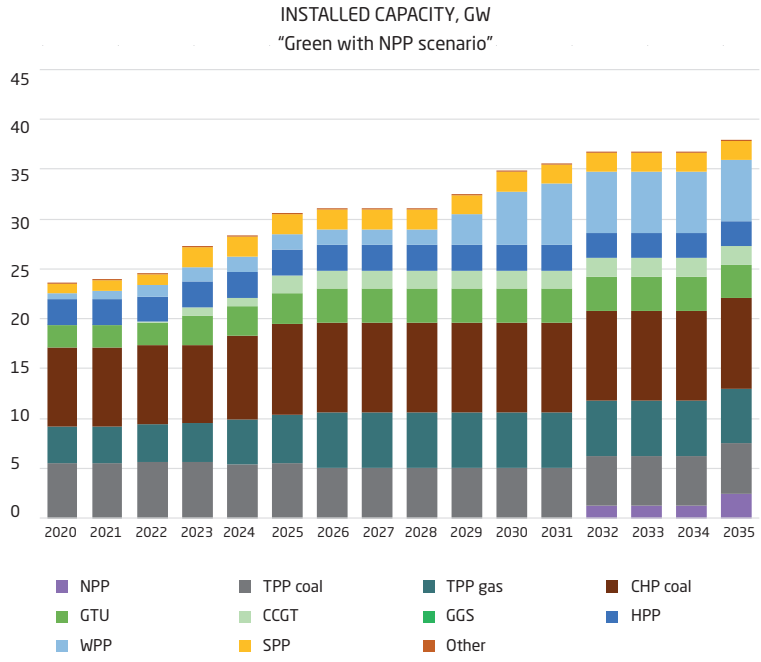
Modeling was performed for two scenarios of generation development: "Green" and "Green with NPP".



The following are the results of modeling the optimization problem of covering the electricity and capacity needs of the National Grid of the Republic of Kazakhstan until 2035 with minimal system costs, as well as taking into account the boundary conditions for CO_2 emissions, the availability and cost of fuel, CAPEX and OPEX for various generating technologies, the topology of the power system and reliability requirements.



Name	Introduction of generating capacities, MW		
	2028	2035	Total for RK before 2035
NPP	0	0	0
TPP coal	301	0	301
CHP coal	1,136	0	1,136
CCGT	1,811	840	2,651
TPPgas	2,219	0	2,219
GTU	1,088	0	1,088
GGS	0	0	0
HPP	0	409	409
sHPP	1,931	105	2,036
SPP	1,003	0	1, 003
WPP	996	7,241	8 237
TPP masut	0	0	0
BioEP	0	111	111
TOTAL	10,485	8,706	19,191



Name	Introduction of generating capacities, MW		
	2028	2035	Total for RK before 2035
NPP	0	2.400	2.400
TPP coal	301	0	301
CHP coal	1,136	0	1.136
CCGT	1,811	0	1.811
TPPgas	2,219	0	2.219
GTU	1,088	0	1.088
GGS	0	0	0
HPP	0	55	55
sHPP	1,931	105	2.036
SPP	1,003	0	1.003
WPP	996	4.476	5.472
TPP masut	0	0	0
BioEP	0	111	111
TOTAL	10,485	7,147	17,632

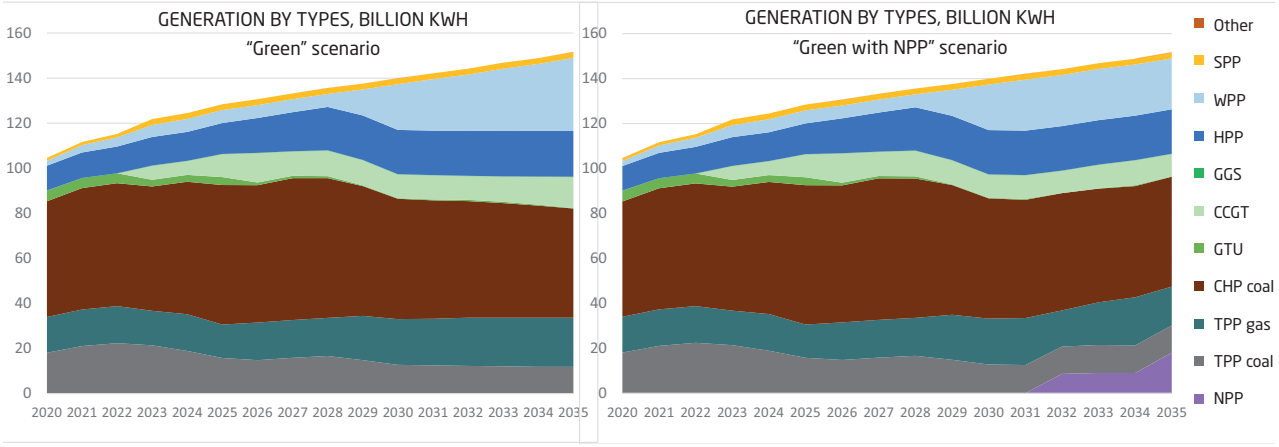
In terms of the size and structure of generating capacities, in general, in the Republic of Kazakhstan until 2035, it is expected to increase the installed capacity by ≈ 19.2 GW under the "Green" scenario, and ≈ 17.6 GW under the "Green with NPP" scenario.

According to the "Green" scenario, the main inputs account for gas generating sources (CCGT – 2.7 GW + CHP gaz – 2.2 GW + GTI – 1.1 GW = 6.0 GW), WPP (= 8.2 GW) and SPP (= 1.0 GW), as well as hydraulic power plants (HPP – 0.4 GW + MHPP – 2.0 GW = 2.4 GW).

According to the "Green with NPP" scenario, in comparison with the "Green" scenario, the commissioning of nuclear power plants in the period 2032–2035 (= 2.4 GW) leads to a decrease in inputs to the CCGT by – 0.9 GW (= 1.8 GW), and to the wind power plant by – 2.7 GW (= 5.5 GW). Inputs at hydraulic power plants are also reduced by – 0.35 GW (HPP – 0.05 GW + MHPP – 2.0 GW = 2.1 GW).

In terms of electricity generation at power stations of the Republic of Kazakhstan in 2035:

- According to the "Green" scenario, the share of coal-fired power plants will decrease to 40%, gas-fired power plants will increase to 24%, hydroelectric power plants, including small hydroelectric power plants, will amount to 13%, wind power plants and SPP – 23%. The total expected gas consumption will be 7.5 billion m³.
- According to the "Green with NPP" scenario, in comparison with the "Green" scenario, the share of electricity generation at the NPP will be 12%, gas – 18%, WPP and SPP will be 17%. At the same time, the total expected gas consumption will be 6 billion m³.



Name	"Green" scenario	"Green with NPP" scenario
Generation in 2035, billion kWh	152	152
PP coal	40%	40%
PP gas	24%	18%
NPP	0%	12%
HPP	7%	7%
sHPP	6%	6%
WPP	21%	15%
SPP	2%	2%
Gas consumption in 2035, billion m^2	7.5	6.0

CO_2 emissions have been declining since 2028, reaching the unconditional targets under the Paris Agreement –15% in 2030 and continuing to decline. At the same time, at the level of 2035, the share of emissions from coal-fired power plants is 90–91%, gas-fired power plants – 9–10%.

By 2035, ICUF at the CCGT is increasing, at the GTI it is decreasing, which indicates the transition of the GTI to work in the peak of load coverage schedule. At coal-fired thermal power plants and CP, the ICUF also reduces due to the requirements for limiting CO_2 emissions.

Emissions are reduced by reducing ICUF of coal-fired power plants, increasing the share of renewable energy and gas generation in the "Green" scenario, as well as by introducing a nuclear power source in the "Green with NPP" scenario.

Name		"Green" scenario	"Green with NPP" scenario
Emissions, mln t CO_2		89	89
	PP coal PP gas	90% 10%	91% 9%
Total reduced system costs, billion		32.7	37.8
	fixed	11.5	11.4
	variable	2.6	2.6
	cost of fuel	5.6	5.8
	capital expenditures	13.0	18.0

The total inputs of generating capacities for the period up to 2035 amount to 17.6 GW, and the increase in installed capacity is 16.6 GW (the difference is due to the fact that according to the "Rules..." the outputs of the existing generation are also taken into account).

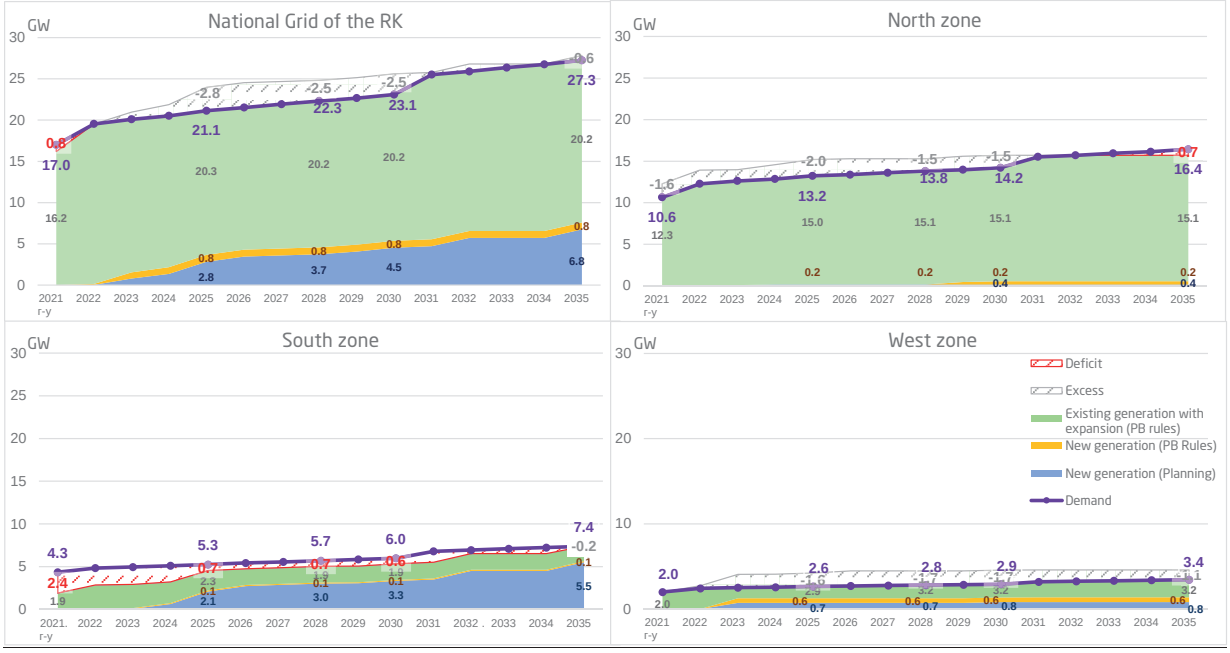
The balances of electricity and capacity for the period up to 2035, taking into account the planned optimization of the development of generation under the "Green with NPP" scenario and without it, are shown in the figure below.

It should be noted that in general, taking into account the planned optimization of the development of generation, the National Grid of Kazakhstan is self-balancing in terms of electricity.

Without taking it into account, an increasing shortage of electricity and capacity is expected, which in 2030/2035 may exceed 40/60 TWh and 3/7 GW, respectively.

ELECTRICITY BALANCE

CAPACITY BALANCE



The electricity balance for 2035 in the Northern and Western zones is formed with a deficit of 14,7 TWh and 9,0 TWh, respectively, in the Southern zone – with an excess of 22,4 TWh due to a decrease in production at coal-fired thermal power plants and thermal power plants and an increase in production at nuclear power plants, gas-fired thermal power plants and renewable energy sources, which are currently expanding in the Southern zone. The capacity deficit of the Southern zone is gradually decreasing from 2.0 GW in 2022, and in 2035 the balance will be in excess of 0.2 GW. In the Northern zone, the excess capacity is gradually decreasing, and starting from 2032 the balance becomes deficient to 0.8 GW in 2035. In the Western zone, an excess capacity of up to 1.8 GW is predicted for the entire period. To cover the projected deficits in the North–South association, it is necessary to unite with Western Kazakhstan.

The main measures aimed at ensuring coverage of the projected demand for capacity and electricity in the National Grid of Kazakhstan include:

In the short term:

- Participation of ZHGRES in full-block mode.
- Organization of electricity import.
- Introduction of financial responsibility to cover deviations between the projected and actual capacity of renewable energy facilities, as one of the incentives for the installation of energy storage systems.
- The introduction of balancing market in real mode and the return of tariffs differentiated by the hours of the day to the practice for wholesale and retail consumers as the initial stage of the implementation of demand management program (tariff increases during peak hours and decreases during the hours of failure, especially relevant for the Southern zone).

Medium-term measures include:

- Implementation of all planned reconstruction, expansion and modernization projects, including the commissioning of units at EGRES 1 (500 MW) and EGRES 2 (636 MW).
- Implementation of plans for the development of gas generation (Turkestan CCGT 1,000 MW, Shymkent CCGT CHPP 450 MW, Kyzylorda CCGT 250 MW, Almaty CCGT CHPP 1–3).
- Implementation of plans for the development of hydraulic power industry.
- Development of renewable energy projects and energy storage systems.
- Construction of nuclear power plants.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Eni inaugurates its second wind farm in Kazakhstan

Nur-Sultan (Kazakhstan), March 2, 2022 – Eni, through its local renewable subsidiary Arm Wind LLP, inaugurated today the Badamsha-2 Wind Farm located in the Aktobe Region, Kazakhstan with a ceremony that was attended by representatives of national, regional and local institutions and the Ambassador of Italy to Kazakhstan, Marco Alberti.

Badamsha-2 Wind Farm was awarded to Eni following an auction managed by the Kazakh Ministry of Energy and entered commercial operation in September 2021, around 12 months after starting construction. Badamsha-2 Wind Farm is Eni's second wind project in the Aktobe Region, doubling the installed capacity of Badamsha-1 48 MW Wind Farm that was commissioned in early 2020 and is now in full operation. To date the wind turbines of Badamsha-2 are the largest installed in Kazakhstan, both in terms of size (rotor diameter 158 meters, hub 101 meters) and power (4.8 MW each) and are expected to deliver an annual energy generation up to

200

GWh

which is equivalent to the energy consumption of around 37,000 households, and an overall CO_2 saving of 173,000 tons per year. Badamsha-2

Wind Farm has also promoted job creation locally, with a peak of 300 people working on the construction site this year.

Following a separate auction in late 2019, Eni was also awarded a 50 MW photovoltaic project in the Turkestan Region, which is currently under construction.

These projects align with Eni's wider commitment towards the energy transition and decarbonization and will contribute to Kazakhstan's carbon neutrality target. Arm Wind, which is fully owned by Eni gas eluce – Plenitude (100% Eni), will implement Eni's strategy in the renewables business, aimed at achieving a balanced and diversified portfolio of up to more than 6 GW of renewables capacity by 2025 and more than 15 GW by 2030.

INTERVIEW

Like all countries in the world, Kazakhstan has set a goal of becoming carbon neutral by 2060. Investing in renewable energy (RE) projects is a whole new direction for our republic. In this interview, Yerlan Dairbekov, an expert of UNDP-GEF project "Derisking renewable energy investment", talks about the conditions created for RES projects, the measures taken to improve legislation, reduce risks for investors, etc.

Yerlan Dairbekov:

TRANSITION TO RENEWABLE ENERGY is a global trend

THE USE OF SMALL-SCALE RENEWABLE ENERGY PROJECTS CARRIES A LOT OF POSITIVE ASPECTS FOR CONSUMERS – EXPERT OPINION

– The UNDP-GEF project The name of the project is: "Derisking renewable energy investment" has been working in Kazakhstan for the past few years. What tasks were set for the project and what was achieved?

– The project The name of the project is: "Derisking renewable energy investment" is a joint initiative of the United Nations Development Program (UNDP) in Kazakhstan and the Ministry of Energy of the Republic of Kazakhstan, funded by the Global Environment Facility (GEF). The total budget of the project is $4.6

million, $2 million of which is provided for stimulating small and medium-sized businesses.

The objectives of the project include assisting the Ministry of Energy in developing and amending the country's legislation to promote renewable energy sources (RES) as well as introducing pilot mechanisms for SMEs interested in using RES technologies for their own needs. The pilot projects are implemented jointly with the "Damu Entrepreneurship Development Fund" JSC, which is also a partner of the Project under the Cooperation Agreement between UNDP and "Damu".

One of the important achievements of the initiative is the proposal and implementation of the pilot project "Site-specific RE auction". During the auction, participants offer the lowest tariff per kWh of "green energy", considering, firstly, the amount of energy intended for purchase by the government, and secondly, the location proposed by the potential investor for the construction of the plant. The "proposed" location of the facility carries additional risks (uncertainties) for the investor. For their part, the auction participants must consider the cost of the generated energy. For example, the area may have its own characteristics (e.g. marshy area, or grid-crossing area), and all this leads to additional unexpected costs for the investor, increases the cost of the project and restricts it if the tariff price is reduced during the auction.

This mechanism has proven to be successful, now the Ministry of Economy of the Republic of Kazakhstan uses it independently.

Another promising area of the project is development and implementation of financial instruments for renewable energy projects. We are talking about subsidizing instruments and "green" bonds, which were first issued in Kazakhstan in 2020. Thus, with issue and placement of the first "green" bonds, the Damu Fund attracted funds from the market to finance renewable energy projects through second-tier banks. Further, these funds were used to finance SMEs that implement renewable energy projects.

"Green" bonds, issued with the UNDP support, are another step in the country's transition to a low-carbon economy based on energy efficiency, reduction of greenhouse gas emissions and a higher share of renewable energy.

The role of the UNDP-GEF project in this process was to classify and select possible small-scale renewable energy generation projects, to create a so-called taxonomy catalogue. Thus, the initial reduction in the cost of borrowed funds allowed second-tier banks to provide funds for the final borrower, that is, SMEs on preferential terms.

Thanks to such "green" investments, a solar power plant with a capacity of 1 MW was launched in the Turkestan region.

"Green" bonds, issued with the UNDP support, are another step in the country's transition to a low-carbon economy based on energy efficiency, reduction of greenhouse gas emissions and a higher share of renewable energy.

This financial instrument is expected to contribute to the country's environmental goals of increasing the share of alternative and renewable electricity to 50% of total energy generation by 2050.

– The UNDP-GEF project in the professional environment is associated primarily with the development of small-scale RES. The project has done a lot of work on the preparation of regulatory changes for the development of this segment. What are the advantages of developing distributed generation? Why do the developed measures not find a resonance in government agencies?

– Currently, there is a global trend towards decentralization of the energy sector. The transition to renewable energy is a global trend, and its development is facilitated by the improvement of technologies, availability of financial opportunities and various incentive programs, as well as public awareness of environmental issues.

According to the latest report of the International Energy Agency, in 2018 the total installed capacity of rooftop solar installations (with a unit capacity of up to

in Germany

33

GW

in Japan

34

GW

10 kW) reached 58 GW, and this figure is planned to be increased 2.5 times by 2024.

For example, in Germany, the total capacity of distributed generation (SES) was 33 GW, while the installed capacity of home installations was 6.5 GW, and the capacity of commercial and industrial installations that small and medium-sized businesses install for their own needs was 26.5 GW (more than 60% of the total installed capacity of the country's solar stations).

In Japan – 34 GW, of which 9 GW are home installations, in Italy – 16 GW, of which 4.2 GW are home installations. Moreover, these data are relevant only for the electricity supply sector.

It is obvious that there is already a steady trend to increase the total installed capacity of decentralized systems, both commercial and industrial, and installations for households.

It should be noted that for consumers, the use of small-scale renewable energy projects carries a lot of positive aspects. Firstly, the cost of the generated electric energy will not depend on the cost of energy carriers. Secondly, reducing energy consumption and, as a result, saving resources in the medium and long term. Thirdly, improving the comfort of living and fire safety.

Of course, with current cost of electric/thermal energy, the use of such systems will be economically unprofitable without special support measures, but in the medium term the use of these systems will be more than justified.

The simulation of the regional distribution network has shown

quite interesting results. Thus, the connection to the electrical network of home installations of solar power plants, on a regional scale, will contribute to improving the reliability of the network as a whole, unloading overloaded nodes and reducing electrical energy losses. At the same time, the implementation of projects of rooftop solar installations in only 5–10% of households in the country will be equivalent to the construction of a large thermal power plant with a capacity of 500–1,000 MW.

Some of the proposed measures have not yet been supported, this, on the one hand, may be due to a general misunderstanding of both the potential volumes of renewable energy capacity in these segments and the ultimate benefits for all stakeholders – the population, the business community and the government, and on the other hand, the existing tariff system in the energy sector and the need to provide targeted help. It is important to emphasize that the country has set goals to achieve carbon neutrality by 2060. However, if the widespread use of various renewable energy and energy efficiency technologies for hot water and heating is not stimulated, the household segment will not be carbon neutral, especially in rural areas. Thus, according to the Bureau of National Statistics, the level of improvement in terms of "central hot water supply and heating in rural areas" is only 3–4%.

It should be noted that distributed generation projects are practically the only possible and economically feasible way to decarbonize the heat supply sector of individual and autonomous systems (projects of centralized heat supply networks in rural areas are practically unrealizable).

For the implementation of distributed generation projects at the initial stage and in the short term, it will be necessary to set target indicators, including for the heat supply sector by analogy with the share of RES in the production of electric energy. Clear and understandable target indicators will allow, firstly, monitoring the achievement of the country-wide goal of reducing GHG emissions by 2030 and reducing the energy intensity of the economy; secondly, planning and implementing various incentive measures, which in the long term will provide systematic approach to carbon neutrality by 2060 in the segment of households and in the heat supply sector in the area not covered by central networks.

– The task of any institute or project aimed at developing is to develop a turnkey solution and leave it to the recipient for further use or scaling. Is there such an understanding in the case of site-specific RE auction and implementation of measures to subsidize rates for the introduction of renewable energy technologies through the "Damu"?

– Our project has tasks to develop an exit strategy, for example, in the case of site-specific RE auction. The project was prepared and the mechanism for the development/preparation and holding of such auctions was handed over to FSC LLP, now the FSC LLP itself is working in this direction. After the test issue of "green" bonds together with the Fund "Damu", it can be noted that the rules on subsidizing "green" bonds by the government were included in the LSI. A strategy is also being developed to exit from the financial support mechanisms for SMEs and transfer the mechanism itself to the Damu Fund. To do this, the project team is constantly working on training the fund's staff on financing "green" projects (RES and EE).

– As far as we know, a meeting of the Project management committee (PMC) was held recently. What decisions have been made? How do the donors of the project – UNDP and GEF – assess its interim results?

– It is important to note that UNDP is not a donor of the project, but is engaged in its implementation, with funding from the GEF. The national partners highly appreciated the positive impact of the project on the further development of the renewable energy sector, including the segment of small-scale renewable energy projects.

The project, together with partners, will continue to work in the following areas: improving legislation on renewable energy support and testing financial instruments together with the Damu Fund.

In addition, at the meeting, the members of the PMC proposed to develop a mechanism for redistributing payments for emissions into the environment. It should be mentioned that the amended Environmental Code of the Republic of Kazakhstan require that payments for emissions into the environment be directed to solving environmental issues in full. Previously, there was no such requirement and akimats could spend this money on any other activities in their territories.

In turn, we will help develop some kind of action plan, methodology or mechanism for akimats, how to redirect these payments to "green" measures for the implementation of renewable energy and EE projects.

Currently, Almaty region is being considered for the implementation of "green" projects and as a possible pilot.

– One of the important decisions is the prolongation of the project for a year and a half. What tasks does the project set for itself within the remaining time for implementation?

– During the remaining time of the project implementation, testing of financial mechanisms and tools will continue; conducting various activities to raise awareness and knowledge in the field of renewable energy for various target groups; development of the exit strategy together with the Damu Entrepreneurship Development Fund JSC.

– Thank you for the interview.

I-REC is a new RES support tool in Kazakhstan

Kazakhstan Association "ECOJER" became the issuer of the international organization I-REC. This will allow domestic renewable energy facilities to receive additional income through certification of the energy produced, and enterprises to implement the principles of sustainable development in practice.

Alan Bokayev,
Chief Specialist of
Association EcoJer

THE INTERNATIONAL REC STANDARD

ECOJER

What is I-REC?

The International REC Foundation (I-REC Standard) is a non-profit organization offering a reliable international standard for tracking green attributes. I-REC standard is recognized as the basis for reliable and verifiable tracking tools by major reporting systems such as Greenhouse Gas Protocol (GHGP), Carbon Disclosure Project (CDP) and RE100. Accordingly, I-REC certificates are issued based on this standard.

> Link to the I-REC website https://www.irecstandard.org/#/

I-REC certificate confirms that a certain amount of electricity is generated using renewable energy sources. The certificate is tied to 1 MWh of pure electric power, the geographical location of the power plant and the time interval of electricity generation. It is important to note that a power plant cannot issue certificates twice in a certain period. I-REC standard consists

of a number of rules and best practices that ensure a high level of tracking the issuance and redemption of certificates by applying a single I-REC Registry, eliminating the possibility of double-counting "green" certificates.

The Registry is an Internet resource (website) where users from all over the world register. The registry stores extensive information about certificates, generators, issuing organizations, etc. The place of issue of the certificate, the type of renewable energy (solar, wind, hydro, bio, etc.), the selected period, amount of electricity generated, and the contact details of the organizations that issued and redeemed the certificates are taken into account. Thanks to the Registry, it is possible to keep statistics and accounting for the issuance of certificates, both in a separately selected country and around the world.

I-REC system is presented in 51 countries with 19 accredited organizations. As of December 2021, the total issue of I-REC certificates amounted to 63 TWh. In general, certificates are issued and traded in the local area. However, the transfer of certificates between countries is not excluded, subject to a number of nuances.

The certificate itself is a PDF file of two pages, which displays: the amount of certified electricity generated (1 certificate = 1 MWh), contact details of the electricity generator, the generation period, the type of renewable energy, etc. Generators have the opportunity to issue certificates exclusively for the actually generated renewable electricity, approximately for the past 12 months.

The use of I-REC certificates by one or another company is voluntary.

THE PARTICIPANTS OF THE I-REC SYSTEM ARE DIVIDED INTO THREE TYPES:

1) Registrant is a generator of renewable electricity.

2) A market participant is any person holding or trading I-REC certificates.

3) The issuing organization is an I-REC accredited organization that registers generating companies and power plants in the Register. ECOJER Association (https://ecojer.kz/) is an I-REC credited organization In the Republic of Kazakhstan.

To issue I-REC certificates, a renewable electricity generator (registrant) goes through the following stages:

1. Conclusion of an agreement with the ECOJER Association.
2. Power plant registration.
3. Issue of certificates.

Stage 1. Conclusion of an agreement with the ECOJER Association

Upon the request of a potential registrant, the

ECOJER Association sends a standard "Agreement on standard conditions for issuing certificates". In case of agreement with the terms, the registrant sends a scan of the signed Agreement accompanied by documents required.

Within a few days, I-REC will send the registrant the necessary information to access the unified I-REC Registry: Login and Password.

Having gained access to the personal account of the Registry, further document flow between ECOJER and the registrant on the registration of the power plant and the issuance of certificates is carried out through Registry at: https://evident.app /.

Stage 2. Power plant registration

Having gained access to the personal account of the Registry, the registrant can submit an application for registration of its power plant(s).

Stage 3. Issue of certificates

Certificates are issued per unit of generated electricity (MWh per certificate) of a registered power plant for a certain period. For example, until May 31, 2022, certificates can be issued for the period:

January 2021 – May 2022. From June 1 to September 30, 2022, the issue is possible for the period July 2021 – September 2022. From October 2022, the issuance of certificates for any period of 2021 becomes impossible. For more information about the deadline dates for applying for certificates, see the table below (the deadline dates are approved annually).

Table: Deadline dates for submitting applications for the issuance of certificates determined by I-REC for 2022.

Production month, year X	Issue deadline, year X+1
January –June	May 31
July – December	September 30

The process of selling I-REC certificates

There are two ways to sell certificates: 1) by concluding a bilateral agreement with the buyer; 2) with the support of intermediaries (traders/ brokers).

If a "registrant" account is used to issue certificates, then a "market participant" account is used to redeem certificates. The latter is usually purchased by traders/brokers or buyers. In some cases, generator companies obtain a "market participant" account in order to be able to provide a full range of services for the sale of certificates for the final beneficiary. At the same time, the final beneficiary does not need to purchase an account in the Registry.

When redeeming certificates, a market participant fills out a form where he indicates the contacts of the final beneficiary. Thus, there are several options for selling or buying certificates. The price of the certificate is determined by the market.

Application of certificates

In general, the demand for certificates arises among large/international companies that have made voluntary commitments to reduce their environmental footprint, using ESG principles, etc.

In general, international standards for calculating emissions distribute emissions into 3 scopes. Where, Scope 1 defines direct emissions, Scope 2 defines indirect emissions, Scope 3 defines all other indirect emissions, including emissions from outsourcing contracts, leases, franchises, etc.

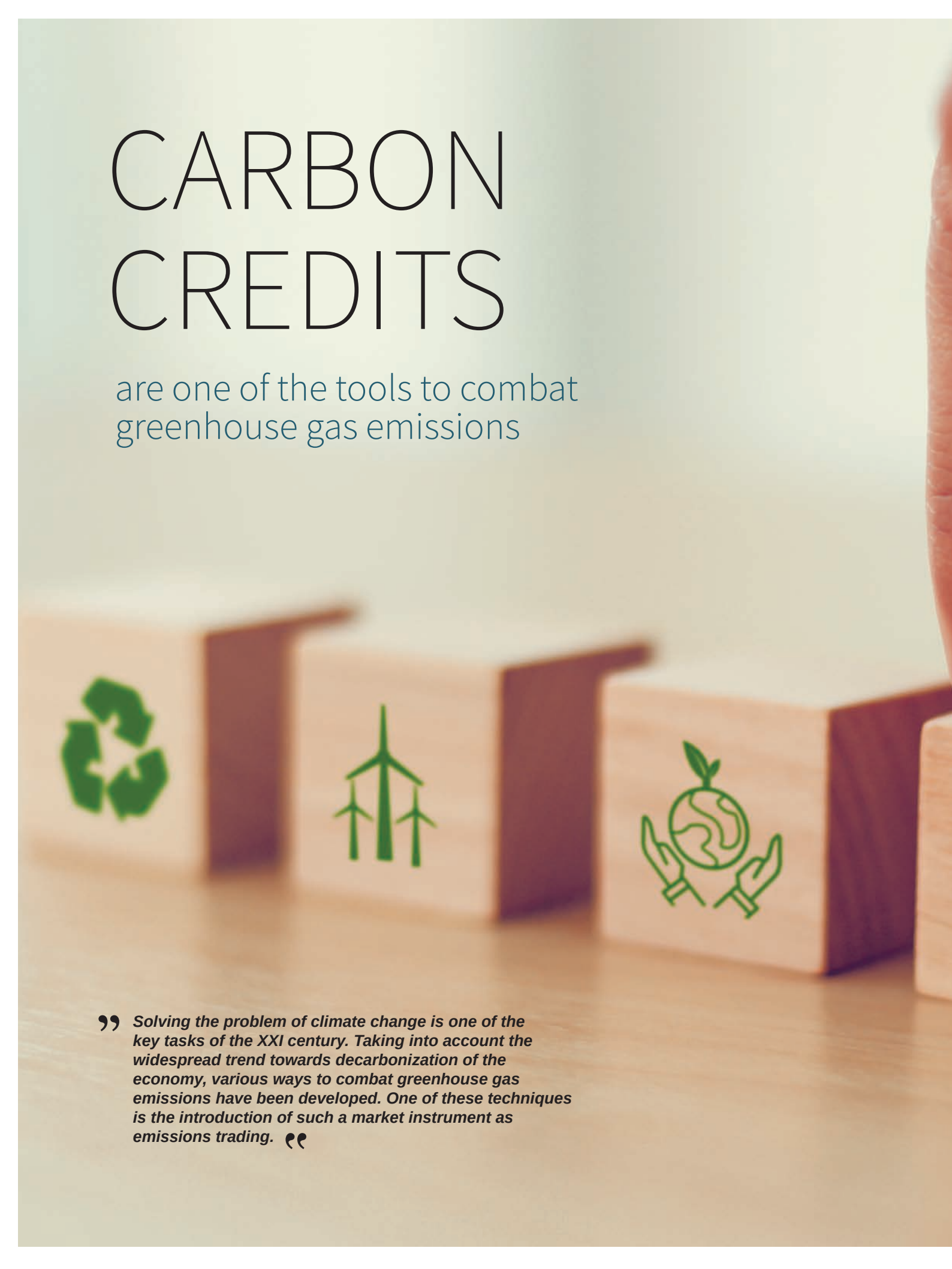
Due to the fact that I-REC certificates confirm the generation of green electricity, and not a direct reduction in greenhouse gas emissions, they are used within Scope 2.

It is proposed to consider the recent case of the use of I-REC certificates in the field of international trade. In February 2021, Emirates Global Aluminum announced the sale of 40,000 tons of aluminum produced using solar energy to the BMW Group. Solar energy was provided by Dubai Electricity and Water Authority and Mohammed bin Rashid Al Maktoum Solar Park. During production, 560,000 MWh of solar energy was consumed, for which I-REC certificates were issued. In this regard, taking into account the environmental value of aluminum, BMW Group has agreed to conclude a contract for bulk purchase from the United Arab Emirates.

Consequently, I-REC certificates have the potential to increase the competitiveness of Kazakhstani enterprises by greening operations and products. It is important to note that in accordance with the principles of green financing, more environmentally responsible companies are more likely to receive more profitable loans from financial institutions.

CARBON CREDITS

are one of the tools to combat greenhouse gas emissions



Solving the problem of climate change is one of the key tasks of the XXI century. Taking into account the widespread trend towards decarbonization of the economy, various ways to combat greenhouse gas emissions have been developed. One of these techniques is the introduction of such a market instrument as emissions trading.

Saniya Perzadayeva,
Managing Partner of a Law Firm Unicase

Dinara Yskakova,
Junior Lawyer at Unicase

Carbon credits are part of the greenhouse gas emissions trading system, which has been operating since 2005, influencing industry and energy companies. This mechanism works according to the general principle cap-and-trade. The Government or an international organization sets an upper limit on permissible greenhouse gas emissions into the atmosphere (cap) in the form of quotas, which are provided to producers for free or for a fee, and companies use them and if emissions are less than the permissible limit they can sell their surpluses to other companies (trade).

Carbon credits are a quota for the allowable amount of emissions into the environment. A carbon credit is equivalent to one ton of carbon dioxide. Each country is given a certain quota for emissions of gases into the atmosphere, which is further distributed among the companies of the country. If company exceeds the established threshold, it must either pay a fine or buy a carbon credit on the open market. A company or a country that has not fully used its quota can sell its carbon credit. As a result, the buyer company does not have to pay a fine, and the seller contributes to the greening of the environment. At the same time, due to the gradual reduction of the issued quotas, the amount of greenhouse gas emissions is reduced. Companies resort to buying carbon credits when they do not have the opportunity to change quickly the technology and significantly reduce greenhouse gas emissions.

INTERNATIONAL EXPERIENCE IN THE IMPLEMENTATION OF CARBON CREDITS

One of the countries that has successfully implemented a quota trading system is China. In 2021, China launched a national carbon emissions trading market. It is reported that about 2000 companies have already joined the chosen system, producing together about 4 billion tons of carbon dioxide emissions per year, which makes this market the largest in the world [1]. The pilot sector of the economy covered by the system in the first year is the thermal power industry with its coal and thermal power plants. The entities of the system will include enterprises with an annual volume of greenhouse gas

emissions equal to 26 tons. In case of a decrease in this indicator for two consecutive years, such companies are removed from the list of entities.

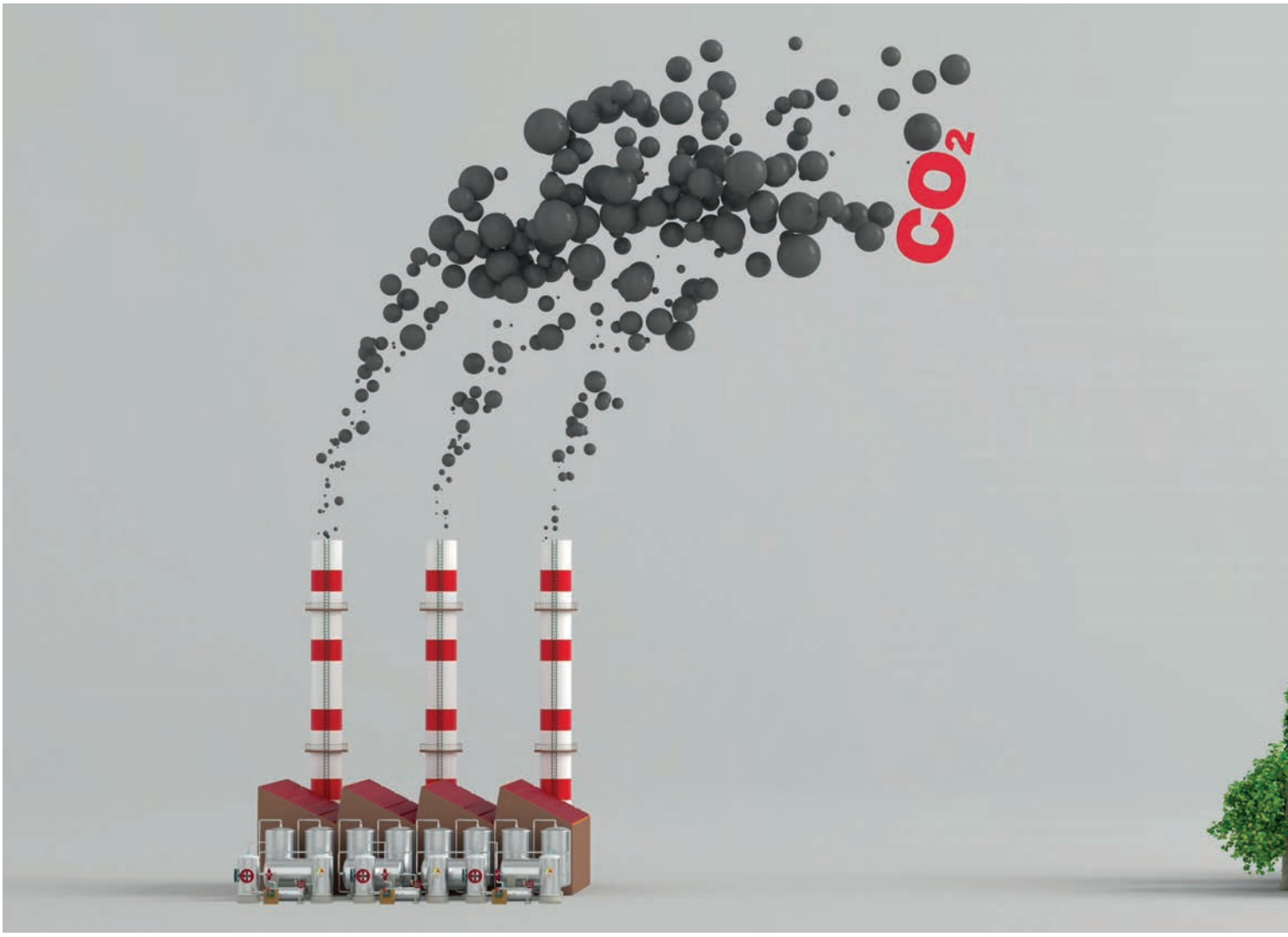
Another example of the implementation of quota trading system projects is the Republic of Korea, in which about 60% of greenhouse gases are already covered by the proposed mechanism. The Korean model of the quota trading system is divided into three stages, which made it possible to implement this mechanism efficiently and smoothly. At the first stage (2015–2017), all permits were issued free of charge, gradually introducing a system of auctions at which 3% of quotas were sold first at the second stage (2018–2020), and up to 10% of quotas that will be auctioned at the third stage (2021–2025) [2].

CARBON MARKET IN KAZAKHSTAN

Within the framework of the Paris Agreement, Kazakhstan presented its nationally determined contribution and committed to reduce greenhouse gas emissions by 15% by 2030, and the emissions trading system was one of the decarbonization mechanisms contributing to achieving this goal. It should be noted that in 2013 [3] Kazakhstan became the first country in Eastern Europe, the Caucasus and Central Asia to launch such a system [4].

In accordance with amended Environmental Code of Kazakhstan dated January 2, 2021, a carbon unit is an accounting unit of carbon quota or carbon offset, equal to one ton of carbon dioxide equivalent, and is a commodity allowed for turnover between carbon market entities [5].

The carbon unit trading system in the Republic of Kazakhstan consists of primary and secondary carbon markets. In the primary market, the operator of the carbon units trading system sells carbon quota units from



the corresponding reserve category of the National Quota Plan on auction terms. In the secondary carbon market, subjects purchase and sale carbon units among themselves through a direct transaction or through a commodity exchange [6].

Kazakhstan's quota trading system operates according to the following scheme: there is a list of companies producing more than 20,000 tons [7] of greenhouse gases [8] per year, which are required to report annually and reduce emissions. Let us assume that company A and company B produce 30,000 tons of CO_2 each (together 60,000 tons of CO_2). Their combined emissions need to be reduced to 50,000 tons of CO_2. As a result of the allocation of quotas, 25,000 carbon units (25,000 tons of CO_2) were allocated to each company. However, in fact, company A could not reduce emissions and still produces 30,000 tons of CO_2 per year, and company B, in turn, produced only 20,000 tons of CO_2. Since company A needs an additional 5,000 quotas, and company B has unused quotas, then the trade is carried out between these companies. As a result of such a transaction, company A, actually emitting 30,000 tons of CO_2, and company B – 20,000 tons of CO_2, jointly produced 50,000 tons of CO_2,

Kazakhstan's quota trading system operates according to the following scheme: there is a list of companies producing more than 20,000 tons of greenhouse gases per year, which are required to report annually and reduce emissions.

which made it possible to achieve the goal of reducing carbon dioxide emissions by 10,000 tons.

The exceeding the quota entails administrative liability in the form of a fine for each unit of the quota above the established volume comes [9]. To avoid this penalty, the quota subject buys a carbon credit from another company that has not exceeded its volume. At the same time, carbon quota units resulted from reducing the capacity of the quota installation are not subject to purchase and sale. A decrease in capacity is understood as a decrease in the annual volume of mining, production, processing and (or) transportation of products. The carbon units obtained in this way must be returned to the reserve of the National Carbon Quota Plan in accordance with the procedure established by the rules of state regulation in the field of greenhouse gas emissions and removals. It should be noted that the National Plan for 2022–2025 [10] and the Rules of State Regulation in the field of greenhouse gas emissions and removals [11] have not yet been adopted and are under consideration.

The National Carbon Quota Plan is a document that establishes the total number of carbon quota units to be distributed among the subjects of quotas for regulated sectors of the economy, as well as the amount of the reserve of carbon quota units [12]. In order to fulfill the obligations to reduce greenhouse gas emissions, the number of carbon quotas is gradually decreasing. In accordance with the draft National Plan for 2022–2025, Kazakhstan plans to reduce the volume of carbon quotas from 151 million quotas in 2022 to 125 million quotas in 2025.

A decrease in capacity is understood as a decrease in the annual volume of mining, production, processing and (or) transportation of products.

CARBON QUOTA ALLOCATION

The distribution of carbon quota units among the quota subjects is carried out on the terms of their free distribution and sale through an auction within the volumes determined by the National Carbon Quota Plan. In order to credit carbon quota units, the quota subject opens an account with the state register of carbon units in accordance with the rules [13]. Carbon quota units within the scope of the National Plan may be transferred from one reporting period to another.

PROBLEMS OF THE QUOTA TRADING SYSTEM IN KAZAKHSTAN

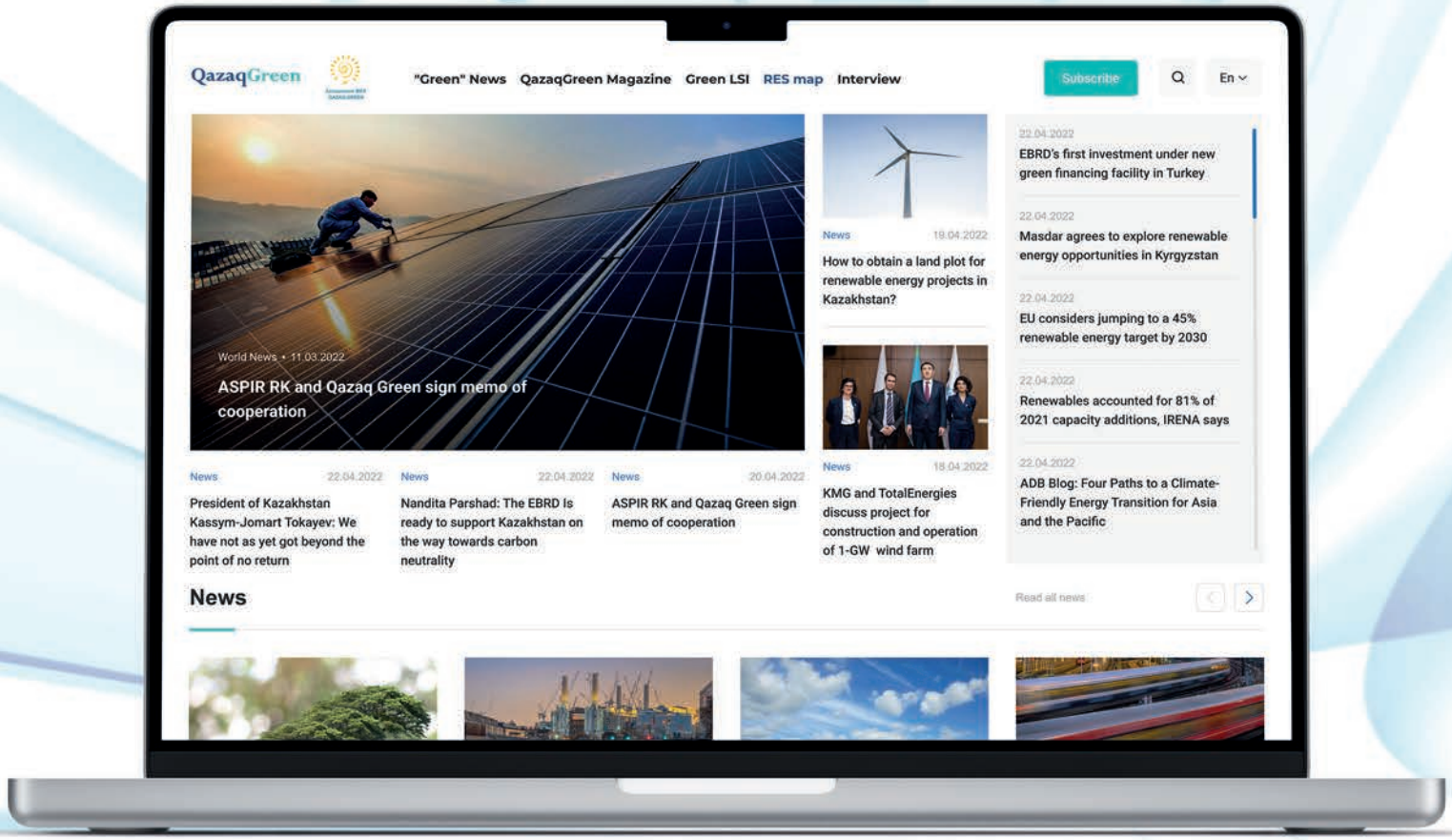
One of the problems of the system in Kazakhstan is the low cost of the carbon quota. The recent quota auctions on the electronic platform of the Caspian Commodity Exchange JSC were held on August 11, 2021. According to the platform, the cost of one quota at the last auction from May to August 2021 amounted to 500 KZT ($1.1) [14]. The low price of carbon quotas hinders the promotion of decarbonization of production: it is easier for companies to buy carbon quotas than to reduce greenhouse gas emissions. According to experts, the minimum cost of the quota required for the implementation of environmental projects should be at the level of 15 euros ($17) [15]. According to the draft resolution of the Government of the Republic of Kazakhstan "On approval of nationally determined contributions of the Republic of Kazakhstan", the price of a carbon unit should increase from $1.1 in 2021 to $50.8 per ton in 2026–2030 [16]. Such prices will make the quota trading system profitable for companies that have an excess of quotas, and will make the practice of not reducing emissions unprofitable for those who prefer to simply buy quotas.

In addition, there is a lack of transparency of quota trading. In particular, trading operations and prices are indicated on the platform of the Caspian commodity exchange, but no information about buyers and sellers is provided [17].

CONCLUSION. The carbon unit trading system is an effective market tool in the fight against greenhouse gas emissions and allows for the introduction of a phased decarbonization process. However, of particular note is the existing problems of the carbon market in Kazakhstan, which require solutions. Solving these problems will make it possible to build a highly organized emissions trading system, which is particularly relevant in connection with Kazakhstan's ambitious commitments to reduce greenhouse gas emissions by 15% by 2030.

QAZAQ GREEN Association

KONRAD ADENAUER STIFTUNG



QazaqGreen launches information portal on "green" economy of Kazakhstan

www.qazaqgreen.com

information portal will present latest news from Central Asia, Kazakhstan and all over the world, as well as articles of QazaqGreen magazine.

Roman Melnik

Doctor of Law, Professor, Professor of the Higher Law School, Director of the German Law Center M.S. Narikbayev KAZGUU University

Ecology and legal education

It can be said without exaggeration that ecology and environmental policy are at the forefront of not only global attention, but also Kazakhstan's, which is explained by a systematic increase in the "burden" on the environmental resources of all countries as a whole and each country individually. In order to improve and increase the efficiency of regulation of various environmental relations in the Republic of Kazakhstan, the Environmental Code was adopted, which entered into force on July 1, 2021.

This event was truly epochal for Kazakhstan, as the Code incorporated a large number of positive (world-class) practices of building environmental relations in the country. Thus, the following provisions of the Code are of particular interest.

THE ENVIRONMENTAL CODE AND ITS "PROS"

Firstly, attention is drawn to Article 2 (Environmental legislation of the Republic of Kazakhstan), which contains several fundamental positions. In particular, the decision of the legislator should be welcomed, which prohibits the inclusion of provisions regulating the environmental relations in other laws of the Republic of Kazakhstan, except in cases provided for by this Code. Such a step will help to minimize the "erosion" of environmental legislation, which is accompanied by the "stretching" of environmental standards under special/separate laws. In this part, It should be reminded that Kazakhstan has previously faced similar problems, which led to the formation of multi-vector and not always properly coordinated legislative and subordinate provisions, which, in the end, necessitated the re-codification of environmental legislation. It will probably not be erroneous to say that ecology requires the stability of its legal foundations, since in this sphere, as in no other, the subjects of environmental relations build the trajectory of their activities not even for years, but for decades, and, obviously, they expect the government to remain unchanged in legal regulation. The above-mentioned Article 2 of the Code specifically can provide a high level of legal certainty in this area, and trust in the government.

Secondly, Article 13 of the Code looks progressive, which enshrines the rights of the public in the field of environmental protection. Among the powers granted, special attention is drawn to paragraph 5, part 2 of the said article, which grants the public the right to appeal to the court with a statement challenging the legality of actions (inaction) and decisions of state bodies, local self-government bodies, officials and civil servants on environmental protection issues, including those related to the elimination of environmental damage and suppression of violations of the requirements of the environmental

legislation of the Republic of Kazakhstan. In other words, the public has the opportunity to file administrative lawsuits in order to protect the rights and interests of other persons, which significantly expands the concept of the Administrative Procedural Code of the Republic of Kazakhstan, which, as is known, in the vast majority of cases sees only the subject whose direct rights and/or interests have been violated by the administrative body as a plaintiff. These legislative innovations have become an example of the real implementation of the provisions of the Aarhus Convention, ratified by Kazakhstan in 2000 into national legislation.

Thirdly, the approach of the legislator should be recognized as justified, which "linked" the Environmental Code and the Administrative Procedural and Procedural Code, indicating that the procedures for interaction between individuals and administrative bodies (on access to information, participation in discussion of issues related to ecology, etc.) are regulated by the latter. Due to this approach, it is possible to achieve unity of procedural activities, which, of course, will have a positive impact on the level of implementation and protection of the rights of individuals participating in environmental and legal relations.

Of course, the positive aspects of this Code do not limited to the listed aspects. But in this article, I would like to focus on a slightly different aspect, namely ensuring its effective application. It is not enough to adopt a law, it is necessary to adopt a working and, moreover, an effective regulatory act.

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FROM REGULATORY CONTROL TO LAW ENFORCEMENT PRACTICE

Not much time has passed since the entry into force of the Code, which will not yet allow us to draw objective conclusions about the results of its application. But at the same time, a somewhat different fact is obvious – in order for the Code to fully fulfill the tasks assigned to it, the government must take care of training specialists who are able to understand, correctly interpret its norms and accurately apply them to regulate specific environmental and legal relations.

UNIVERSITIES AND LEGAL TRAINING

The main violin in this part, obviously, is assigned to higher educational institutions of a legal profile, as well as those which have a law faculty or institute in their composition.

The analysis of the level of teaching, in this case, environmental law can be initially assessed through the prism of the educational literature that is available to both teachers and students. This is on the one hand. On the other hand, today we need not just textbooks on environmental law, but textbooks that will be conceptually and meaningfully coordinated with the new Environmental Code. The study of the available legal literature on this issue shows that the most "recent" textbook in the Republic of Kazakhstan dates back to 2010 (S. T. Kulteleyev. Practicum on environmental law of the Republic of Kazakhstan: textbook, manual / S. T. Kulteleyev. Almaty: NURPRESS, 2010). Accordingly, it

can be concluded that today Kazakhstan has not created the minimum necessary conditions for the training of lawyers capable of applying the new and promising Environmental Code. I would like to emphasize that in this case we are talking about future lawyers. The same colleagues who are already practicing are obviously in a more advantageous position, since they have some practice and understanding of the issues. But again, for them, new knowledge obviously would do well.

Thus, it is advisable to think about the idea of preparing a new textbook on environmental law of Kazakhstan. At the same time, it should be noted that in the modern conditions of the development of the country and society, we obviously will not be satisfied with a textbook focused on retelling the provisions of the current environmental legislation. Law enforcement practice, enhanced by a large number of positive trends (the introduction of institutions of administrative procedure and administrative justice) requires its own "enrichment" by modern literature, which should be created on new concepts. Let us dwell on this idea in more detail, identifying only the most important aspects.

THE CONSTITUTION AS THE BASIS OF ENVIRONMENTAL LAW

Any branch of public law, and environmental law is undoubtedly an element of it, should be studied, first of all, through the prism of the relevant constitutional provisions. It is the provisions of the Constitution, which lay down the legal status of objects of nature, the duties of the state and the rights of citizens in this area, that form the axis of environmental law. Therefore, the textbook should demonstrate not only the connection between the constitution and environmental legislation, but also show examples of the influence of the provisions of the Constitution on formation of environmental legislation; identify ways to check the provisions of environmental law for their consistency

with the Constitution of the Republic of Kazakhstan; explain the basics of constitutional-conformal interpretation of certain provisions of environmental legislation.

FOCUS ON INTERNATIONAL STANDARDS

Environmental law has long gone beyond the narrow national framework, having absorbed a huge number of international standards, many of which, as is known, were also the basis of the Environmental Code. It is obvious that not all international regulations and rules have become an integral part of national environmental legislation, but at the same time another fact is obvious – without knowledge of these supranational standards, it will be impossible to coordinate promising national environmental legislation with global legal trends; to ensure law enforcement activities of such a level that it meets the expectations of the country's international partners. Thus, the international component of environmental law should be presented in the textbook in a voluminous chapter.

CONSISTENCY WITH RELATED DISCIPLINES

The authors of the textbook on environmental law should remember that a student studying the similarly-named discipline learns other branches of law along with it. Therefore, in the textbook it is important to avoid "layering" and unjustified repetitions of material that has already been studied or will still be studied in other disciplines, for example, land or construction law. In this part, it is impossible to ignore the issue of the consistency of environmental and administrative law, the latter of which is improved by the adoption of the Administrative Procedural Code, the provisions of which are applicable in the field of regulation of environmental legal relations. It is necessary to think carefully about how to transfer all modern administrative and legal mechanisms and

tools used by the power participants (the government represented by authorized bodies and officials) of environmental and legal relations to the sphere of environmental law.

LAW ENFORCEMENT PRACTICE AT THE FOREFRONT

Any textbook on law, including environmental law, should be focused on teaching students law enforcement skills. It is expected that it will be filled with algorithms for analyzing practical situations, which cannot but be accompanied by examples from administrative and judicial practice. If not everyone, then the vast majority of the provisions of the Environmental Code should be commented on and explained in terms of how and in what cases one or another of them should be / can be applied.

It is obvious that the presented short review will not be able to replace a full-fledged discussion about the fate and prospects of the development of environmental law in Kazakhstan and the peculiarities of its teaching and study. To discuss the issues raised, it seems appropriate to organize a broad professional discussion of this issue. It seems that university professors, practicing lawyers, and representatives of the public dealing with environmental issues should become its mandatory participants. Only in such a composition it is possible to create a high-quality intellectual product capable of meeting both the needs of higher legal education and legal practice.

Analysis of innovation activity in the field of "green" economy in the Republic of Kazakhstan

According to the 2020 rating of the Yale Center for Environmental Policy and Law in the USA, Kazakhstan ranks 85th out of 180 countries on the environmental efficiency index. Compared to 2016 (69th place) Kazakhstan has reduced its environmental efficiency by 16 positions.

At the same time, Kazakhstan ranks 115th in terms of air quality, and the level of air pollution is increasing every year, especially in megacities and cities where 57.4% of the country's population lives.

Kazakhstan's lagging environmental efficiency is a consequence of various factors, including the poor introduction of environmentally friendly technologies to solve the problems of climate change and the environment.

Saule Bishimbayeva,
Head of Competence Center for Commercialization of technologies, International Green Technologies and Investment Center, Phd in economics

CURRENT SITUATION

To date, the innovative potential of Kazakhstan is 3,444 "green" patents for inventions and utility models, of which more than 50 are international (8 – PCT, 41 – EAPO).

According to the RSE NIIP, over the past seven years there has been a sharp increase in patent activity in the field of environmentally friendly technologies. Thus, in 2020 alone, 435 new "green" patents were registered, of which 52% – environmental, 48% – energy.

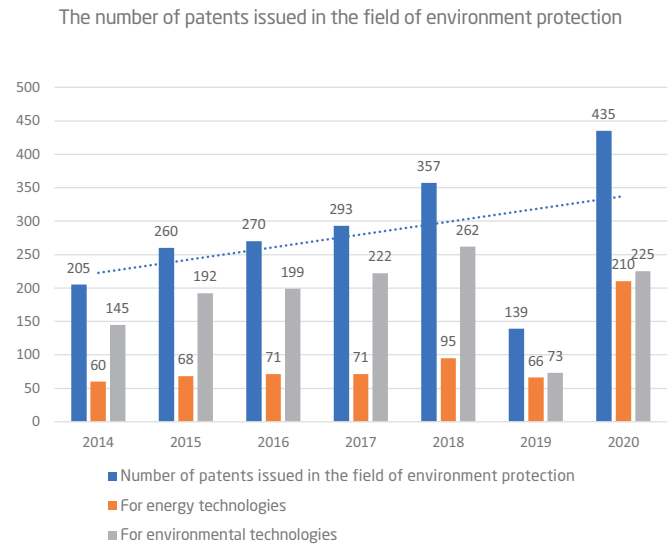
This is explained by the fact that since 2015, Kazakhstan has been operating an accelerated examination of renewable energy inventions (6 months), introduced shortly before preparation to Expo-2017.

Nevertheless, **there is a paradoxical situation in Kazakhstan when patent activity in the field of "green" technologies is growing from year to year, and the number of enterprises implementing environmental innovations is decreasing from year to year** (see Diagram 1).

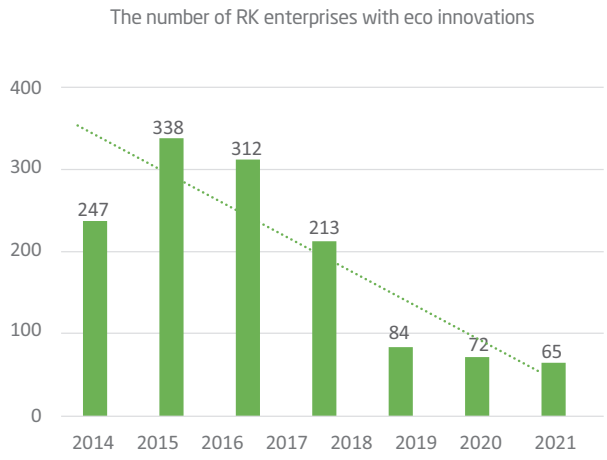
Moreover, the analysis of 2,554 large industrial polluting enterprises of the Republic of Kazakhstan, conducted by the NJSC "International Green Technologies and Investment Projects Center" (hereinafter referred to as the Center) in 2019, revealed that only 141 enterprises use green technologies, i.e. 1.6% of the country's enterprises.

This is despite the fact that, according to the National Bureau of Statistics of the ASPR of the Republic of Kazakhstan, investments for "green" economy increased 4.5 times compared to 2016 and reached record values in 2019–2020 in the entire history of investments in this area (see Diagram 2). However, in general, investments in the "green" economy account for an insignificant share – only 1.6% of the country's investments. Thus, according to the "green" economy concept (2013), in order to achieve the indicators of the Paris Agreement, it is necessary to invest 1% of GDP annually.

Diagram 1

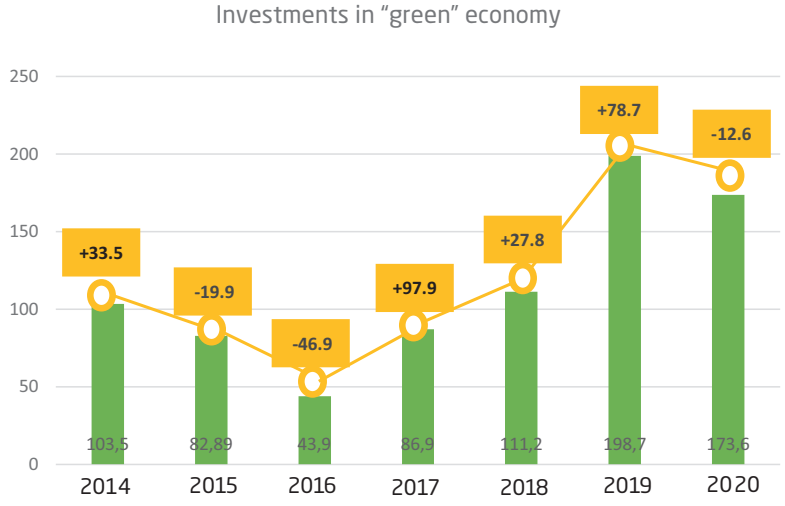


According to data of NIIP



Data of Bureau of National Statistics of ASPR RK for 2020

Diagram 2



Data of Bureau of National Statistics of ASPR RK for 2020

Analysis of statistical data for 2020 revealed similar trends:

– the share of environmentally friendly products in the total output of the country is only 0.2%;

– extremely low level of innovative activity of enterprises for the introduction of environmental innovations – 0.3%;

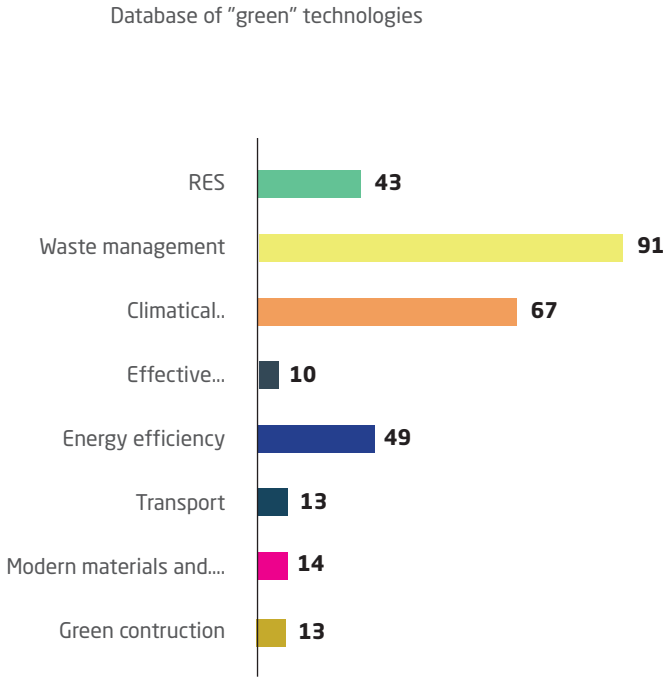
– the costs of enterprises for environmental innovations account for 1.3% of the costs of enterprises for innovation;

– low share of "green" jobs – 1.6% of jobs in the country.

The poor implementation of "green" technologies in Kazakhstan is explained by such serious barriers as lack of technological competencies in the industry; enterprises are unwilling to provide information on emissions; poor interdepartmental communication and cooperation; "imperfect" legislation; insufficient economic incentive measures; lack of financial resources; lack of infrastructure to support commercialization (Table 1).

In addition, an analysis of the database of about 300 "green" projects collected by the Center showed that over 70% of project relate to projects at an early stage of readiness for implementation. At the same time, most of the technologies are in the field of waste management, climate-optimized agriculture, energy efficiency and RES (Diagram 3).

Diagram 3



According to the IGTIPS's date for 2021.

The low pace of innovation is also explained by the fact that companies in the field of "green" technologies differ from typical companies in that business is most often built on physical components. (Batteries, cars, solar panels, sensors, micro-grid components, etc.), therefore, unlike IT-companies for example, "green companies" have a longer "valley of death". It takes years for "green" companies to get stronger, a higher level of financial support, as well as the availability of a variety of skills and abilities to achieve success.

Moreover, the creation of waste-free ("green") industries, and all environmental protection activities always face resistance from industrialists, since they require large costs. Thus, the environmental costs of a coal-fired power plant, on average, account for a third of the cost of the power plant itself.

Therefore, an important article of the Environmental Code entered into force on July 1, 2021, is the "Introduction of the best available techniques" (hereinafter referred to as BAT), aimed at modernizing industrial enterprises and conducting a comprehensive technological audit of 82 industrial enterprises of the 1st category. The Technical Handbooks are planned to be issued in 2023, and enterprises that have implemented BAT for 10 years are exempt from emission fees. At the same time, at the first stage, the top-50 enterprises that release 80% of emissions into the environment will switch to the principles of BAT.

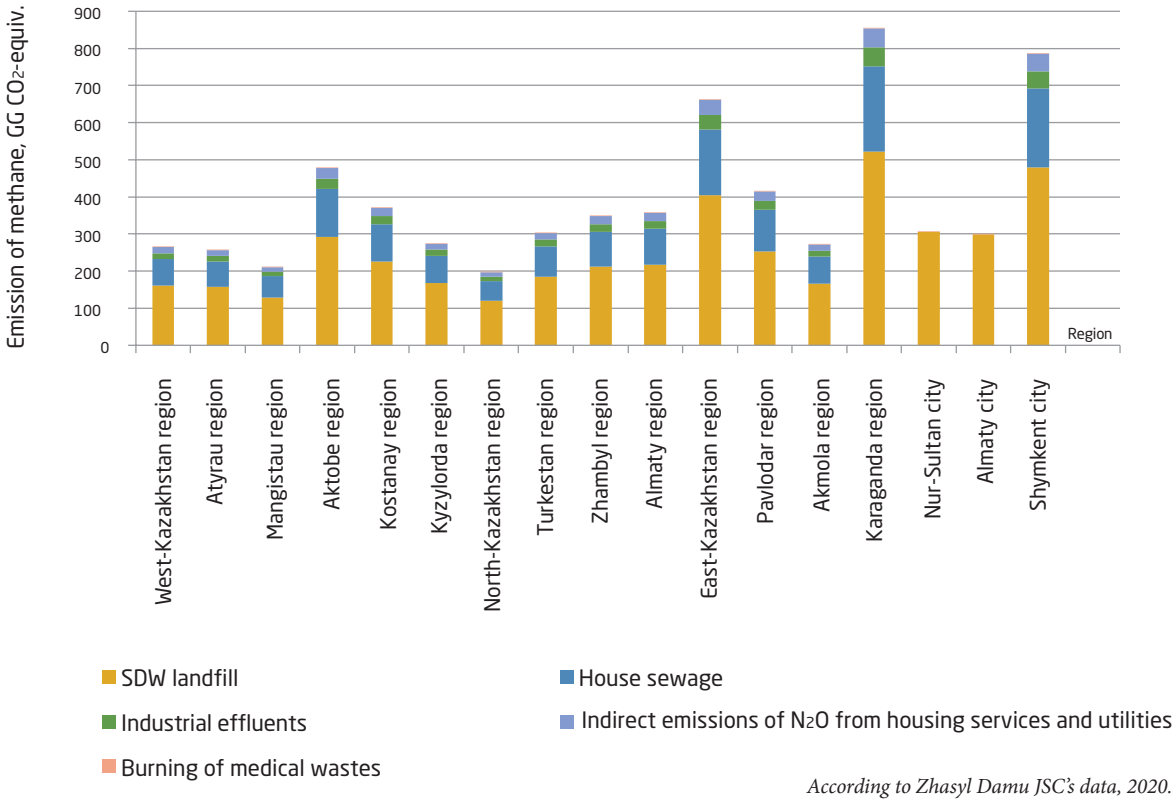
However, when industrial enterprises begin to introduce environmentally friendly technologies, the question will arise where to get these best available technologies? Will they be available to industrial enterprises in the near future?

After all, many enterprises are already ready to modernize their production facilities before 2023. In addition, there are many other environmental problems in the country: the problem of industrial waste disposal (more than 300 million tons of solid waste); the problem of solid waste disposal (more than 120 million tons of solid waste), the problem of transport pollution, etc. At the same time, 57% of national GHG emissions are emitted uncontrollably and continue to grow, and the most environmentally vulnerable regions are Pavlodar, Karaganda, East Kazakhstan, South Kazakhstan, Aktobe and Atyrau regions (Diagram 4).

Therefore, it is necessary to develop simultaneously a technological platform of "green" technologies to identify, prepare and ensure a high-quality flow of the best available "green" technologies and projects for their further introduction into industrial production.

Thus, the above analysis indicates deterioration of the environmental situation in Kazakhstan due to the poor introduction of innovations, and the accelerated transfer of "green" technologies at the business level and especially small and medium-sized enterprises is still a bottleneck in the national innovation system of Kazakhstan.

Diagram 4
Methane emissions from the waste sector by regions of the Republic of Kazakhstan for 2019



According to Zhasyl Damu JSC's data, 2020.

It is necessary to create immediately a mechanism for the rapid exchange of efficient and economical "green" technologies that would maintain balance and environmental safety and restore the environment. In this regard, let us turn to the best practices of developed countries.

WORLD EXPERIENCE

Currently, one of the key megatrends in the world is the growth of environmental requirements for enterprises, and eco-oriented enterprises are becoming a brand of modern responsible business.

Environmental requirements form new directions in industries: recycling, extraction of associated energy, the transition of larger number of enterprises to a full production cycle, i.e. a circular economy, including the economy of recycling.

The second equally important megatrend is the rapidly developing startup ecosystem of clean technologies and the growth of investments in low-carbon development.

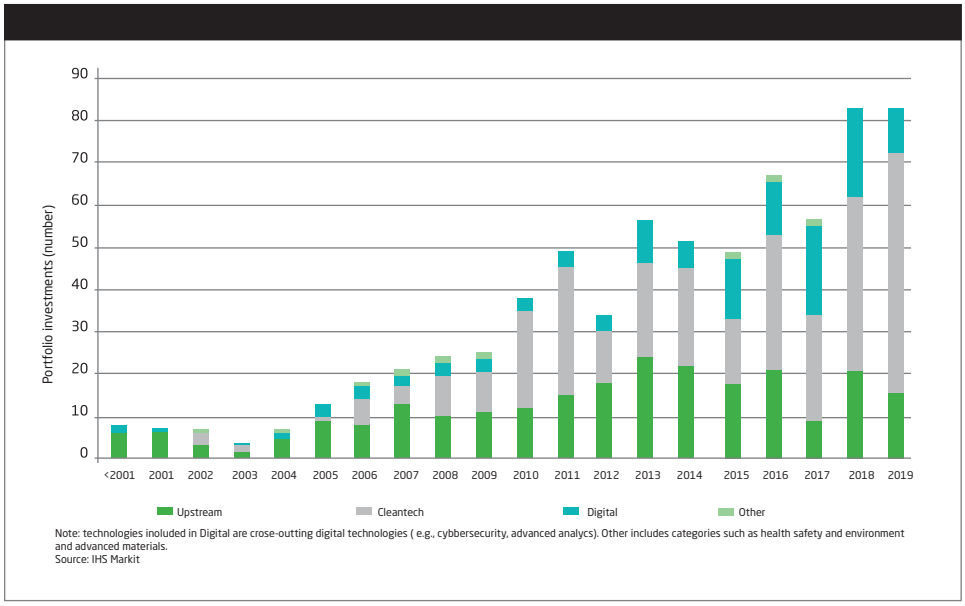
Thus, according to UNIDO, the global clean technology industry will exceed $6.4 trillion in the next decade. Of these, more than $1.7 trillion is available for SMEs and startups in developing countries. This is an opportunity for SMEs and startups to become key growth engines in the clean technology sector in these countries.

Thus, over the past ten years, global oil and gas industry corporations with the help of corporate venture funds have gained access to technologies and new business models developed by startups. At the same time, more and more emphasis is placed on environmentally friendly technologies, rather than on IT applications in the field of exploration and production. Thus, in 2019, 67% of the investment activity of oil companies is allocated for financing startups developing environmentally friendly energy technologies (Diagram 5).

The second equally important megatrend is the rapidly developing startup ecosystem of clean technologies and the growth of investments in low-carbon development.

Diagram 5
Investment in "green" technologies

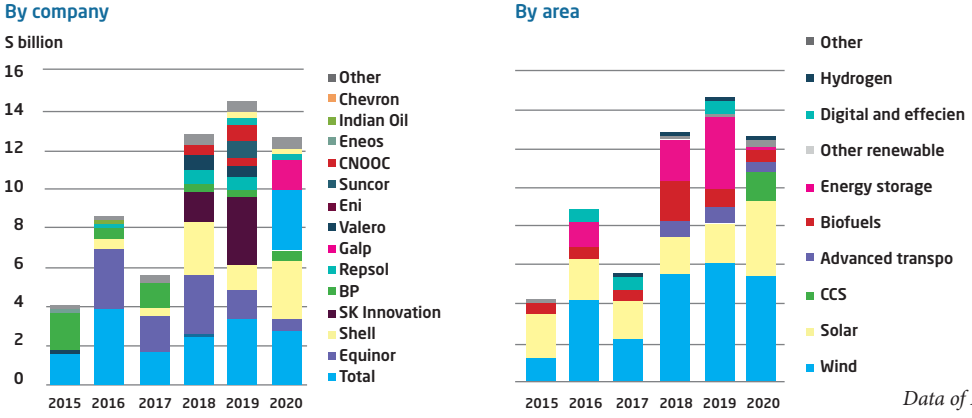
Oil and gas corporaste venture activity, by technology category



Data of IHS Markit

In 2019, 67% of investment activity was aimed at financing "green" startups.

Oil and gas companies' investments in "green" energy from 2015 to 2020



Data of BloombergNEF (BNEF)

For the last 5 years, investments in "green" technologies has amounted to almost 60 billions USD.

In 2015–2020, the total investments of oil and gas companies in renewable energy, energy storage, advanced transport, hydrogen, CCS amounted to almost $60 billion. The leaders of investments in clean technologies are such companies as Total, Shell, Repsol, Golp, SK innovation, BP, Eni.

Kazakhstan is an oil country where 46% of the economy is provided by oil production, so this investing experience of oil and gas companies in clean technologies is very relevant to attract additional investments in the "green" economy.

In developed countries, clean/"green" technologies are one of the main priorities of innovation development. Thus, the US long-term strategy for the development of innovations is mainly devoted to innovations in the field of environmentally friendly technologies and their practical use in order to increase the share of electricity produced in an environmentally friendly way to 80% by 2035 and reduce greenhouse gas emissions produced by coal-fired power plants. At the same time, in the United States, the focus is on innovations in the field of overcoming the consequences of global climate change, renewable energy sources, clean energy projects, hydrogen fuel, biofuels, the development of car batteries, solar panels, etc.

For systemic development, in 2012, the United States created the Agency for Advanced Projects in the field of clean energy (APRA-E), which establishes a link between scientific research, development and industrial implementation of new environmentally friendly technologies. This is an innovative

PPP, a model with government officials communicating directly with venture financiers and entrepreneurs, engaged in technology development. It is an integrated system that uses the unique capabilities of scientific organizations, investors and the expertise of professionals working in the field of energy and clean technologies.

At the same time, the cluster approach is the most effective model for organizing technological platforms of clean/"green" technologies based on innovative PPP, which allows increasing economic activity due to close cooperation of all subjects of the industry.

The key to the successful development of clusters of "green" technologies is a favorable startup environment that attracts venture investors, funds from business angels, as well as crowdfunding. Thus, only in the California alone, which ranks first in the world in terms of venture financing of high-tech cleantech companies, an extensive network of more than 20 clean technology business incubators has been created.

An example of a successful urban cluster and innovative PPP partnership is Los Angeles Cleantech Incubator (LACI), which was created at record time as a result of a partnership between the Los Angeles City Hall and private investors and recognized by UBI Global as the most innovative business incubator in the world: https://laincubator.org.

Having prototyping and Training Centers, over 6 years LACI has supported 220 companies (more than 50 of them international), attracted $465 million of investments (an average of $2.2 million per company), issued 119 patents, created 2,100 jobs in the field of clean technologies, earned $270 million, and more than $470 million of long-term economic benefits for Los Angeles.

In 2050, LACI plans, together with regional stakeholders and other partners, to increase the number of "green jobs" by 80% from 320 000 (2021) to 600 000 in 2050.

By analogy with successful countries, Kazakhstan needs to expand the window of opportunities and make a leap to solve the problem of "greening" the economy through the development of innovations, support for the commercialization system and accelerated introduction of "green" technologies.

The experience of Austria is unique, where a hundred years ago in Graz (Styria) the best (first of all, in terms of concentration of enterprises, growth dynamics, innovations) in Europe innovative cluster of "green" technologies – Cluster Greentech was created. This is a whole Valley of "green" technologies, where the largest number of the world's leading companies in the field of environmentally friendly technologies are concentrated: https://www.greentech.at/en.

Today, 200 "green" companies and scientific organizations in Austria work on the territory of the Greentech Clusterand cooperate with 20,000 different partners around the world. Thanks to the creation of a favorable ecosystem of "green" technologies, the Styria region today occupies an honorable

second place among 300 regions of Europe, and companies are world leaders in the field of energy and environmental technologies.

In addition, the Russian Skolkovo Foundation has created a cluster of environmentally friendly technologies with the first accelerator of technological startups in the field of ecology in Russia – Green tech startup booster, launched with the support of the Ministry of Natural Resources and Ecology of the Russian Federation: https://greentech.sk.ru.

Thus, international experience clearly shows that the pace of mastering new knowledge in the field of ecology and environmental protection can be accelerated significantly with the help of a set of actively coordinated measures in the field of commercialization of environmentally friendly technologies, stimulated and supported at the level of public policy.

By analogy with successful countries, Kazakhstan needs to expand the window of opportunities and make a leap to solve the problem of "greening" the economy through the development of innovations, support for the commercialization system and accelerated introduction of "green" technologies.

Table 1. SWOT analysis of the development of "green" technologies market in Kazakhstan

STRENGTHS:

- New Environmental Code
- Political support from the country's leadership
- Great potential of "green" innovations (3,444 "green" patents)
- Accelerated examination of renewable energy inventions (6 months)
- Support from international organizations (UNDP, GEF, WCF)
- Strong development of Nur-Sultan, including the holding of key events such as Expo-2017

WEAKNESSES:

- Lack of technological competencies in the industry
- Low synergy between policy documents and legislation in the field of "green" technologies
- Commercialization is not a priority for the branch ministry
- Financial instruments are scattered and do not provide systematic support for projects
- Weak incentive measures to support businesses in the introduction of "green" technologies
- Technological immaturity of projects

THREATS:

- Deterioration of the environmental efficiency rating and decline in the country's global innovation index
- Risks of failure to achieve country's international commitments:
  – 15-25% reduction in carbon footprint by 2030 achieving carbon neutrality by 2060
  – Failure to achieve carbon neutrality by 2060
- EU Carbon tax
- "Brain drain". The risk of local environmental startups moving abroad

OPPORTUNITIES:

- To become the Central Asian climate hub of "green" technologies
- To build an effective system of commercialization and international transfer of "green" technologies
- Introduction of carbon tax
- High growth potential for the ecology, life sciences and renewable energy sectors in Kazakhstan

Energy Dialogue Germany – Central Asia

dena German Energy Agency

"Green" Hydrogen in Kazakhstan:

a Power Fuel Fit for Purpose

Green hydrogen (H_2) offers enormous potential to Kazakhstan's businesses, economy and global political standing as energy producing country. In order to unleash this potential, the German Energy Agency (dena) on behalf of the German Federal Ministry for Economic Affairs and Climate Action (BMWK) promotes the development of a hydrogen strategy in Kazakhstan within the Bilateral Energy Dialogue Kazakhstan – Germany. The idea behind this is straightforward and even more compelling: hydrogen made from renewable energies can help the Central Asian country achieve its decarbonisation commitments it has signed on to in the Paris Agreement. At the same time, the green gas can fuel economic growth and stimulate a future-proof trade relationship with Germany and the European Union. While not the only element in an effective energy transition, "green" hydrogen is and will be an integral part of it. The production is based on electrolysis – a process that uses renewable electricity such as wind and solar energy to split water into its components oxygen and hydrogen. In this case, the final hydrogen product will be "green".

Dr. Robert Stüwe

Senior Expert, Hydrogen and Synthetic Energy Carriers

HYDROGEN OFFERS A VARIETY OF APPLICATION AREAS

As for its use, at least three preferential fields of application come into mind:

First, hydrogen is an industrial feedstock suitable for being used in the metallurgy and the chemical sector such as fertilizer production. The steel industry, for example, is currently geared towards supplying the neighbouring CIS region, while the fertiliser industry mainly produces for local needs. Low-

carbon hydrogen can leverage previously untapped potential in these industries by expanding their offtake markets to the EU and Germany. Given the awaited finalisation of the EU regulation for taxing emissions originating in imported products via a union-wide, legally binding carbon border adjustment mechanism (CBAM) as part of the European Green Deal, German importers will have to switch their demand to low-carbon metallurgy products to stay cost-competitive. This presents Kazakhstan with a unique opportunity. As hydrogen possesses a high calorific value, good thermal conductivity and a high reaction rate, the use in steel refining and finishing applications seems plausible. Leading energy scenario studies likewise agree that the production and finishing of nonferrous metals such as aluminium and copper are also feasible. Currently, Germany's and Kazakhstan's focus should be on steelmaking, where several technology routes could enable hydrogen use, including hydrogen in blast furnaces, direct reduction of iron (DRI) and smelting reduction. First international projects towards commercialising hydrogen DRI take place in Japan, Russia, China and in the United States as well as in Germany, amongst others carried out by Salzgitter AG (SALCOS) and Thyssenkrupp. Kazakh stakeholders, such as ArcelorMittal, have expressed a keen interest in the topic. In 2020, Kazakhstan exported steel worth around $7.6 million accounting for 16% of total exports[1]. Using this asset to launch a hydrogen economy would help Kazakhstan seize its own decarbonisation commitments for 2060 as an opportunity for modernising the country's strong export industry. A further impetus to the German-Kazakh Raw Materials Partnership from 2012 would be another plus.

Currently, Germany's and Kazakhstan's focus should be on steelmaking, where several technology routes could enable hydrogen use, including hydrogen in blast furnaces, direct reduction of iron (DRI) and smelting reduction.

The second area of H_2 application refers to its quality as an energy carrier, permitting the use as a durable storage medium for renewable electricity in gaseous form in high-pressure tanks or in

[1] *Official numbers by the Bureau of National Statistics for the Export of metals and metal products 2020. Agency for strategic planning and reforms of the Republic of Kazakhstan: Import and Export Structure of goods: https://stat.gov.kz/official/industry/31/statistic/6 (accessed: 08.10.2021)*

underground cavern storage facilities repurposed from natural gas. On top of that, storing H_2 in liquefied condition at –253 °C in insulated cryogenic tanks or specific Liquid Organic Hydrogen Carrier (LOHC) such as oil is also possible. Another though less tested way of depositing H_2 are solid carrier media such as carbon, zeolites or certain metals (metal hydride storage). Against the backdrop of Mazakhstan's large potential for generating wind and solar power, the comparative advantage of H_2's energy-related use for Mazakhstan will likely be the capture of excess renewable volumes. These can later be fed back into the electricity grid by way of re-electrification and bridge electricity shortages. One promising way to achieve this are reversible high temperature fuel cells (rSOCs) that allow a dual, two-way use by being able to reach efficiency levels of more than 60 per cent for re-electrifying hydrogen and well-above 70% in the ele trolysis mode for hydrogen prod tion (Fors hungszentrum Jüli h). If the Mazakh government o nsiders the country's electricity grid capacity not to be sufficient for taking up sufficient loads that would enable hydrogen production, the separate attachment of additional wind power and solar parks to individual hydrogen production units such as electrolysers would be a sensible alternative. Making hydrogen would thus become more independent from grid bottlenecks in the power sector. This would certainly require a flexible, incentivising regulatory approach from the Mazakh government and administration.

A third yet less mature way of using H_2 as an energy carrier is to make gas combustion turbines fit for purpose. A first real-life pilot project is underway in Austria. Here, Wien E nergie, is planning to blend a 15% share of "green" hydrogen into a gas turbine integrated in a combined heat and power station. This option however represents a medium to long-term solution due to the currently low technological readiness level.

PRIORITISING THE POWER FUEL WILL BE KEY

To ensure that "green" hydrogen is used most effectively, Germany and Mazakhstan should prioritise industry, as primarily steel and chemicals production will be hard if not impossible to decarbonise in an economically viable way with the help of battery-powered electrification. At the same time, the mobility sector such as shipping, aviation and hydrogen-fuelled long-haul trucks should not be neglected. As straightforward as this assessment may be, it is far from being self-evident in the case of Kazakhstan. Due to its considerable natural gas reservoirs and production capacity, generating methane-based "blue" hydrogen would at first glance also present a workable option requiring less adaptation for Kazakhstan in the short-term. Following through on hydrogen made from fossil gas however creates new problems that a "green" hydrogen economy can actually prevent.

RENDERING KAZAKH HYDROGEN READY FOR EXPORT BY REDUCING EMISSIONS

The most pressing one is emissions. Abating them would require domestic and foreign investors in and from Kazakhstan to make massive investments in minimizing methane leakage in natural gas production, storage and transport as well as highly-effective carbon capture and storage technology (CCS) both for natural gas exploration and for the actual hydrogen production steps of steam or auto-thermal reforming (SMR/ATR). Cutting-edge research suggests that CO_2 capture technology

Hydrogen forms a crucial part of the German Energy Agency's (dena) activities with Kazakhstan. But dena's work in Kazakhstan goes well beyond that and has started over ten years ago. Since 2020, dena has been implementing the Bilateral Energy Dialogue Kazakhstan – Germany on behalf of the German Federal Ministry for Economic Affairs and Climate Action, which is anchored in an intergovernmental Memorandum of Understanding from 2012. Key thematic areas of cooperation besides hydrogen topics include:

- **Cross-sectoral improvement of energy efficiency (Road map Energy Efficiency 2022-2026)**
- **Development of renewables (auctions, grid flexibility, buildings)**
- **The development of a start-up ecosystem**
- **Support for civil society on energy transition topics**

Dena's main partner ministries from the Kazakh side are:

- **Ministry of Energy**
- **Ministry of Industry and Infrastructural Development**

Other crucial partners include the German Embassy in Kazakhstan, The Delegation of German Economy in Central Asia, KEGOC, KOREM, EEDI, Zhasyl Damu, IGTIC as well as professional associations such as Qazaq Green, Association of RE of Kazakhstan, AEOK and ECOJER. Furthermore, dena reaches out to international think tanks as well as international financial institutions / IFIs such as UNDP, GIZ, USAID, EBRD, ADB and the World Bank.

is already sufficiently mature to allow high long-term removal rates at the hydrogen production plant of above 90%. Capture rates close to 100% are technically feasible too, slightly decreasing energy efficiency and increasing costs, but still have to be demonstrated at scale. For this, hydrogen production and CO_2 capture needs to be organised in an integrated manner to minimise additional energy demand for CO_2 capture.

It has to be highlighted that "blue" hydrogen can only have a sufficiently low greenhouse gas footprint in line with EU law if methane leakage is kept to a minimum. Such a level of GHG abatement is already possible today in the technologically most sophisticated natural gas sectors such as Norway's, the UM's and the Netherlands, where methane leakage rates are mostly below 0.5%. A ording to the M opernikus Project Ariadne Special D ossier of 2021, a higher methane leakage rate would definitely make methane based H_2 more polluting than its renewable equivalent.

As for carbon capture, rates below 90% efficiency clash with binding EU sustainability criteria and disqualify hydrogen imports from third countries to the EU from being labelled low-carbon in line with European Union law. To receive certification in the EU internal market, Mazakh hydrogen would have to do better. "Blue" hydrogen would only qualify as low-carbon, if it meets a greenhouse gas emission reduction target of 70% vs. the legally defined fossil fuel comparator, as the EU sustainable finance taxonomy and the prospective EU gas market directive [Art. 2 (10), COM (2021) 803 final] set out. According to dena calculations, the 70% reduction requirement translates into a maximum of 3.75 kg CO_2-eq. per kilogram of produced methane-based H_2, taking 12.5 kg CO_2- eq. per kilogram produced H_2 as the legally binding reference value for the average life-cycle emissions of natural gas-based steam methane reforming in line with EU directive 2015/652.

Only such a GHG footprint – a low methane leakage and a high CO_2 capture rate for hydrogen production – would narrowly meet the conditions set by current EU law and make fossil gas-based hydrogen from Mazakhstan eligible for export to the EU.
So ultimately, a natural gas-oriented production path might prove harmful to Mazakhstan's ambitions as an exporting country. Instead, Mazakhstan should double down on "green" hydrogen and bank on its gigantic renewable energy sources (RES) potential. Estimations by most experts on the average levelised costs of "green" hydrogen range between 2 and 7 euro. There is ample to reason to believe that Mazakhstan will end up being at lower end of the cost spectrum – given the country's abundant availability of land area, excellent average onshore wind speed conditions of around 8 m/s similar to the North Sea Coast and exceptional solar radiation levels comparable to the Mediterranean. Therefore, wind and solar-powered H_2 production will be easiest to secure export readiness and accelerate Mazakh decarbonisation commitments, possibly supplemented by nuclear energy if desired.

THE GLOBAL HYDROGEN MARKET IS ON THE MOVE

As things stand, current global volume forecasts and current price developments are underlining the case for building a "green" hydrogen production in Mazakhstan that is capable of satisfying a fair share of the global demand. A ording to dena's Global Alliance Powerfuels (GAP) and LUT University, 270 million tons (9,000 TWh) in "green" hydrogen will be required in a net-zero energy system by 2050, making a total investment of at least 18 billion euro necessary. Furthermore, price hikes of natural gas is driving the shift to renewable hydrogen. In places that offer cheap "green" power production, for example using hydropower in Scandinavia or large amounts of wind and sun in Namibia or Northern Africa, power-to-x products such as "green" ammonia are already cheaper than the fossil alternative. According to a recent report by Bloomberg New Energy Finance (BNEF), "green" hydrogen is already cheaper than fossil hydrogen from natural gas in parts of Europe, the Middle East and Africa. BNEF suggests a delivered hydrogen price of $6.59 per kg is now sufficient to make "green" ammonia cheaper than "grey" ammonia, made from unabated natural gas on a short-run, marginal cost basis. Bloomberg pointed out that prices in countries like Spain, India and China would be competitive, while even that price level is even enough for a "green" ammonia facility in Germany to be competitive. (PV Magazine) Michael S terner from the Technical University of Regensburg lays out that a year ago one ton of "grey" ammonia would cost about 350 euro, whereas "green" ammonia had a price between 600 a nd 700 euro (Handelsblatt). Due to the price of natural gas having climbed since the end of 2021, the competitiveness assessment has turned upside down.

How durable this trend reversal will be, is still far from certain. What is certain though is that the race for closing large scale purchase agreements has begun. Fortescue Metals and German energy group E.ON for example signed a deal to replace about a third of Germany's gas imports from Russia with Australian "green" hydrogen. The Memorandum of Understanding agrees to deliver 5 million tons of the low-carbon fuel to Germany and the Netherlands. The fuel would initially be shipped as liquid ammonia. E.ON is not the only German company to sign a hydrogen deal with the Australian billionaire Andrew Fortescue. Bayer affiliate Covestro announced in January 2022 its intention to procure

100,000 tons of "green" hydrogen equivalent per year from Fortescue "green" energy subsidiary Fortescue Future Industries (FFI), starting in 2024. (Financial Times) Against the backdrop of global competition on the supply side, Mazakhstan will have to rapidly find its role and adopt pertinent measures if it wants to become a major hydrogen supplier. The EU's newly grown ambitions for 2030 (20 million tons in total) to purchase an additional 10 million tons of H_2 via imports plus a production leap of another 5 million tons should provide fresh impetus to Mazakhstan's push for a "green" hydrogen economy.

GERMAN SUPPORT CAN MAKE A DIFFERENCE

Once the price for natural gas declines again, the widely expected "green" premium for renewable hydrogen is still likely to be paid. Here, support schemes such as the German H_2Global programme can step in to bridge the price difference. Equipped with 900 million euro, H_2Global is an auction-based mechanism for providing fixed volumes of hydrogen and its derivatives from third countries, pursuing a Contract for Difference (CfD) approach. This implies the German government compensates the difference between supply prices and demand prices by grants. Priority will initially be given to Power to X products such as ammonia, methanol, and sustainable aviation fuel as logistics for transport (ship, rail, and road haulage) are more mature, whereas long-distance hydrogen pipelines still need to be built. A Hydrogen Intermediary Company GmbH (HINT.CO) will conclude long-term purchase contracts (HPA of ten years) on the supply side for which bidding consortia of PtX production projects will compete. The demand side such as industry, transport companies and the energy sector will strive to close short-term sales contracts of about one year in the form of Hydrogen Service Agreements (HSA). A first round of auction is scheduled to take place in 2022.

To make H_2Global work, emerging countries should also be included in the international market ramp-up and specifically promoted. In this context, the development of hydrogen production and the demand for "green" hydrogen require targeted support in order to identify opportunities for hydrogen projects, to translate these into concrete project approaches and to support their realisation, as well as to provide political support where necessary. To contribute in a targeted way, the German Federal Ministry for Economic Affairs and Climate Action has launched the public-private partnership (PPP) measure "International Hydrogen

To contribute in a targeted way, the German Federal Ministry for Economic Affairs and Climate Action has launched the public-private partnership (PPP) measure "International Hydrogen Ramp-up Programme" (H_2Uppp).

Ramp-up Programme" (H_2Uppp). It supports small and medium-sized enterprises (SMEs) in identifying, preparing and implementing pilot projects for the production and use of "green" hydrogen – especially in developing and emerging countries. The aim is to draw on innovative German and European technology know-how and make it usable. The Energy Export Initiative has a supporting role via its existing structures (energy business travel programme, consortium formation and project development programme) to identify suitable projects for the H_2Uppp ideas competition.

INFRASTRUCTURE CHALLENGES FOR KAIAKHSTAN

As offtake agreements and underlying support schemes are not doing the trick alone. Infrastructure is the missing link. For Mazakhstan, it will be critical to reconcile the easier goal of developing the internal market with the more challenging task of ensuring export readiness. Here, the most cost effective mode of transport would be to retrofit existing natural gas pipelines or build new hydrogen-only corridors in order to benefit from economies of scale.
A rule of thumb is that comparatively high transport capacities and high TRL levels result in low transport costs. A general u nderstanding from meta studies (H PAT Working Paper 01/2021. Frau nhofer ISI) is that "green" hydrogen tra nsport via
pipeline up to 1,500 km represents the cheapest transport option. Except for very transport capacities, new H_2 pipelines up to 3,500 km and converted pipelines up to about 5,000 km offer the cheapest choice at costs below 1 euro/kg (30 euro / MWh) of transported hydrogen. oth options would merit political suppor t and can be realised in the short to medium-term.

However, alternative short-term transport strategies via rail, road and the seaway are needed, as pipelines are either time-consuming to build as the case of the pla nned Trans-Caspian Pipeline shows, or politically out of reach as for a possible pipeline transit via Russia and Ukraine. As for non-pipeline exports, hydrogen derivatives such as ammonia and methanol represent the most promising means for export. Especially ammonia can rely on established value chains. For transport distances over 5,000 km ships come into play. A cost-based ranking between the different transport options – liquid ammonia (LNH_3), liquid hydrogen (LH_2) and liquid organic hydrogen carriers (LOHC) – however is more difficult to determine, as the cost calculations of the transport technologies need to factor in different TRL levels and transport volumes depending on the source. NH_3 has a special status with regard to the transport pathway, as ammonia is used both as a raw material for the chemical industry and as a hydrogen carrier. In the latter case, hydrogen is separated after import to the demand centre, i.e. the bonded hydrogen is split off again.

KEY REGULATORY PRINCIPLES FOR FUTURE HYDROGEN INFRASTRUCTURES IN KAZAKHSTAN

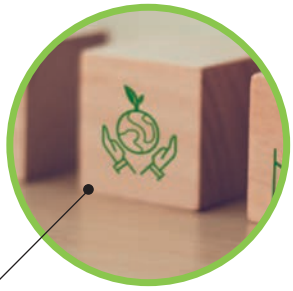
Finally yet importantly, Kazakhstan would benefit from placing a strong emphasis on creating a conducive, non-discriminatory regulatory environment. Creating an independent national regulatory authority will be key to this. The alignment of Kazakh regulation with EU and German regulatory standards implies to promote the independence of the Committee on Regulation of Natural Monopolies – the national competition watchdog currently operating directly under the authority of the National Ministry of Economy. For this to happen, it will be essential to incorporate a viable concept of national regulatory authorities (NRA) as separate legal entities into Kazakh law. Furthermore, key EU legal concepts for network industries stand ready to be adopted:

- Essential facility. In the electricity and future hydrogen sector, the physical network that connects electricity or hydrogen producers to consumers can be regarded as an essential facility. Access to the network is fundamental for anyone willing to sell or buy energy at reasonable costs as the duplication of any existing network infrastructure is either impossible or extremely expensive. However, the owner of the transmission or the distribution grid should be able to charge a regulated toll to create to keep up the incentive for infrastructure investment.
- Ownership Unbundling of energy production and supply from network operators (e.g. Transmission System Operators) to stimulate competition and encourage foreign direct investment in infrastructure. This means a firm owning and operating a network cannot be active in any other competitive segment of the supply chain nor have an interest in any company involved in those activities. On the other hand, a hydrogen supplier must not have any stake in the fully unbundled network company. This reasonable form of separation solves the issue of discriminatory access to the network.
- The Third Party Access-principle ensures that owners of natural monopoly infrastructures grant access to parties other than their own customers in a regulated manner in order to bring about fair competition.

OUTLOOK

National legislation (including the RES law) does not yet define rules nor standards for creating a hydrogen value chain. The Energy Dialogue between Kazakhstan and Germany has reached out to local stakeholders from government, business and academia to guide the discussion. Given the pending Kazakh policy strategy for hydrogen, the Bilateral Energy Dialogue Kazakhstan – Germany seeks to instil further dynamism into completing such a strategy. Recent discussions in the context of the first hydrogen workshop have displayed awareness among Kazakh stakeholders for the chances and challenges the country is facing. To use and resolve these, opening mutual learning channels and making them permanent will be key.

The need for regional cooperation for development of "green" hydrogen in Central Asia



EXECUTIVE SUMMARY:

• **Geography.** Kazakhstan and Uzbekistan have a favorable geographical location between Europe and East Asia, which, according to forecasts, will become the world's largest consumers of hydrogen.

• **Development of RES.** Kazakhstan and Uzbekistan are working on a significant increase in installed renewable energy capacities. Kazakhstan plans to introduce more than 6 GW of solar and wind power plants by 2035, as well as achieve carbon neutrality by 2060. At the same time, Uzbekistan plans to generate 25% of electricity from renewable energy sources by 2030, which implies the commissioning of about 10 GW of RES capacity.

• **International practices.** Active development of "green" hydrogen projects in Europe takes place through specially created clusters of "green" hydrogen production, which are created by the efforts of several countries. This is done to optimize logistics, as well as to improve integration and regional cooperation.

• **The need for actions.** Competition on the part of Persian Gulf countries, or rather Saudi Arabia and the UAE, which also have logistical access to the markets of Europe and China and a more developed infrastructure necessary for the production of "green" hydrogen. Under fierce competition, the most effective way for Central Asian countries to gain a large share in global exports of "green" hydrogen is to act in a coordinated manner, jointly develop and use the infrastructure necessary for the production and export of "green" hydrogen.

Pavel Tereshchenko,
Head of Research Department
of Invest In Network

What is "green" hydrogen?

Hydrogen itself is not an innovative element. It is actively used in various sectors, such as oil refining and ammonia production, and its use as an energy carrier was worked out at the end of XX century. However, this process was not developed actively due to various political and economic factors. Hydrogen production can be implemented in various ways according to the classification by color:

- **"gray"** – steam-gas conversion.
- **"brown"** – coal gasification.
- **"blue"** – steam-gas conversion with carbon dioxide utilization.
- **"turquoise"** – pyrolysis of natural gas.
- **"orange"** – electrolysis using atomic energy.

- **"green"** – electrolysis using RES.

The most interesting for the world community is **"green"** hydrogen, since its production does not involve carbon dioxide emissions even in small quantities, as in the case of low-carbon "blue", "turquoise" and "yellow".

WHY "GREEN" HYDROGEN AND WHY NOW?

The issue of the development of "green" hydrogen in Central Asia is becoming more relevant every month. In addition to the extremely dynamic promotion of the sustainable development agenda, the existing energy crisis is actively pushing countries to look for an alternative to oil and gas, which have significantly increased in price. Such an alternative is "green" hydrogen. It allows the use of renewable sources where electrification was impossible or difficult from a technical point of view.

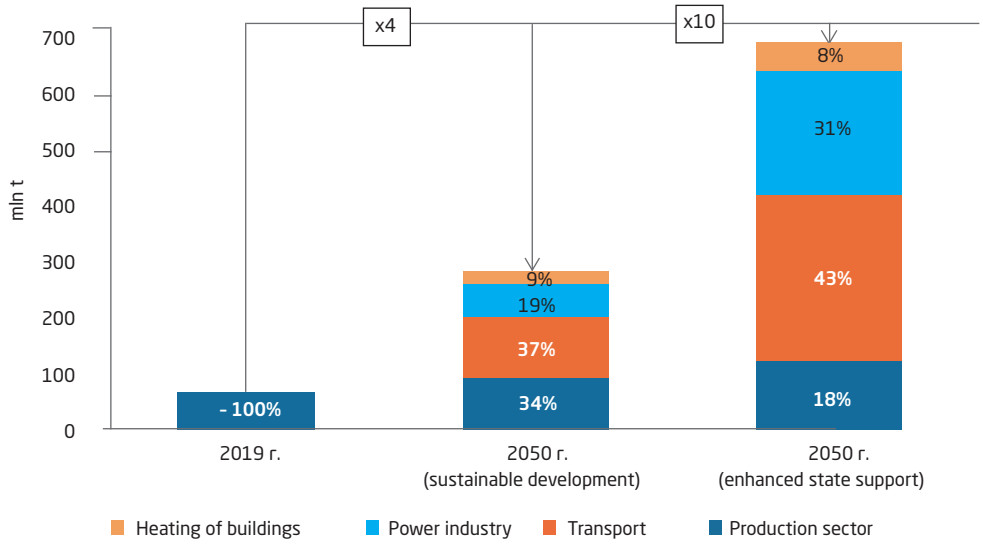
External factors that emphasize the need for accelerated development of hydrogen infrastructure in the region are experts' estimates of the volume of the hydrogen market, as well as plans of other countries for the development of production capacities. According to the analysis of the EY Energy Center, in the conditions of enhanced state support, the demand for hydrogen in the world will increase 10 times by 2050 compared to the level of 2019. At the same time, analysts of Precedent Research in 2020 stated that the market volume of "green" hydrogen alone could reach

$89,18

billion

by 2030.

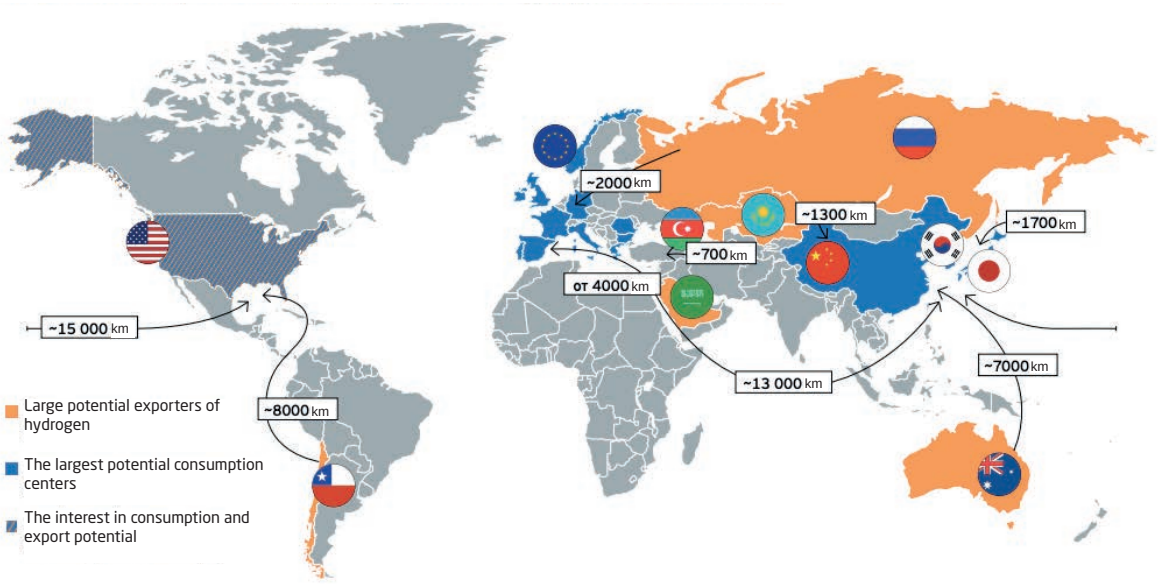
Forecast of demand for hydrogen in the world



Sources: IEA, Rystad Energy, Hydrogen Council, analysis of YE energy center (Central, East, South-East Europe and Central Asia).

As for other countries, the main rival of Kazakhstan and Uzbekistan in the potential export of "green" hydrogen is Saudi Arabia. The country plans to become one of the largest exporters of "green" hydrogen to diversify energy exports, as well as achieve carbon neutrality by 2030, having 40 GW of installed capacity of PPS, 16 GW of the WPP and 2.7 GW from other renewable sources. For reference: Kazakhstan will achieve carbon neutrality in 2060, and plans to introduce about 6 GW of renewable energy generating capacity by 2035. This comparison shows that additional capacities will be required to compete with Saudi Arabia in the export of "green" hydrogen. The competition itself will occur due to overlapping sales markets. According to EY, Saudi

Key potential centers for hydrogen offer and demand*



* Based on statements of intent
Sources: EY energy center (Central, East, South-East Europe and Central Asia).

Arabia plans to export its products to EU countries, as well as to China. Kazakhstan and Uzbekistan have access to the Chinese market through a joint border, as well as access to the European market through Russia or through potential cooperation with the countries of the Caucasus. The geographical location in this case is an advantage and to some extent delimits the markets: Saudi Arabia, in the case of China, will supply products to other regions of the country. However, with a developed hydrogen distribution system, even regions of China closer to Kazakhstan and Uzbekistan will be able to receive hydrogen from ports where Saudi Arabia will supply it. Thus, in the conditions of an actively developing renewable energy market in all Central Asian countries, regional cooperation will be a logical response to the upcoming tough competition in the export of "green" hydrogen. The cooperation will allow the most efficient use of existing infrastructure facilities to optimize them for the export of "green" hydrogen, and will also allow the use of more renewable energy resources for its production.

WHAT WILL COOPERATION GIVE?

Developing the capacities of "green" hydrogen with the help of international clusters is already a popular strategy. For example, the European Union plans to develop the hydrogen economy by creating international clusters that will optimally use the infrastructure of several countries for the production of "green" hydrogen. This is advantageous due to several factors:

- Improving the energy security of the region.
- Improving the investment climate of the entire region.
- Exchange of experience, training of highly qualified specialists in the region and subsequent development of new technological solutions.
- Reducing carbon dioxide emissions has a positive effect on the environmental situation in neighboring countries.

The use of such cooperation schemes in Central Asia will also diversify the structure of state revenues and reduce dependence on oil and gas exports. The Central Asian countries have the opportunity to get all the advantages of cooperation on "green" hydrogen, if the countries coordinate their actions and develop regional clusters for the production of "green" hydrogen.

WHAT NEEDS TO BE DONE?

In order to achieve the most efficient production of "green" hydrogen in Central Asia, as well as to obtain the largest share in the world market as exporters of "green" hydrogen, countries need:

- To promote the creation of a coordinated renewable energy development program between the countries of the region.
- To develop a single transparent legislative space to simplify investments.
- To adopt the standardized technical requirements for "green" hydrogen infrastructure facilities.
- To develop joint training programs for new specialists with the involvement of the private sector.
- To create a regional distribution system of "green" hydrogen.
- To upgrade power lines for efficient transmission of EE generated by RES to increase the capacity of production of "green" hydrogen.

For successful implementation of all tasks, it is necessary to create a special platform enabling representatives of the private and public sectors to interact closely with each other, thereby contributing to deeper regional integration of RES. "Invest In Network" company fully shares this point of view and holds specialized regional renewable energy conferences attended by high representatives of all interested market participants. Participation in such events allows the private sector to find new partners, as well as go directly to the relevant ministries, while for government agencies, participation in the event allows increasing the investment attractiveness of their country and interact directly with potential investors. We, Invest In Network, are confident that it is within the framework of such networking that the most mutually beneficial relationships are established. Seeing the interest in "green" hydrogen in Central Asia, our events also include this topic in their agenda.

For successful implementation of all tasks, it is necessary to create a special platform enabling representatives of the private and public sectors to interact closely with each other, thereby contributing to deeper regional integration of RES.

ROTTERDAM IS INNOVATING AND WORKING TOWARDS A HYDROGEN FUTURE

In line with environmental issues and the European goals regarding the Paris Agreement of 2015 and the energy transition, hydrogen is at the forefront of global attention. But hydrogen energy is certainly also in the spotlight because of the good prospects for the developments within the hydrogen energy transition, there, hydrogen can be obtained from various common resources. With the eye on leaving no carbon (CO_2) emissions, "green" hydrogen, produced from solar or wind energy has a lot of great advantages. And a strong preference for developing new innovations in this area. The city of Rotterdam (NL), a city being described as "a city with innovation ingrained in its DNA", therefore addopted the Hydrogen innovative developments strongly on their agenda.

Not only the city of Rotterdam, but also in general this developments and use of hydrogen is seen as a potential future replacement for fossil fuels in heating private homes, business premises and greenhouses. But certainly also its use in and industry processes. Biggest advantage, when used as a fuel, hydrogen only emits water (vapour) and warm air. There are several advantages and it is therefore very logical that Rotterdam and other stakeholders are looking for the implementation possibilities of hydrogen as an energy supply! Rotterdam is rapidly developing into a European base where innovations are developed and the production, storage and distribution of hydrogen progress at a rapid pace.

ROTTERDAM HYDROGEN HUB

In the Rotterdam port and industrial areas, companies and innovative entrepreneurs come together with the local government and the Port of Rotterdam Authority to set up an international hub for the production, import, application and transport of hydrogen.

The city of Rotterdam, the region and the port have many advantages to function as a Hydrogen Hub. Rotterdam is Europe's largest port, with an extensive industrial network and infrastructure that is connected with Europe. The port of Rotterdam is therefore also called "the Gateway to Europe". At this moment, the traditional fossil fuel-based energy industries are still the most important factor in the region of Rotterdam, but with the eye towards more sustainable energy sources hydrogen offers important developments and opportunities for future implementations. Now the old and new economy go hand in hand, but in the meantime industry crossovers are emerging and many innovations are shared with and applied by multiple parties.

WORLD HYDROGEN 2022 SUMMIT & EXHIBITION 2

Reason enough that the World Hydrogen 2022 Summit & Exhibition will take place in Rotterdam.

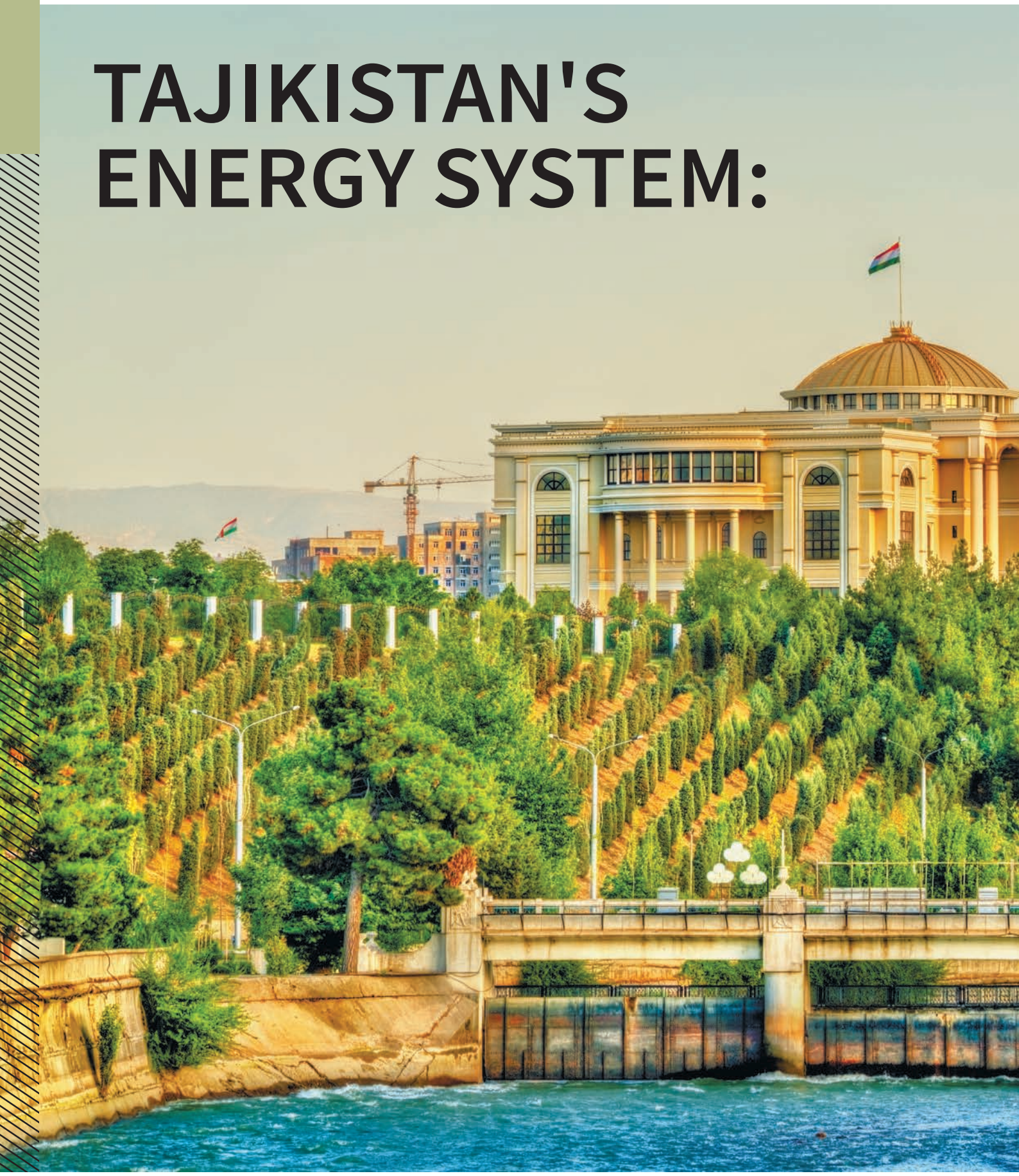
The Municipality of Rotterdam and the Port of Rotterdam Authority are partners within the organization of the World Hydrogen 2022 Summit & Exhibition. A event on high-level hydrogen insights and networking dedicated solely to the advancement of the hydrogen industry.

The World Hydrogen 2022 Summit & Exhibition will be held from 9 to 11 May in the Rotterdam Ahoy-Congress facility.

https://www.world-hydrogen-summit.com/
Source: Rotterdam Partners
(official Destination Marketing Organization & Investment Agency of the city of Rotterdam)

FRANK DONKERS
(Editor Innovation Media Magazine)

TAJIKISTAN'S ENERGY SYSTEM:



CURRENT STATE AND PROSPECTS

Abdugani Mamadazimov,
Candidate of Political Sciences,
Chief Scientific Officer
Institute of Asia and Europe NANT

It is well known that all five Central Asian countries are divided, among other things, into upstream countries (Tajikistan and Kyrgyzstan) and downstream countries (Kazakhstan, Uzbekistan and Turkmenistan), when upstream countries are primarily interested in the energy use of water resources, and downstream countries rich in hydrocarbons focus on their irrigation potential. Therefore, we will analyze the hydropower potential of sovereign Tajikistan, located in the head of the region's rivers.

Currently, four strategic objectives are being implemented in the country (energy independence, food security, getting out of communication isolation and accelerated industrialization), when the government pays special attention to the first of them, which has huge untapped resources and opportunities.

Currently, four strategic objectives are being implemented in the country (energy independence, food security, getting out of communication isolation and accelerated industrialization).

Mountainous Tajikistan has enormous reserves of hydropower resources, which are estimated at 527 billion kWh per year, and technically, they have good prospects for development and consist of 317 billion kWh per year, of which only 4–5% (16.5 billion kWh) have been used so far. According to this potential, Tajikistan ranks eighth in the world (after China, Russia, the USA, Brazil, Zaire, India and Canada) and first in Central Asia. More than 95% of Tajikistan's energy is based on hydropower.

This (hydropower) potential of Tajikistan is three times higher than the current electricity consumption throughout Central Asia. With the efficient use of these resources, the region can be provided with inexpensive and environmentally friendly ("green") energy. The main hydropower potential is concentrated in the basins of the Panj, Vakhsh, Kafernigan and Zeravshan rivers. At the same time, there is currently an imbalance of energy consumption in the country, when the excess of electricity in summer is 3–5 billion kWh, and the shortage of electricity in winter is 2.5 billion kWh.

Mountainous Tajikistan has enormous reserves of hydropower resources, which are estimated at 527 billion kWh per year.

Currently, there are 11 large and medium-sized hydroelectric power plants operating in the RT, as well as about 300 small ones, with a total capacity of 132 MW. In 2009, an updated program for the construction of small hydroelectric power plants was adopted. According to this program, the construction of 189 sHPP with a total capacity of 103.6 MW is envisaged. In 2010–2011, more than 60 small hydroelectric power plants with a total capacity of 47 MW were built. And this trend continues. Preliminary estimates show that it is technically possible and economically feasible to build more than 900 sHPP with a capacity of 100 to 3,000 kW on the tributaries of rivers in the mountainous regions of the country. According to experts, the use of energy from small rivers can satisfy the electricity demand of about 500–600 thousand people living in remote regions of the country by 50–70%, and in some cases – by 100%.

In 2011, a unified energy system of the country was created, connecting the southern energy system of the country with the northern one (after the completion of the South-North transmission line). All this has significantly increased the possibilities of physical access of the entire population of Tajikistan to the generated electricity. Today, electricity tariffs for the population in the Republic of Tajikistan are socially oriented and equal to 2.32 US cents / 1 kWh.

The electric power system of Tajikistan operates as a single system and connects four separate regions by geographical location (Sughd (North), Khatlon (South), Dushanbe and nearby districts, as well as regions of republican subordination (RRP)).

The electricity sector is managed by the open joint-stock holding company "Barki Tojik", which is state-owned. The company controls power plants and the generation, transmission and distribution of electricity in the country, except for Gorno-Badakhshan Autonomous Region (GBAO). Since December 2002, GBAO's electricity supply network has been transferred from the company "Barki Tojik" to the private company "Pamir Energy" on the basis of a Concession agreement for a period of 25 years. In the spring of this year, GBAR's isolated electrical system was connected to

the nationwide energy system by Pamir Energy. It became possible due to the construction of a 25-kilometer "power line (110 kV) Vanj – Darwaz" with the assistance of the Government of the country, the Kingdom of Norway and the Aga Khan Fund. RT Pamir Energy operates 11 small and mini-hydroelectric power plants with a total installed capacity of 44.16 MW and 35/10/0.4 kV transmission lines with a total length of 2,609 km.

In order to achieve full energy independence in the country, the Rogun HPP occupies a privileged place –a hydroelectric power plant under construction on the Vakhsh River with an installed capacity of 3,600 MW, being the largest HPP in Central Asia. Six hydroelectric units with a capacity of 600 MW each with radial-axial turbines will be installed in the HPP building. The average annual electricity generation at the Rogun HPP will amount to more than 17 billion kWh per year. In other words, this giant hydroelectric plant doubles the country's electricity generation twice at once (from 16.5 billion to almost
34 billion kWh).

The hydroelectric dam with a height of 335 m will become the highest rock-fill dam in the world. It forms the Rogun reservoir with a total volume of 13.3 cubic km and a useful volume of 10.3 cubic km. The Rogun HPP is planned to be used as a multi-purpose hydroelectric facility, including for generating electricity, regulating water, reducing the risk of floods and mitigating droughts. The uniqueness of this giant hydroelectric facility lies in the placement of its key components (the hydroelectric power station building and the transformer room) in the underground, in the heart of the mountain range surrounding the future reservoir, and the total length of underground tunnels is about 75 km.

The construction of the Rogun HPP was started back in the 1970s, but for some reason it was suspended in the early 1990s. In 2007, the Government of the Republic of Tajikistan applied to the World Bank for an international examination of the project, taking into account modern requirements and safety standards. All interim and final evaluation reports for the Rogun HPP were published on September 1, 2014, which marked the completion of the evaluation process. According to these estimates, the Rogun HPP construction project was recognized as technically feasible, economically feasible and compliant with international safety standards both from a technical point of view and from an environmental point of view.

The research also served as a basis for decision-making and dialogue between the countries of the river basin. Over the course of four years, five consultative meetings were held with the participation of officials of government bodies of the river basin countries, representatives of diplomatic circles and international organizations and hundreds of civil society organizations.

The first and second hydroelectric units of the Rogun HPP were commissioned in 2018 and 2019, respectively, and the third and other units are planned to be commissioned in the near future.

Construction and installation works at the Rogun HPP are carried out with the involvement of 70 organizations and institutions, well-known domestic and foreign contractors, 22 thousand specialists and workers, more than 90% of whom are citizens of Tajikistan, as well as using 3,600 machines and mechanisms.

Electricity from the Rogun HPP is already being supplied to the electric power system of Tajikistan by the 500 kV Rogun – Dushanbe transmission line, which was put into operation on the day of the launch of the first unit of the station – November 16, 2018.

The next largest energy project of the region along the route "Central Asia – South Asia" CASA-1000 is closely connected with this giant. This project involves the construction of a cross-border high-voltage power transmission line (HVTL), which will connect the energy systems of Kyrgyzstan and Tajikistan with Afghanistan and Pakistan. The implementation of the project will allow the countries to organize a single electricity market and trade all year round. Kyrgyzstan and Tajikistan will be able to supply 1,300 MW of excess electricity to southern Asian countries every summer.

To implement the CASA-1000 project, it will be necessary to build:

- transmission line-500 kV AC from Datka substation (Kyrgyzstan) to Sugd-500 substation (Tajikistan) with a length of 477 km;
- converter substation with a capacity of 1,300 MW in Sangtuda (Tajikistan);
- high-voltage DC transmission line with a length of 750 km from Sangtuda (Tajikistan) to Nowshera (Pakistan);
- converter substation with a capacity of 1,300 MW in Nowshera (Pakistan).

It should be emphasized that the project is supported by a number of global financial institutions and international cooperation institutions, the World Bank Group, the Islamic Development Bank, the European

Despite the objective fact that there is twice as much solar energy in Tajikistan as in Europe, however, solar energy in our small country is expensive compared to hydropower from the point of view of saving.

Bank for Reconstruction and Development, the European Investment Bank, the US Agency for International Development (USAID), the US Department of State, the UK Department for International Cooperation (DFID), as well as a number of other donor organizations.

The official start of construction work within the framework of the CASA-1000 project was on May 12, 2016 in Tursunzad (Tajikistan) with the participation of the President of the Republic of Tajikistan, Prime Ministers of the Kyrgyz Republic, the Islamic Republic of Pakistan and the Islamic Republic of Afghanistan.

In September 2018, in Almaty, after signing a number of other contract agreements between energy companies and contractors, the project moved fully to the construction stage in accordance with all legal requirements.

After the Taliban came to power in neighboring Afghanistan in August last year, it was officially confirmed that this project (CASA-1000), along with other major projects in our region, such as TAPI (Turkmenistan – Afghanistan – Pakistan – India gas pipeline) and the Termez – Mazar-I-Sharif railway – Kabul – Peshawar", is a priority.

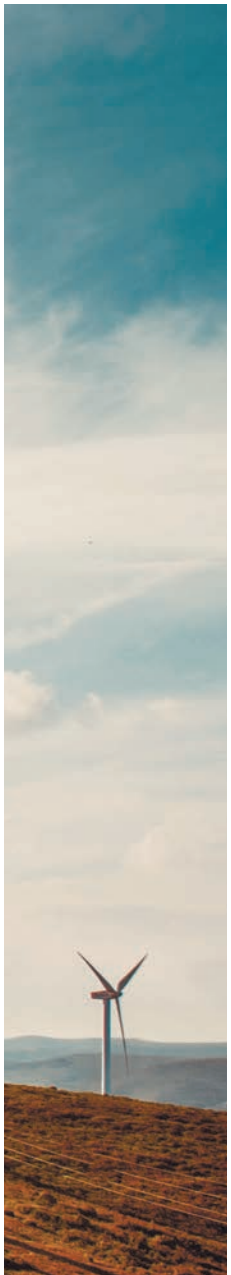
Despite these obvious prospects in Tajikistan's hydropower sector, which forms the basis of the country's "green" economy, its government is making a number of efforts to create regulatory legal acts on renewable energy sources (RES). These measures are primarily related to global climate change, which in our mountainous republic is projected through the disappearance or reduction of glaciers – the main sources of hydropower. Therefore, the government of the country and the relevant ministry also began to pay attention to alternative electricity, primarily renewable energy sources such as solar and wind energy.

The climate of Tajikistan is particularly favorable for the use of solar energy. Having 280 – 330 sunny days a year and the intensity of total solar radiation, which, according to experts, varies throughout the year from 280 to 925 MJ/sq.m in the foothill areas, as well as from 360 to 1,120 MJ / sq. m in a mountainous area. The use of available solar energy in Tajikistan can cover 10–20% of energy demand in the future. According to estimates, the potential of solar energy in Tajikistan is about 25 billion kWh per year (one and a half times more than the potential of the giant – Rogun HPP). This potential is practically not used, if you do not take into account some of its use for heating water.

Despite the objective fact that there is twice as much solar energy in Tajikistan as in Europe, however, solar energy in our small country is expensive compared to hydropower from the point of view of saving. For example, according to experts, today the unit cost of construction of hydroelectric power plants in Tajikistan is $1,000/kW, the tariff is less than 2 cents per 1 kWh. At the same time, the unit cost of solar PP with a capacity of 1,000 MW, being built today in China, in the Ordos steppe with huge solar radiation is $2,500/kW, and the planned tariff is more than 18.8–20 cents per 1 kWh.

Therefore, the first projects on the introduction of a new (expensive) type of energy – solar electricity – in the republic are implemented within the framework of not purely economic or commercial projects, but social ones aimed at improving the standard of living in remote and mountainous regions of the country. The pioneer in this direction is a new (220 kW) solar power plant commissioned in the autumn of 2019 in the mountainous Murghab district, located on the border with China. This largest solar power plant in Tajikistan, built with the support of USAID, also acts as the tallest solar power plant in the world. This first solar power plant is a direct result of successful cooperation between the Government of Tajikistan, USAID and Pamir Energy. At the request of the Ministry of Energy and Water Resources of Tajikistan, USAID supported a project for installation of solar power plant in Murghab to supplement the nearby Tajikistan hydroelectric power plant (formerly Aksu) with a capacity of 1.5 MW and add clean renewable energy to the local power grid. Murghab settlement (the center of similar name district) in the Pamirs is one of the highest mountain settlements in the world. More than 6,000 people were isolated from Pamir Energy's power supply sources and the national grid due to uneven topography at an altitude of 3,600 m. A new solar power plant in Murghab will increase the available daytime electricity by 50%. This will not only significantly improve the quality of life of residents, but will also contribute to the

The average annual wind speed in these regions is about 5–6 m/s. In the annual flow, the highest wind speed is usually observed in spring or winter with increased cyclonic activity, the lowest in summer and autumn.



overall economic development in the region. This pilot solar power plant project demonstrates how the national Government, international donor organizations and the private sector can jointly address development challenges even in the most remote and isolated areas of the world.

The next one of the alternative energy sources in Tajikistan is wind energy. The wind energy potential of the country has not been studied well enough. According to various estimates of experts, it varies from 30 to 100 billion kWh per year, which indicates that when clarifying this potential, which can be commensurate with the technical potential of the country's hydropower, it will also act as another colossal untapped energy resource.

Its use as a complement to the main hydropower is justified in some regions of the country. The strongest winds in the country blow in mountainous areas, where the landscape of the country contributes to convergence of air flows, as well as in the Sughd region and in the Rasht Valley. The average annual wind speed in these regions is about 5–6 m/s. In the annual flow, the highest wind speed is usually observed in spring or winter with increased cyclonic activity, the lowest in summer and autumn. Observations show that the wind with a speed of 1–5 m/s (70–90%) has the greatest repeatability in most areas. The wind speed of more than 10 m/s is rare, and the repeatability does not exceed 10%. In the valleys and hollows, there is an average of 5–15 days a year with strong winds (Dushanbe and Istaravshan). In some forms of relief at high altitude and in places of narrowing valleys, the number of days with strong winds reaches 40–60 (Khujand, Shakhristan district, Anzob pass, Fedchenko glacier, etc.).

The use of wind energy is promising in certain regions of the republic, where the wind speed is quite high (more than 5–6 m/s at an altitude of 10 m from the surface level – Khujand, Kayrakkum, Faizabad, Khoburobad, Shahristan, Anzob passes, other areas) and wind power plants (wind turbines) can be used to generate electricity, raise water, grinding of grain, etc.

Usually turbines of wind power plants (wind turbines) have a capacity of 250–750 kW. The cost of generating electricity at wind turbines directly depends on the average annual wind speed and local conditions and ranges from $0.03 (10 m/s) – $0.12 (5 m/s) per 1 kWh, which is acceptable for the country. According to experts, the conducted technical and economic estimates of the cost of wind turbines give a value of $1,000-1,500 per 1 kW of design capacity. With the predominant use of hydropower, the use of wind energy is justified in certain areas as autonomous or additional energy sources of small capacity. Not having a large industrial value, wind energy can at the same time solve important social problems, providing energy to remote areas, farms, pasture and beekeeping cooperatives, etc.

Thus, the hydropower industry of Tajikistan, while remaining the core type of energy generation, is gradually losing ground to the generation of electric power in the country, when interest in other renewable energy sources is gradually increasing. In this process, there is an interesting trend when the fragmentation of types of electricity generation does not lead to the disconnection of the country's energy system, but, on the contrary, to their complement, when centralized hydropower is supplemented with alternative solar electricity, which fills the "bottlenecks", thereby ensuring uninterrupted generation and providing the population with affordable electricity.

The completion of the giant Rogun hydroelectric complex and the introduction of large solar and wind power plants contribute not only to achieving genuine energy security of sovereign Tajikistan, but also can help turn the country into one of the leading exporters of electricity in the Central Asian region.

TARGET INDICATORS FOR DEVELOPMENT OF ELECTRIC POWER AND RENEWABLE ENERGY

Problems in the fuel and energy sector:

• The continued isolation of Tajikistan's energy system from the Central Asian energy system exacerbates the seasonal shortage of electric energy (capacity) in Tajikistan and significantly limits the export potential of the electric power industry, which is a destabilizing factor of the country's energy and economic security. The damage caused by the introduction of restrictions on the supply of electricity in the winter period is estimated by the World Bank at 200 million US dollars per year;
• low level of reliability of power supply and barriers to joining new consumers;
• insufficient use of local fuel and energy resources to make up for seasonal electricity shortages;
• low energy efficiency of production and consumer sector;
• ineffective regulatory framework in the fuel and energy sector of the country;
• inadequate tariff policy in the electric power industry, which is a barrier to the development of private entrepreneurship in the RE, creates prerequisites for expansion of shadow business, does not stimulate the processes of energy savings and energy efficiency;
• poor diversification of generating sources (HPPs generate 96% of the total installed capacity of power plants) and involvement of solar, wind, and biomass energy in the economic turnover.

Priorities for development of the fuel and energy sector:

• ensuring reliable energy supply to the country's economy with efficient use of energy resources;
• ensuring the transition of the country's hydropower industry into the budget-forming industry of the country, its decisive role in reducing poverty, promoting not only its own development, but also development of other sectors of the economy;
• further development of small hydropower and other renewable energy sources both to reduce poverty and ensure access of the population, especially rural, to social benefits, and for the overall development of the economy, primarily small business;
• ensuring Tajikistan's transition from a regional and world leader in potential hydropower reserves to a leader in the efficient development and use of the country's energy potential and on this basis promoting the interests of national energy in foreign markets both through appropriate energy diplomacy and through the use of market mechanisms

IN TAJIKISTAN

Goals 10/10/10/10 – to ensure the development of the electric power sector:

- Increase the design capacity of the electric power system to 10 GW;
- Reach 10 billion kWh of annual electricity exports to neighboring countries;
- Diversify generating capacity by at least 10% through increase in capacity of other energy sources, including coal, oil, gas and RES;
- Reduce electricity losses in the country up to 10%;
- Create conditions for energy diversification based on the development of coal and oil and gas subsystems of the fuel and energy sector and the development of RES;
- Ensure a high reliability of power supply to the population and production sector, overcome the seasonal shortage of capacity in the electric power industry, significantly reduce dependence on imports of basic foodstuffs;
- Increase energy efficiency and manageability of all sectors of the national economy, by introducing energy-saving technologies and improving energy efficiency, savings of up to 500 million kWh of electricity have been provided
- Form the necessary personnel potential for modern energy and industrial management, effective management of RE;
- Ensure financial stability and transparency of the energy sector and increase the investment attractiveness of the RE;
- Create prerequisites for an optimal structure of the fuel and energy balance of the country with a decrease in the share of imported energy resources in the structure of domestic consumption, and increase in the share of non-fuel energy by increasing the use of RES (solar, wind, biological, geothermal)
- Hydroelectric power plants up to 30 MW are considered small.

Source: National Development Strategy of the Republic of Tajikistan for up to 2030.

RES development: mission is

Timur Shalabayev,
Executive Director Renewable Energy Associations "Qazaq Green"

Due to the President's policy and commitment to the "green" course in the last 3 years, the renewable energy sector has received a powerful boost for development: recognizing the "greening" of the economy as one of the key principles of the new national economic policy, increasing the target share of renewable energy in the energy balance until 2030 from 10 to 15%, extending the term of contract for purchase of renewable energy from 15 to 20 years, classification of renewable energy projects as priority investment projects, adopting legislative norms for the construction of maneuverable generation (gas and hydroelectric power plants). However, at the moment, the RES business community sees a number of problems and challenges facing the RES industry.

DEVELOPMENT OF SMALL-SCALE RENEWABLE ENERGY PROJECTS

Currently, there is a global trend towards the decentralization of energy. This trend is facilitated by the improvement of technologies, the availability of financial opportunities and various incentive programs, as well as public awareness of environmental issues.

According to the International Energy Agency, the total installed capacity of domestic (rooftop solar installations, with a unit capacity of up to 10 kW) reached 58 GW* in 2018, and it

impossible?

is expected that by 2024 this figure will be increased by 2.5 times.

In Germany, the total capacity of distributed generation (SPP) was 33 GW, while the installed capacity of home installations was 6.5 GW, and the capacity of commercial and industrial installations that small and medium-sized businesses install for their own needs was 26.5 GW (more than 60% of the total installed capacity of all solar stations in the country). In Japan, 34 GW, of which 9 GW are home installations, in Italy 16 GW, of which 4.2 GW are home installations. Moreover, these data apply only to the electricity supply sector.

In order to stimulate the development of this area in Kazakhstan, the UNDP-GEF project "Reducing the risks of Investing in Renewable energy" (hereinafter – UNDP-GEF) has been working for several years. According to the UNDP-GEF study, 5,907 installations with a capacity from 1 to 1,000 kW have been commissioned in the country by both households and small and medium-sized businesses to cover their own electricity needs. This trend is especially relevant for the southern regions of the country with high solar potential and high tariffs for business for electricity (Turkestan region – 24.7 tg/kWh).

In addition, UNDP-GEF conducted a simulation of the distribution grid of the Turkestan region, including Shymkent, on the integration of small renewable energy projects into the network. The simulation showed quite interesting results: the potential of 5–10% of households is equivalent to the construction of a large thermal power plant with a capacity of 500 –1,000 MW. Connection to the electric network of the so-called home installations of solar power plants on the scale of the region will contribute to improving the reliability of the network as a whole, unloading overloaded nodes and reducing electrical energy losses.

On May 26, 2021, at a meeting on the development of the electric power industry, you gave specific instructions to the Government of the Republic of Kazakhstan on the development of this segment of renewable energy with a deadline until June 2022:

- to prepare and introduce legislative changes in terms of simplifying the list of permits for the generation of clean energy by households and improving the mechanism for subsidizing capital costs for low-power home installations;
- to make proposals to improve measures to stimulate the

population (sale of excess generated energy to the grid, subsidizing the purchase of equipment with a revision of its maximum cost and the subsidy rate upward, simplification of procedures for obtaining permission to install RES) for the use of renewable energy sources, to form a pool of pilot projects for the operation of RES within the framework of the development of "smart" cities.

As part of support for development of small-scale RES, UNDP-GEF, based on international experience, developed specific measures of state support and amendments to legislative and regulatory acts that can give impetus to using the renewable energy technologies in the country:

- targeted assistance to individual and net consumers, in terms of state reimbursement of part of the costs for acquisition, installation and commissioning of small-scale projects;
- mechanisms of connection to electric networks and commissioning of small-scale renewable energy facilities;
- mechanisms for monitoring and controlling the operation of small-scale renewable energy facilities;
- free access to the transmission of electricity through networks generated by small-scale renewable energy facilities and exemption from payment for the transmission of generated electricity;
- mechanisms for offsetting excess electricity generated and supplied to the grid for offsetting generation and consumption in subsequent billing periods.

It should be noted that these measures have been repeatedly discussed during 2020–2022 at various venues with the participation of the business community, the authorized state body, the System Operator, development institutions, business. To implement the above measures, it is necessary to obtain the decision of Republican Budget Commission on allocation of targeted assistance to individual and net consumers, to make amendments to the legislation on support for use of renewable energy sources, on natural monopolies, and to develop subordinate legislation.

In addition, on December 27, 2021 the Law of the Republic of Kazakhstan "On amendments and additions to certain legislative acts of the Republic of Kazakhstan on industrial policy" amended the Law of the Republic of Kazakhstan "On support for use of renewable energy sources", whereby only renewable energy producing organizations, for which contracts have been concluded with RFC RES LLP, as well as buyers and their energy producing organizations that are part of the same group of persons using renewable energy sources for their own needs, are exempt from paying for transmission of electric energy by energy transmission organizations.

Thus, households and net consumers who want to implement or have already implemented renewable energy technologies do not fall under these categories. Already, this has led to the fact that energy supply organizations refuse to buy renewable energy from small-scale installations, due to the fact that now they, as end users of this electricity, have an obligation to pay for its transmission.

In this regard, in the current situation, the development of the segment of small-scale RES has become almost impossible. A certain optimism was brought by the draft Law of the Republic of Kazakhstan "On amendments and additions to some legislative acts of the Republic of Kazakhstan on the implementation of certain instructions of the President", which was initiated by the Ministry of National Economy of the Republic of Kazakhstan in early March this year. This draft Law included important amendments to the Law of the Republic of Kazakhstan "On support for use of renewable energy sources" in terms of the development of small-scale renewable energy projects based on the developments of the UNDP-GEF project. It also includes corrections in the correction mode regarding the legislative conflict that arose at the end of last year and described above.

Already, this has led to the fact that energy supply organizations refuse to buy renewable energy from small-scale installations, due to the fact that now they, as end users of this electricity, have an obligation to pay for its transmission.

"Qazaq Green" hopes that the draft Law proposed by the Ministry of National Economy of the Republic of Kazakhstan will be adopted. It is necessary to take advantage of the result of many years of work of UNDP-GEF and in order to fulfill the instructions of the President, it is necessary to take the support measures proposed by international and domestic experts, aimed primarily at supporting decarbonization initiatives by the population and SMEs.

IMPLEMENTATION OF RENEWABLE ENERGY PROJECTS BY BUSINESSES FOR THEIR OWN NEEDS

In December 2020, our country joined the global climate movement to achieve carbon neutrality. Many businessmen, representatives of the real sector of the economy (metallurgy, oil and gas sector, telecommunications, etc.) took this news as an opportunity to diversify their electricity consumption and reduce the carbon footprint in the production of their final products. However, even here, despite the fact that companies want to build renewable energy facilities at their own expense to cover their own electricity needs under bilateral agreements in the B2B format without support from FSC of RE LLP, there are problems related to the requirements of the System Operator KEGOC JSC.

According to the requirements of regulatory legal acts, such facilities must coordinate the scheme of power delivery with KEGOC JSC. In particular, one of the companies plans to build a solar plant with a capacity of 17 MW without connecting it to the grid, that is, the plant will consume electricity both from the grid and directly from the solar station.

According to KEGOC JSC, in case of intention to implement the project, applicant should provide the project of regulating power with connection to the ALFC and the conclusion of a corresponding contract with KEGOC JSC for provision of services for regulating electric power in the National Grid of Kazakhstan. At the same

time, maneuverable generating capacities that are not currently involved in the power balance of the National Grid of Kazakhstan should be presented as the regulating capacity.

As an alternative, it is possible to consider equipping the SPP with an energy storage device with a capacity of 50% of the installed capacity of the SPP and a capacity sufficient to issue the installed capacity of the storage device within four hours.

That is, on the one hand, it is not prohibited to implement such projects, but in order to implement it next to the solar station, it is necessary to put a gas station in the form of maneuverable generation, which will regulate the operation of the solar station, despite the fact that the solar station is not physically connected to the network. Or, in the second scenario, put energy storage devices (batteries) on the solar station, which will increase capital costs by at least 1.5 times.

At the end of this February KEGOC JSC initiated amendments to the Rules of Technical Operation of Power Plants and Networks, according to which the following requirements are put forward for wind power plants and SPP for integration into networks and the use of energy storage systems:

- for a wind power plant, electric energy storage systems are installed with a capacity of at least 50% of the installed capacity of the wind power plant and a capacity sufficient to release the full capacity of the storage devices within two hours;
- for a solar power plant, electric energy storage systems are installed with a capacity of at least 50% of the installed capacity of a solar power plant and a capacity sufficient to release the full capacity of the storage devices within four hours.

As a result, businesses interested in electricity from renewable energy sources see real risks associated with the requirements for the integration of a renewable energy facility, even without a network connection. But such companies can help the National Grid of the Republic of Kazakhstan to solve current problems with electricity shortages, because part of their consumption volumes from the National Grid of the Republic of Kazakhstan will decrease.

On March 4 this year "Qazaq Green" Association held a discussion of these initiatives with the RES business community. According to investors and developers, it is unfair that the System Operator intends to regulate at the expense of energy storage systems. In a number of cases, it is possible and advisable to use alternative technological solutions (for example, gas turbine or gas reciprocating units). In addition, the participants noted that at the moment there are no calculations confirming the required capacity of energy storage systems, as well as a clear vision of how the introduction of ESS will affect tariffs at renewable energy auctions.

The business community notes that the use of energy storage systems for balancing purposes in the system is the most expensive, costly and, accordingly, technically (short service life, rapid degradation, losses) and economically inefficient solution for the renewable energy market. From international experience, it can be said that such systems are used at renewable energy stations only to smooth out the daily production schedules of the stations themselves. At the same time, the System Operator creates conditions in the energy system for the safe integration of renewable energy into the network, while using such tools as: maneuverable generation, available capacity reserves, automated control systems, market mechanisms (for example, demand management, differentiated tariff, balancing market), effectively built transnational flows with neighboring states, and ESS are only one of the above tools.

The experts also noted that in order to solve systemic problems, it is necessary to use mechanisms that do not require high costs

As a result, businesses interested in electricity from renewable energy sources see real risks associated with the requirements for the integration of a renewable energy facility, even without a network connection.

and can be adopted within the framework of standard-setting activities:

- improving the quality of forecasting electricity generation by renewable energy facilities;
- introduction of financial responsibility to cover deviations between the projected and actual capacity of the renewable energy facility, as one of the incentives for the installation of ESS;
- transition from daily to hourly generation planning schedules;
- to use the geospatial distribution of RES through the RES Placement Plan as a tool for the System Operator to modernize networks;
- launch of the balancing electricity market;
- returning to practice of tariffs differentiated by hours of the day for wholesale and retail consumers, as the initial stage of the implementation of the demand management program (tariff increases during peak hours and decreases during failure hours);
- development of the auxiliary system services market.

It is also necessary to use infrastructure solutions to increase the system's capacity reserves with connection to existing and previously unavailable generation. And if the System Operator is focused on accepting such conditions for energy storage systems – this type of activity should form the basis of system services from renewable energy facilities (a separate business segment). At the same time, the System Operator must conclude separate contracts with renewable energy facilities in order for the ESS to participate in regulation at a separate tariff (different from the generation of electricity by renewable energy facilities) as a separate service.

Expressing the above position, the members of "Qazaq Green" noted the relevance and importance of the issue under

consideration, as well as their willingness to further discuss and develop the necessary solutions.

DEVELOPMENT OF LARGE-SCALE RENEWABLE ENERGY FACILITIES

To date, the most transparent mechanism for the implementation of large-scale renewable energy projects is auctions launched by the Ministry of Energy of the Republic of Kazakhstan in 2018. Over the past 4 years, 196 companies from 12 countries have participated in the auction, 1,705 MW of solar, wind, hydro-and bio-energy capacities have been announced at the auction.

However, it should be noted that due to the problems in the National Grid of the Republic of Kazakhstan, the volume of RES is decreasing from year to year. Thus, for example, in 2018 the volume of capacities at the auction amounted to 1,000 MW, of which for solar power plants – 290 MW, in 2019 the total volume – 255 MW, for solar stations – 80 MW, in 2020 the total volume – 250 MW, for solar stations – 55 MW, in 2021 – 200 MW, for solar stations – 20 MW.

In addition, the RES business community expressed the opinion that for the development of the sector it is necessary to have approved volumes of installed capacities for bidding for 2–3 years ahead. This is primarily necessary for budget planning in companies investing in the renewable energy industry. It's a known fact that large companies form the budget for the next year at the end of the previous year, there are regulations for its amendment. Currently, based on the current practice, the auction schedule is published several months before the auction with indication of terms and volumes of the auction.

In addition, the maximum prices for auctions are formed based on the results of the maximum prices of the winner of the previous auction. This practice, at the time, made it possible to reduce tariffs at renewable energy auctions for solar energy by 64% (34.61 tg/kWh to 12.49 tg/kWh), for wind energy by 38% (from 22.68 tg/kWh to 14.08 tg/kWh). Taking into account the fact that pricing at auctions is carried out in the national currency (for example, in Uzbekistan in US dollars), investors see large currency risks for participating in auctions in our country. At the same time, it should be noted that the existing tariff indexing mechanism is not viable.

Taking into account the low volumes at auctions, significant currency risks, it should be noted that recently there has been an outflow of business activity in the renewable energy sector, let alone the fact that our renewable energy market is not interesting for large global companies-investors in the renewable energy industry.

Today, in a situation where any generation of electricity is expensive for the country's energy system, and also, taking into account all our internationally declared goals and commitments, we believe that new incentives are needed for the development of the renewable energy sector, new signals are needed that are understandable to investors, and the elimination of accumulated problems that were discussed above.

INFORMATION
ON PRODUCTION OF ELECTRIC ENERGY
BY RES
FACILITIES FOR *2021*

Installed capacity **2010,32** MW, *Including*

Wind power plants
683,95 MW

Small HPP
280,98 MW

Solar power plants
1037,61 MW

Bio power plants
7,82 MW

Generation **4220,29** mln. kWh *including*

Wind power plants
1776,41 mln. kWh

Small HPP
799,74 mln. kWh

Solar power plants
1641,09 mln. kWh

Bio power plants
3,04 mln. kWh

The share of electricity generated by RES in the total volume of electricity generation **3,7%**

Compared to 2020, increase in RES electricity production in 2021 is **30%**

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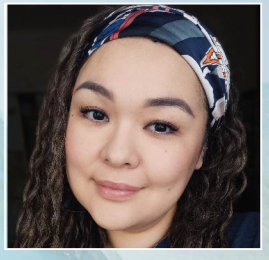

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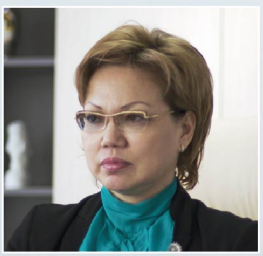

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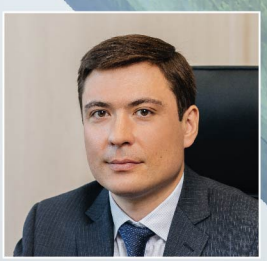

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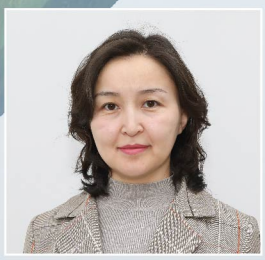

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MAIRA UTESHEVA

Manager for development of Eni branch in Kazakhstan

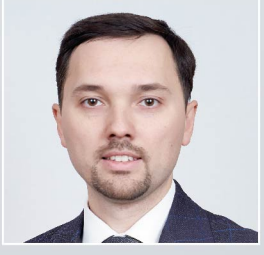
KALIYA KHISAMIDINOVA

Member of the Board of Directors, Qazaq Green RES Association

ILYA CHERNODAROV

Director for business development in Kazakhstan, Total Eren company

TIMUR SHALABAYEV



Executive Director, Qazaq Green RES Association

Qazaq Green magazine introduces regular column "Leaders of decarbonization and low-carbon development" which will present the rating of outstanding representatives in the field of alternative energy.

This rating is based on recommendations and criteria agreed and supported by such Kazakhstan Associations as KEA, KazEnergy, Qazaq Green, EcoJer, KazWaste, AREK, KANRUSD etc.

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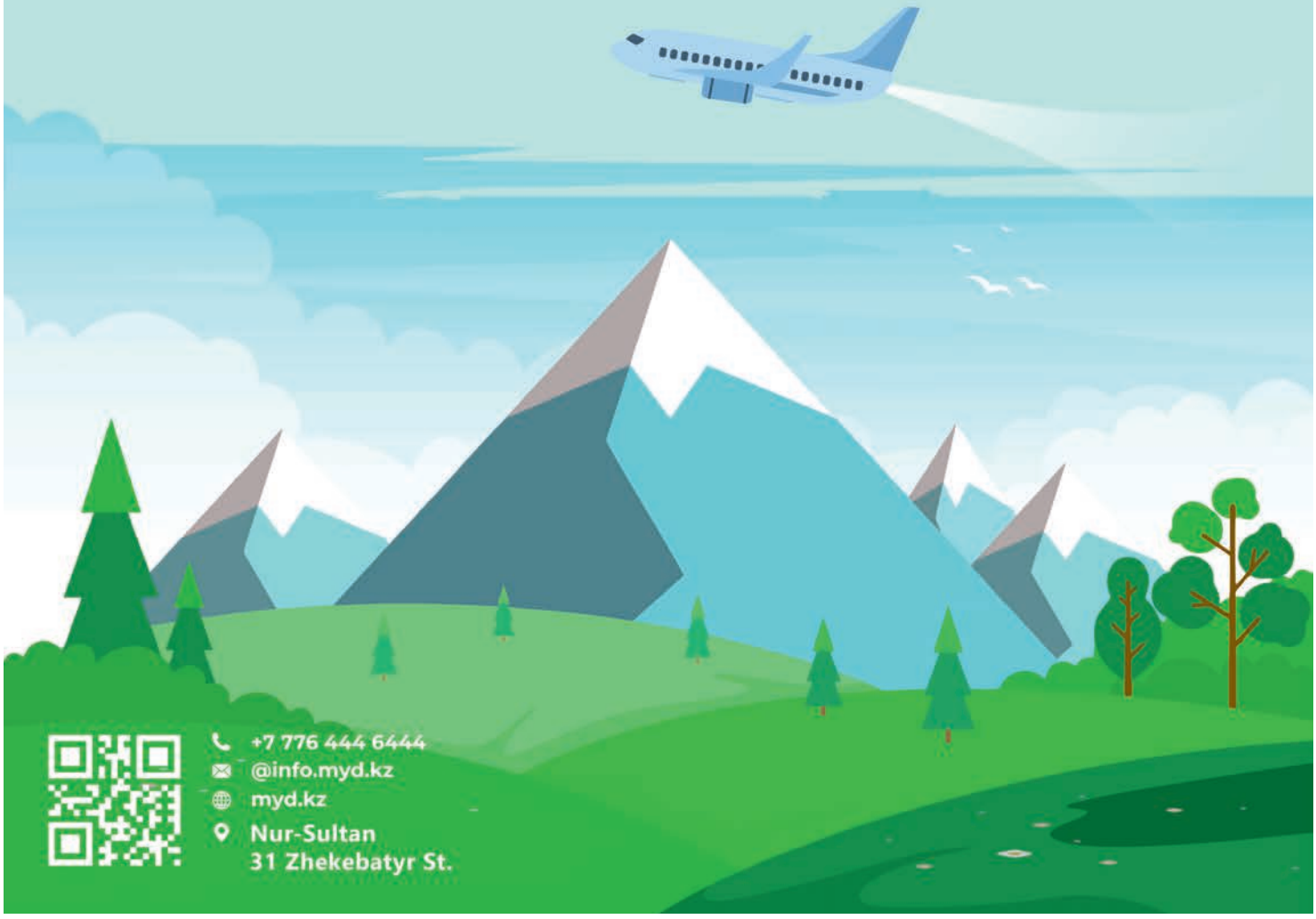

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INTERVIEW

Murat Rakhimzhanov:

Our company actually enhances **the prestige of Kazakhstani solar panels**

DOC Co. LTD LLP – a manufacturer of ALATAU brand cartridges in Kazakhstan, which have no analogues in CIS countries. The company is also the only domestic manufacturer of solar panels with a capacity of 4 MW per year. It is no coincidence that the company was recognized as the winner of the most prestigious national award "Altyn Sapa". The general director Murat Rakhimzhanov tells about the path to victory, about the present day and the day of tomorrow of the enterprise in an interview with our correspondent.

– Murat Kusmanovich, please tell us how you got into business, how it all started?

– My way into business began with friend's offer to sell one computer to Zaisan, as well as install softwares and train a state farm accountant in software. I agreed, because I born in Ainabulak settlement, Zaisan area. In 1987, I enrolled in the Faculty of Electronic Computer Engineering of the Kazakh National Technical Institute and graduated in 1993 with a degree in "system engineer". Already in my second year, I wrote software applications, and then participated in the development of logic programs for modeling artificial intelligence.

In 1991, I opened a small business and began selling computers, as well as installing local area networks. Business was going well until our servicing bank was closed. All accounts were frozen, we were able to get the money only a year later, already devalued a thousand times. The first fry turned out to be a washout. However, the failure did not break us.

DOC Co.LTD LLP was founded in August 2004. The founder and employees of the company were IT industry professionals, graduates of the Faculty of Electronic Computing of KazNTU. The company has rapidly gained its niche in the supply of computers, office equipment, cartridges to the Kazakh market, as well as in the

provision of services for installation of structured cable networks and PBX.

– How did the idea of cartridge production come about?

– It's one thing to resell someone else's products, but entirely different thing to establish own production. In 2010, I set a goal: to organize the production of cartridges under the Kazakh brand in the country for import substitution and creation of new jobs.

To do this, from 2010 to 2011, I with my family lived and worked at one of the innovative cartridge factories in Shenzhen (China). I started from the positionofunskilled worker and worked my way up to a production technologist.

In 2011, I purchased the full technological cycle of cartridge production from Chinese partners for 10 thousand USD. Four engineers of the company have also been trained at factories in China. And already in 2012, a workshop for the production of cartridges under ALATAU brand was opened in Almaty on the territory of SEZ "Information Technology Park" with a capacity of 12,000 pieces per year.

The workshop was running in the black, and in 2014, in order to expand the production, the company acquired a production facility on the territory of a meat processing plant with an area of 900 sq. m. Purchase of new equipment allowed increasing the production of cartridges to 50,000 pieces per year.

In 2017, DOC Co. LTD built and commissioned a new 3,400 sq.m cartridge manufacturing plant in record time on the territory of the Industrial zone of Almaty. More than 700 million tenge of own funds were invested in its construction and purchase of equipment and 35 jobs were created. Today, the plant produces 150,000 cartridges per year.

Since 2019, a mechanical workshop for the production of molds (matrices) for plastic and light-alloy metals has been opened, equipped with modern CNC

The workshop was running in the black, and in 2014, in order to expand the production, the company acquired a production facility on the territory of a meat processing plant with an area of 900 sq. m. Purchase of new equipment allowed increasing the production of cartridges to 50,000 pieces per year.

machines manufactured in the USA, Taiwan, and China, and five additional jobs have been created.

– Did you manage to achieve quality and enter international sales markets?

– The company operates in accordance with international standards and has a quality management certificate ST RK ISO 9001-2016 No. KZ.7500053.07.03.00431 and an environmental management certificate ST RK ISO 14001-2016 No. KZ.7500053.07.03.00432.

In order to produce high quality cartridges, test and laboratory equipment was purchased. For example, today we control the print quality (print density and background) using Japanese Ihara densitometer device, according to the methodology of STMC testing standard.

The page yield is calculated according to the standards ST RK ISO/IEC 19752-2018 and ISO/FEM 19798.

The print quality of the cartridge when exposed to low and high temperatures, as well as at high humidity, is checked using "Climate Camera" equipment.

The cartridge tightness control is carried out using special vacuum device. Vibration stand is used for determination of integrity of the cartridge during transportation.

As a result, LLP produces high quality products with a one-year warranty. The defective cartridge is changed promptly in the shortest possible time.

Our products have already been successfully exported to Russia and Belarus.

– Why did you make a "sharp turn" towards the production of solar panels? After all, these are completely different things – cartridges and solar panels…

– The fact is that I not only constantly improve my own knowledge, but also study market trends. One day I noticed the increased demand for a "green" economy in the country. Therefore, I decided to open a workshop for the production of solar panels on the territory of SEZ "Park of Innovative Technologies" in 2017.

In September – October 2021, a marketing analysis of the US solar panel market was conducted. With the assistance of the Embassy of the Republic of Kazakhstan, offline meetings were organized and agreements were reached with distributors and online stores selling solar panels. In July 2022, I plan to go to the USA and sign contracts for the supply of solar panels to the USA.

In February 2022, offline meetings were held in Europe with Spanish, German and Italian manufacturers of solar panel equipment. Agreements were reached on the configuration and supply of equipment.

An agreement was signed with SEZ Park of Innovative Technologies for allocation of 2 hectares of land

The fact is that I not only constantly improve my own knowledge, but also study market trends.

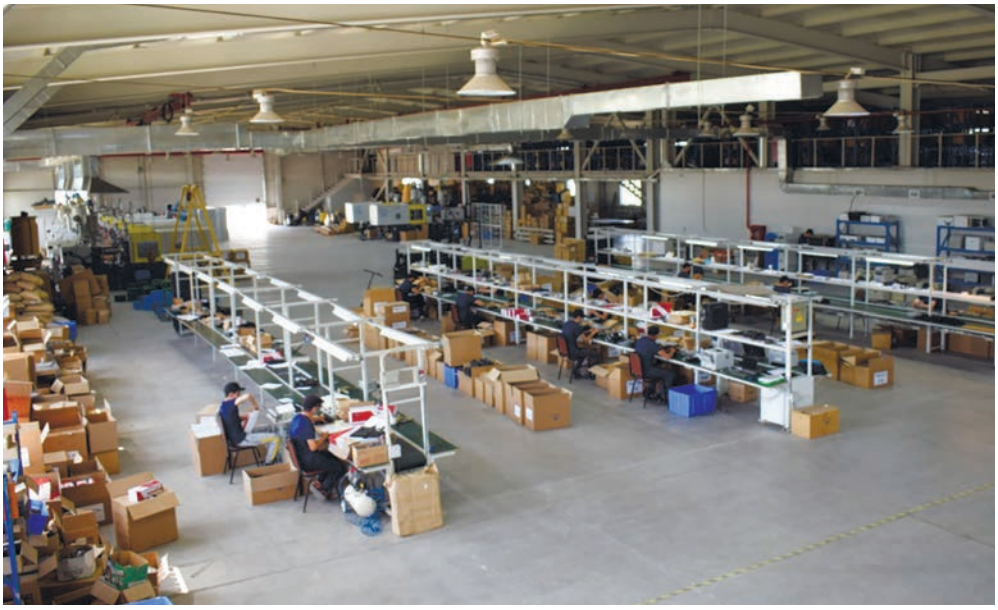
for the construction of a solar panel plant.

The cost of the plant for production of solar panels with a capacity of 200 MW per year is about 2.4 billion KZT.

Today, the development of design and estimate documentation for the construction of the plant on the territory of the SEZ "Park of Innovative Technologies" is underway.

By prior agreement with American partners, all products manufactured by DOC Co. LTD LLP in the amount of 200 MW per year – solar panels will be exported to the USA after receiving the Underwriter Laboratories certificate. The amount of sales of solar panels will be more than $80 million per year.

Work will also be carried out to improve the technology of production of cartridges, plastic products.



– Murat Kusmanovich, man cannot live by bread alone. It is known that you are actively involved in public life, in charity events. How do you manage to find time for everything?

– I have never, since I was a teenager, shied away from social events. In December 1986, after being discharged from service in the Soviet Army, I participated in the famous December events in Alma-Ata. In 1989, together with students of KazGU, medical and polytechnic institutes, I organized the youth movement "Akikat", constantly participated in rallies and meetings initiated by O. Suleimenov and M. Shakhanov. We unloaded the wagons and transferred the proceeds to support the Nevada – Semey movement.

Many people think that the modern leader lives only for one thing: to get more profit. This is far from being the case. Having organized my own business, answering the call of my heart, I participate in many donor and charity events of both urban and republican significance, and also regularly help members of my team solve various financial problems. Even in the current economic difficulties, I find opportunities to continue the company's activities with minimal losses, including keeping all my jobs. For me, the main value of the company is responsibility, mutual understanding in the team and national spirit.

Our company, in fact, not in word, enhances the prestige of Kazakh products not only in the domestic market, but also in far and near abroad countries, creates new jobs for local youth.

Winning the award "Altyn Sapa" in the nomination "the best industrial enterprise" is another confirmation to this.

– Thank you for the interview and I wish you reach new levels of success!

Carbon units:
dynamics and potential

The Kyoto Protocol on the Reduction of Greenhouse Gas (GHG) Emissions laid the foundations for the transition to a "green" economy, introduced a mechanism for setting and trading quotas and determined its regulatory nature for the next years. One of the tools for transition to "green" economy are climate projects that involve measures either preventing, namely aimed at reducing GHG emissions, or compensating, i.e. the absorption of already realized GHG emissions, or combination of these measures. The results of such projects are expressed in carbon units, which represent the amount of emissions prevented or absorbed in tons of CO_2 equivalent.

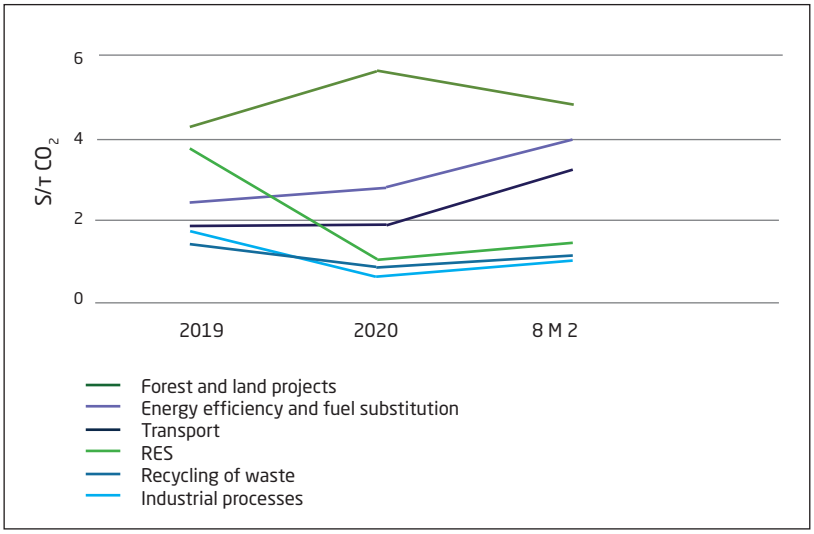
Viktor Kovalenko,
Partner, Head of the Practice of providing services in the field of climate change and sustainable development, Central Asia, Caucasus Countries, Ukraine

Anara Samambayeva,
Consultant of EY Services Practice in the field of sustainable development in Kazakhstan

There are two types of carbon unit markets: regulated and voluntary, where the seller is the party that underutilizes its pollution credit or implements a climate project, thereby generating carbon units; and the buyer is the party that wants to purchase these units to compensate for its own emissions or fulfill its pollution credit obligations. The main difference between a regulated market and a voluntary one is a top-down approach, where national goals for reducing emissions and/or achieving carbon neutrality dictate quotas for CO_2 emissions.

The reverse bottom-up approach is characteristic of the voluntary carbon units market, where issuers themselves seek to reduce their carbon footprint in order to fulfill corporate obligations to reduce climate impacts, improve the company's image, increase investment attractiveness, receive premiums for carbon-neutral products, or prepare for future offsetting of carbon units with the introduction of regulatory instruments for emission control.

Figure1. Change in prices for carbon units on the voluntary market depending on the direction of the project



Source: Ecosystem Marketplace

Another significant difference between the markets is the price of carbon. Thus, the average cost of carbon units in the voluntary market is 10 times lower than in the regulated one. Although there are many factors affecting the value formation according to 2020–2021 estimates, there is a general trend towards an increase in the price of carbon in voluntary markets. Therefore, for example, large issuers from the oil and gas sector proactively buy out entire climate projects in order to reduce the cost of buying individual units at higher prices in the future and get better compensation for their emissions.

Climate projects should be developed on the basis of four fundamental principles specified in the international standards for certification of climate projects (Table 1).

The most popular international standards for checking and confirming the effectiveness of the project (85% of the market) are the Verified Carbon Standard (VCS) and the Gold Standard (Gold Standard, GS). In 2010–2020, the dynamics of demand (+27%) for carbon units produced according to these standards, on average, outstrips the dynamics of supply (+23%).

The algorithm for trading carbon units on the voluntary market consists of the following main stages.

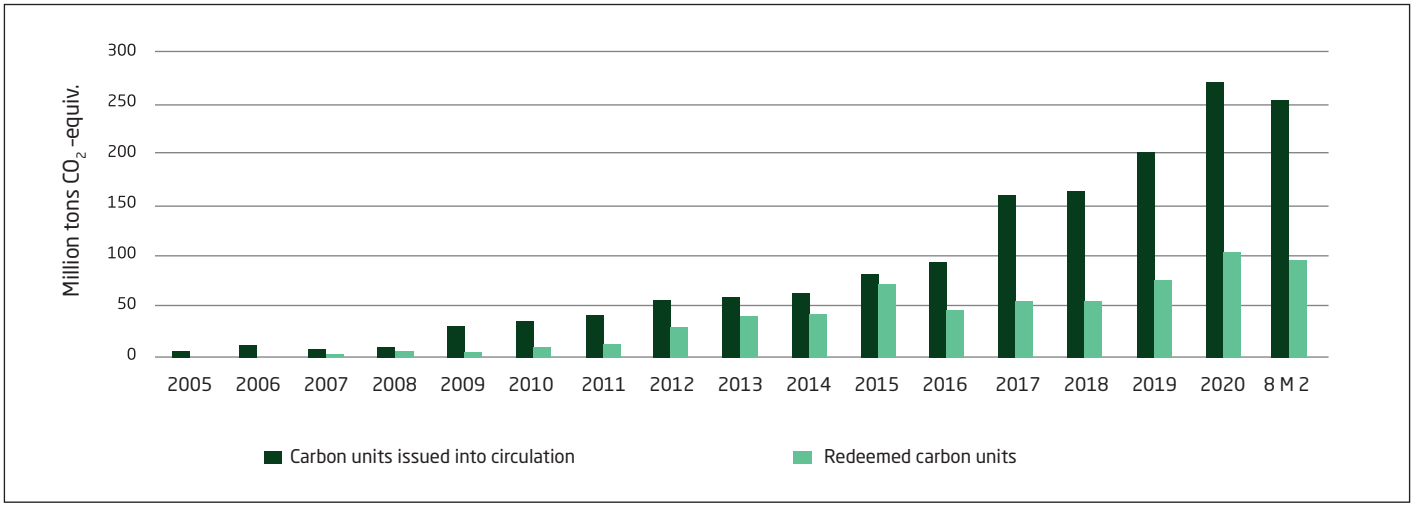
1. Explailning the idea of the climate project, taking into account the economic effect, associated risks, opinions of stakeholders.

2. Design of the project with a description of method used for monitoring and assessing the

Table 1. Basic principles of climate project development

Principle	Description
Complementary principle	Assumes the reduction or absorption of more emissions over a certain period of time than in the implementation of a scenario lacking the project. Moreover, it must be proved that the project would not have been implemented without additional financial resources attracted on the carbon market
Consistency principle	Shows that the project should not only ensure the absorption of emissions, but also prevent the subsequent return of carbon to the atmosphere (for example, forest projects need to prevent forest fires)
The principle of avoiding double counting	The amount of carbon units produced as a result of the project should be offset only once
The principle of preventing leakage	The implementation of the project should not lead to the fact that the source of emissions was transferred to another region

Figure 2. Number of carbon units issued in key international voluntary markets



Source: Ecosystem Marketplace

volume of reduced/absorbed GHG emissions, the accompanying environmental and social effect of the project, as well as evidence of compliance with the complementary principle.

3. Verification of the design of the project by independent experts to be able to proceed with its implementation, the so-called validation of the project.

4. Verification of the project by a third party after its implementation to verify the effectiveness of the project.

5. Release of a carbon unit in accordance with an international standard, registration in the register of carbon units and continued verification during the project implementation period.

6. Purchase of a carbon unit through specialized companies with further write-off from the register.

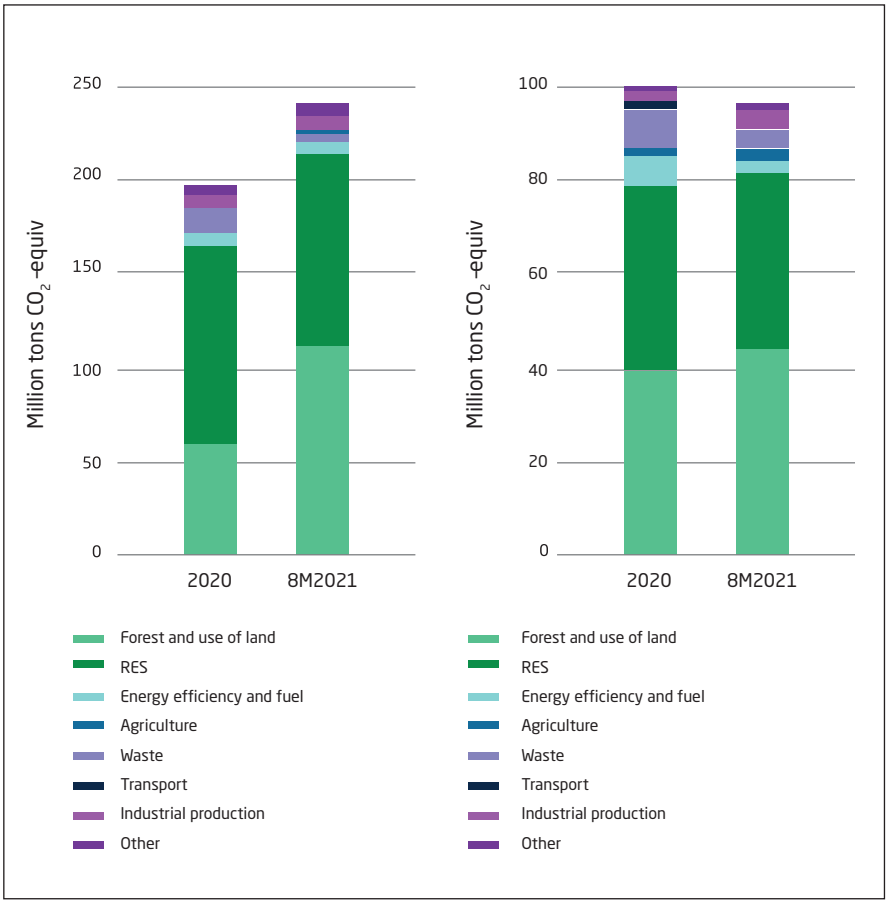
Depending on emission control legislation, voluntary carbon units may become part of existing or emerging CO_2 emissions trading systems, where they can be put into circulation in order to meet the established emission quotas. The focus of the project will be an important factor here. Both international and national voluntary carbon unit markets are dominated by climate projects in relation to forest and land resources, energy efficiency and renewable energy sources.

There is the potential to use carbon units to reduce the carbon tax as compensation for emissions. Thus, the results of climate projects verified according to VCS and GS standards are already counted by regulatory mechanisms when reducing taxes in Colombia and South Africa, CORSIA (scheme for compensation and reduction of carbon dioxide emissions for international aviation), and the mechanism for reducing emissions for oil and gas companies Upstream emissions reduction, which involves offsetting initiatives to reduce emissions during production of fuel.

The Federal Law of the Russian Federation "On Limiting Greenhouse Gas Emissions", which entered into force in 2021, has already fixed the concept of climate projects and laid the foundation for regulating emissions. The system of registration, accounting and offset of the results of climate projects is currently being developed, but the draft Decree of the Government of the Russian Federation dedicated to this indicates the possibility of implementing climate projects certified according to international standards (VCS, GS). Taking into account the results of the Sakhalin experiment, it is expected to create a regulated TES and a voluntary

Figure 3. Changes in the number and structure of carbon units released into circulation by project categories

Figure 4. Changes in the number and structure of implemented emission reductions by project categories



Source: Ecosystem Marketplace.

mechanism for trading carbon units at the national level. The implementation of climate projects will be accompanied by such support measures as tax incentives, "green" financing and industry-wide support for investment projects.

The climate agenda is becoming more and more relevant in Kazakhstan: there is an emissions trading system (KazTES), according to the Updated NDC of Kazakhstan and the Doctrine of Carbon Neutrality, it is planned to strengthen the regulation within the framework of KazTES and the introduction of carbon tax for non-quota sectors of the economy and sources of GHG emissions, it is planned to develop by-laws necessary for the full launch of regulated carbon market. Also, it should be kept in mind that many other planned investment projects aimed at upgrading production facilities and introducing the best available techniques (BAT) actually lead to a reduction in negative environmental impact and

EY has formed an international climate group consisting of experts, lawyers and tax specialists on climate issues, with access to the best practices on decarbonization in all countries where we conduct projects.

indirectly entail a reduction in greenhouse gas emissions.

To increase the opportunities for the successful implementation of Kazakhstan's climate projects, the following regulation is necessary:

• strengthening the national system for limiting greenhouse gas emissions and carbon units trading (KazTES);

• international regulation of the possibility of linking projects to cross-border carbon trading mechanisms / mechanisms of customs and economic unions;

• creating a wide range of national measures of state support and stimulation of climate projects and the introduction of BAT.

In the context of developing climate legislation of Kazakhstan and the seriousness of the consequences of the introduction of appropriate regulatory standards for the country's industry, careful study of each potential project with the involvement of climate experts, lawyers and tax specialists is necessary.

EY has formed an international climate group consisting of experts, lawyers and tax specialists on climate issues, with access to the best practices on decarbonization in all countries where we conduct projects.

Examples of implemented projects with our participation: analysis of the impact of carbon control (both national and international) on investment plans and components of the cost of production of industrial companies), inventory of greenhouse gas emissions and calculation of the carbon footprint of products, development of decarbonization programs for the company, structuring the sale of UER, international benchmarking of legislation on carbon farming and others.

The EY team is ready to provide comprehensive support for the search, preparation, implementation and monetization of climate projects, including:

• analysis of planned investment projects aimed at reducing the negative impact on the environment, for the possibility of implementing climate projects based on them, as well as "carbon testing" in relation to such projects;

• assistance in the implementation of internal carbon pricing approaches;

• analysis and selection of suitable applicable methodologies for implementation of climate projects;

• legal and tax structuring of climate projects taking into account potential markets for the implementation of carbon units;

• preparation of step-by-step map of the climate project implementation;

• analysis of carbon footprint of products and development of programs to reduce it;

• assistance in the preparation of proposals to improve Kazakhstan's climate legislation.

KEY INDICATORS
CONCEPTS FOR THE TRANSITION OF THE REPUBLIC OF KAZAKHSTAN TO A "GREEN" ECONOMY

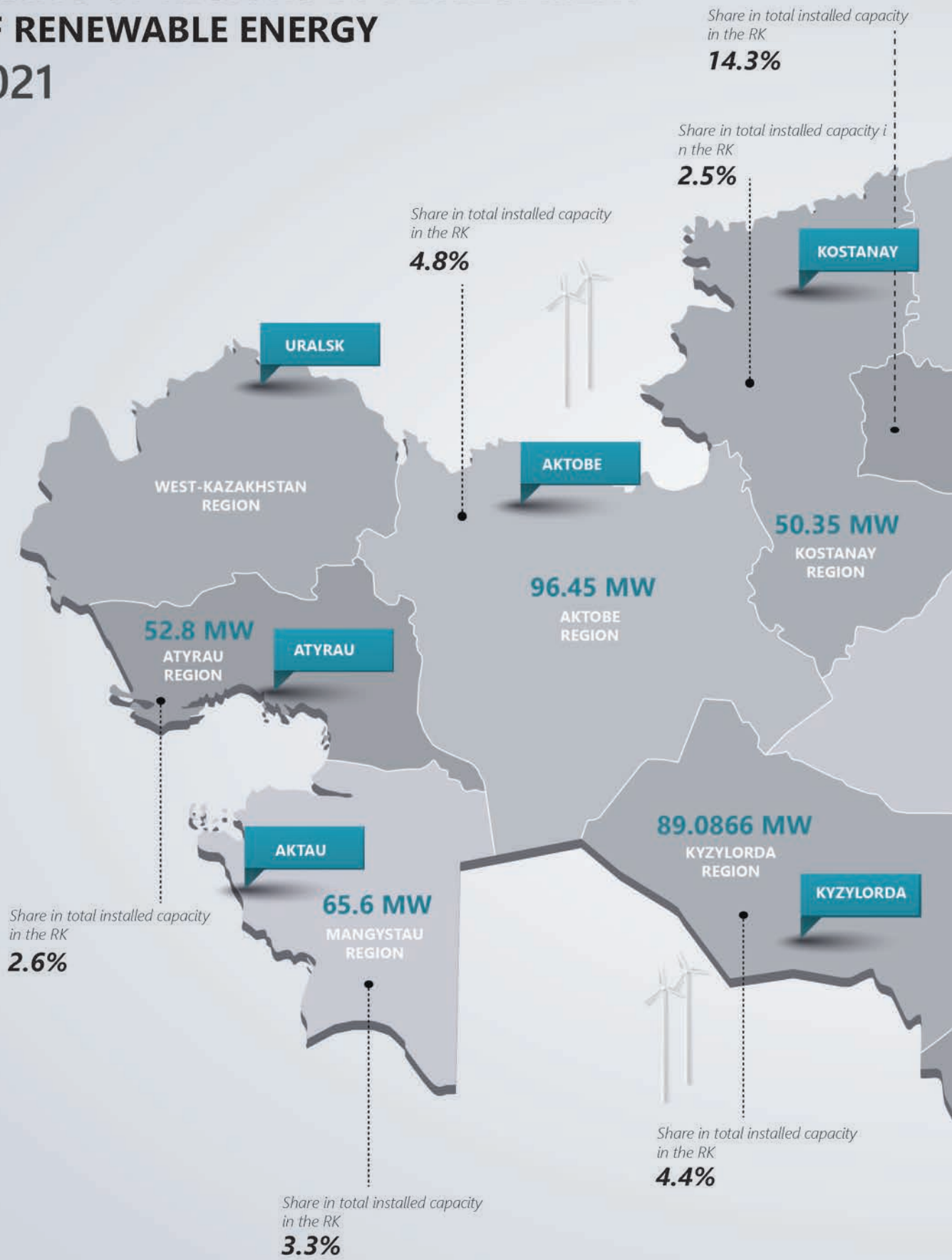
Sector	Goal description	2020	2030	2050
Water resources 	Eliminating water supply deficit at the national level	Provide water to the population	Provide water for agriculture (by 2040)	Solve water supply problems finally
	Elimination of water scarcity at the basin level	The fastest possible coverage of the deficit for the basins as a whole (by 2025)	No shortage for each basin	
Agricultural industry 	Labor productivity in agriculture	Three-fold magnification		
	Wheat yield (t/ha)	1.4	2.0	
	Water consumption for irrigation (m^3/t)	450	330	
Energy efficiency 	Decrease in the energy intensity of GDP from the level of 2008	25% (10% by 2015)	30%	50%
Electric power industry 	Share of alternative sources[1] in electricity generation	Solar and wind: at least 3% by 2020	30%	50%
	Share of gas-fired power plants in electricity generation	20%[2]	25%	30%
	Gasification of the regions	Akmola and Karaganda regions	Northern and Eastern regions	
	Reduction of the current level of carbon dioxide emissions in the electric power industry	Level of 2012	–15%	–40%
Air pollution 	Emissions of sulfur and nitrogen oxides into the environment		European emission level	
Waste disposal 	Covering the population with the removal of solid household waste		100%	
	Sanitary waste storage		95%	
	Percentage of recycled waste		40%	50%

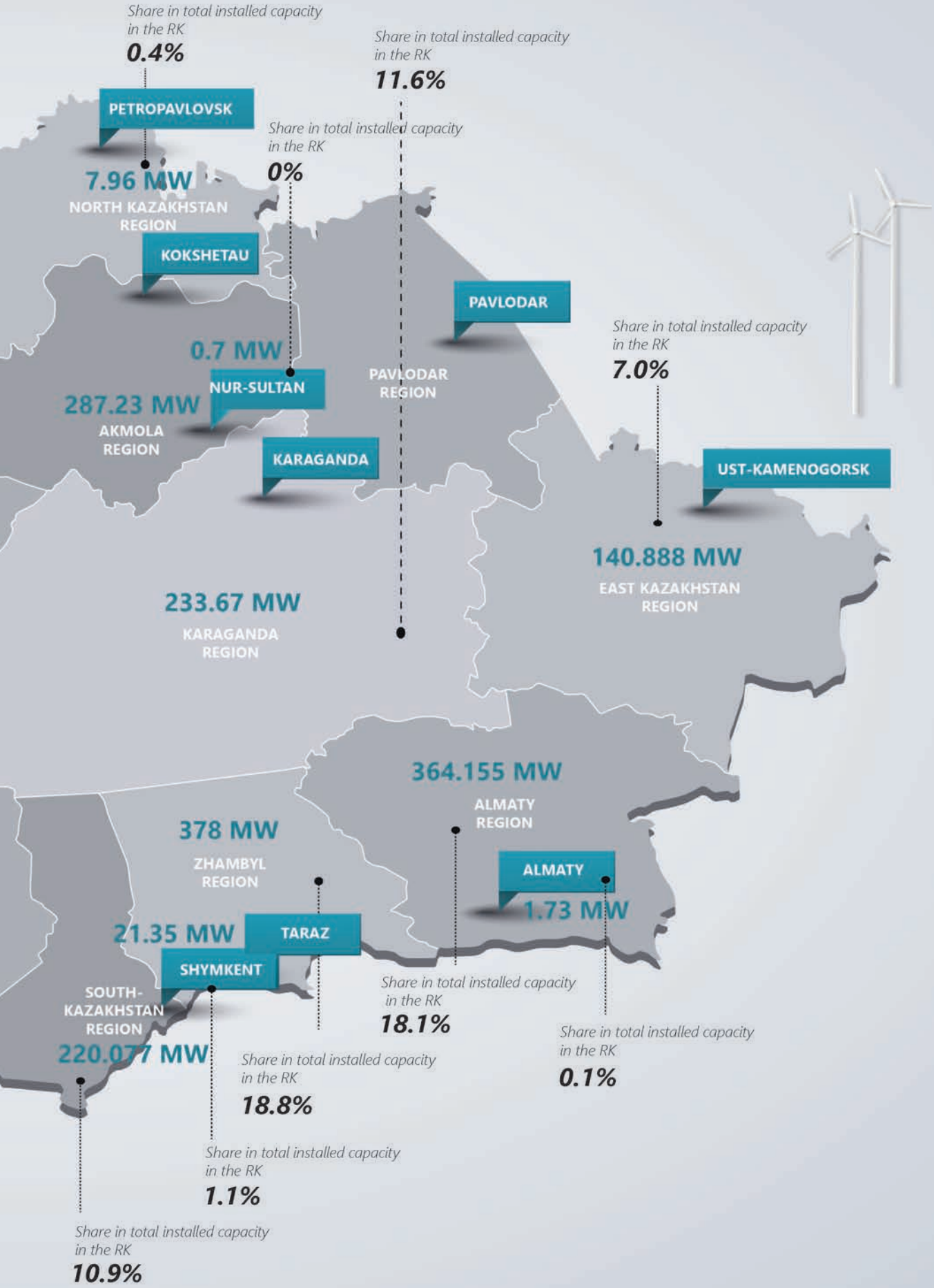
Source: Decree of the President of the Republic of Kazakhstan dated May 30, 2013. On the Concept for the transition of the Republic of Kazakhstan to a "green" economy.

[1] *Solar power plants, wind power plants, hydroelectric power plants, nuclear power plants.*
[2] *With the transfer in the largest cities of thermal power plants to gas, if there are available volumes of gas and an acceptable price for gas.*

RATING OF REGIONS BY DEVELOPMENT OF RENEWABLE ENERGY

2021




Share in total installed capacity in the RK
0.4%
PETROPAVLOVSK
7.96 MW
NORTH KAZAKHSTAN REGION
Share in total installed capacity in the RK
0%
KOKSHETAU
0.7 MW
NUR-SULTAN
287.23 MW
AKMOLA REGION
Share in total installed capacity in the RK
11.6%
PAVLODAR
PAVLODAR REGION
KARAGANDA
233.67 MW
KARAGANDA REGION
Share in total installed capacity in the RK
7.0%
UST-KAMENOGORSK
140.888 MW
EAST KAZAKHSTAN REGION
364.155 MW
ALMATY REGION
ALMATY
1.73 MW
Share in total installed capacity in the RK
0.1%
378 MW
ZHAMBYL REGION
21.35 MW
TARAZ
SHYMKENT
SOUTH-KAZAKHSTAN REGION
220.077 MW
Share in total installed capacity in the RK
18.1%
Share in total installed capacity in the RK
18.8%
Share in total installed capacity in the RK
1.1%
Share in total installed capacity in the RK
10.9%

7 BASIC PRINCIPLES OF THE NEW ENVIRONMENTAL CODE OF THE REPUBLIC OF KAZAKHSTAN

THE FIRST PRINCIPLE IS
THE POLLUTER PAYS AND CORRECTS

1. It implies pollution prevention and control measures, but also responsibility for recovery from environmental damage. Thus, the state should create such conditions under which it is more profitable for nature users to take measures to prevent negative impacts on the environment than to pay environmental fines. In a word, the mechanism of "prevention". In addition, the polluter who has caused environmental damage is obliged to restore the environment to its original level.

THE SECOND PRINCIPLE IS
NEW APPROACHES TO ENVIRONMENTAL IMPACT ASSESSMENT

2. According to the current Environmental Code, the requirement to pass the environmental impact assessment procedure (EIA) applies to almost all, that is, 19 thousand enterprises. Such an approach is ineffective and impractical. Therefore, the new Environmental Code proposes to apply this requirement only to 2.6 thousand enterprises of the "first category", which account for 80% of emissions. At the same time, the public participates in all stages of the EIA.

THE THIRD PRINCIPLE IS
THE INTRODUCTION OF THE BEST AVAILABLE TECHNOLOGIES (BAT) AND ECONOMIC INCENTIVES

3. To maximize the environmental situation, it is necessary to implement the best available technologies. For this purpose, industrial enterprises undergo a technological audit. They are offered technologies that will reduce emissions. Enterprises that have implemented BAT will be exempt from emission fees. If they do not switch to BAT, their emission fee rates will increase.

4. At present, the current legislation does not require spending on environmental protection measures of funds received from payments for emissions into the environment. Therefore, local executive bodies allocate from 0 to 400% for environmental protection, on average 45% only. The current situation with environmental payments and their spending has been repeatedly criticized by international experts. In this regard, the draft accompanying law provides for mandatory financing of environmental protection measures at the expense of incoming environmental payments in the amount of 100%.

5. In order to obtain timely and reliable information on the qualitative and quantitative composition of emissions and discharges, the draft Environmental Code provides for mandatory automation of industrial environmental monitoring with data transmission to the authorized body.

THE FIFTH PRINCIPLE IS
THE CREATION OF AN AUTOMATED EMISSION MONITORING SYSTEM

THE FOURTH PRINCIPLE IS
TO DIRECT THE PAYMENT FOR EMISSIONS TO ENVIRONMENTAL MEASURES

THE SEVENTH PRINCIPLE IS
TO IMPROVE THE MANAGEMENT OF PRODUCTION AND CONSUMPTION WASTE

THE SIXTH PRINCIPLE IS
TO STRENGTHEN ENVIRONMENTAL CONTROL

7. The draft of the new Environmental Code focuses on the implementation of the principles of circular economy used in the OECD countries. Within the framework of this project, a waste hierarchy is envisaged, which is aimed at step-by-step waste management, that is, a sequence of measures aimed at preventing the formation, reuse, recycling, and disposal of waste. In order to reduce the number of unauthorized landfills, licensing of the activities of enterprises engaged in the processing and disposal of waste, and a notification procedure for garbage collection organizations will be introduced.

6. The draft accompanying law proposes to amend the Entrepreneurial Code in terms of conducting inspections on facts directly affecting the living conditions of the population. These changes are aimed at rapid response to the facts of negative impact on the environment. The responsibility for environmental offenses is strengthened by increasing administrative fines by 10 times.

SOLAR FEST QAZAQSTAN

INTERNATIONAL BUSINESS FESTIVAL ON RENEWABLE ENERGY

Solar Fest Qazaqstan was supported by:

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АДС САПА

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ENERGY ECOLOGY ENGINEERING ТОО «Energy Ecology Engineering»

IMPLEMENTATION OF RENEWABLE ENERGY

I. Participation in the auction

1. Check the auction schedule

Order of the Minister of Energy of the Republic of Kazakhstan No. 202 of May 21, 2020 "On approval of the auction schedule for 2020"

2. Register at the website of KOREM JSC, conclude an agreement and undergo a training on the use of the trading system

- title documents *
- documents on the land plot
- documents on the connection point

* Foreign legal entities shall provide the equivalent documents with notarized translations of each document into the Kazakh and Russian languages

3. Financial guarantee for auction participation

- for auctions without documentation - 2000 KZT per 1 kW of installed capacity
- for auctions with documentation - 5000 KZT
- per 1 kW of installed capacity

4. Auction participation

- FSC provides envelopes with financial guarantee
- observers gather in the hall
- 30 minutes before the auction, the envelope is opened, and the data is entered into the system
- trading session opens (accepting and changing bids)
- trading session closes, auction results

5. Auction results

- auction winners
- auction prices
- volumes of selected capacity

II. Post-auction activities and project implementation

1. Inclusion in the RE Facilities Siting Plan and the List of Energy Producing Organizations Using RES

The Ministry of Energy of the Republic of Kazakhstan shall include the winners in the RE Facilities Siting Plan and the List of Energy Producing Organizations Using RES within 5 working days from the date of receipt of the Register of winners from the organizer

2. PPA conclusion

The winner submits an application for the conclusion of the PPA to the FSC within 60 calendar days from the date of inclusion in the List of Energy Producing Organizations using RES

3. PPA financial guarantee

The amount of financial guarantee of the fulfillment of the terms of the purchase agreement is 10,000 (ten thousand) KZT per 1 (one) kW of installed capacity

4. Project implementation terms (from the date of PPA conclusion)

- for SPP - 24 months
- for WPP and BioPP - 36 months
- for HPP- 48 months

5. Registration of land rights, design and survey works

- land plot selection
- obtaining the permit to use the land plot for design and survey works
- design and survey works (D&S)
- obtaining the land plot rights
- obtaining the water use rights (for HPP)

PROJECTS IN KAZAKHSTAN

6. Grid connection

- request to identify the closest connection point to the energy transmitting organization
- development of power generation scheme
- obtaining technical specifications for a connection to the electric grid
- approval of the power generation scheme by the system operator
- conclusion of an agreement on RE facility connection

7. Preliminary project procedures and design

- obtaining source materials to develop construction projects
- approval of schematic design with the construction authority
- development of project documentation (Feasibility study, Design and estimate documentation), approval, expert examination of DED by a design institute (state or private)
- installation and construction works

8. Environmental Permit

- environmental impact assessment (Ministry of Ecology)
- environmental emissions permit (egov.kz)

9. Investment preferences under Entrepreneurial Code

10. State registration of the right to a constructed renewable energy facility

- inclusion of identification and technical information on newly created immovable property in the information system of the legal cadastre (egov.kz)

III. Commissioning *

** SPP as an example*

1. The contractor notifies the customer of the facility's readiness for commissioning

2. The customer asks to provide (within 3 days):

- contractor -declaration of compliance
- technical and designer supervision - conclusion on the quality of the works performed
- technical supervisor- conclusion on the quality of the completed construction and installation works

3. Substation commissioning

Grid connection:
- Acceptance in Commercial Operation of Automated Commercial Energy Metering System (ACEMS) and registration in the ACEMS register
- signing contracts for system services with SO and REC
- compliance with technical conditions for grid connection
- notification of FSC about carrying out complex tests in set period
- successful completion of complex tests
- connecting the substation to the grid

Substation commissioning:
- signing of the commissioning act by the customer, general contractor, authorized technical supervisor
- registration of the act with the justice authorities
- registration of rights to immovable property
- creation of a facility's technical passport
- sending documents to FSC in the set period

4. Solar park commissioning

- signing of the commissioning act by the customer, general contractor, authorized technical supervisor
- registration of the act with the justice authorities
- registration of rights to immovable property
- creation of a facility's technical passport
- sending documents to FSC in the set period

The million-dollar question: indexation of tariffs for renewable energy projects

One of the significant risks for investors in renewable energy projects in Kazakhstan is the risk associated with the volatility of the national currency. Today, all auctions for renewable energy projects are held in the national currency. According to the current regulations, certain deadlines are established for construction of renewable energy facilities: for solar stations – 24 months, for wind stations – 36 months, for hydroelectric power plants – 60 months. Capital expenditures for construction of facilities by investors are spent during this period, while it should be noted that high-tech generating equipment is purchased abroad in foreign currency. To cover currency risks, the authorized state body uses the mechanism of tariff indexing. Unfortunately, today this mechanism does not cover the construction period of RES facilities, indexing begins after the project is put into operation.

For projects with credit obligations in foreign currency, auction prices are indexed once a year on October 1, taking into account inflation and changes in the exchange rate of the national currency to convertible currencies. At the same time, the indexation formula takes into account the 30% of impact of the consumer price index (inflation) and 70% of impact of the volatility of KZT/USD exchange rate. The average KZT/USD exchange rate is taken as a basis, calculated for the period of twelve months preceding the date of indexing, established by National Bank of the Republic of Kazakhstan.

Investors are constantly contacting "Qazaq Green" RES Association and note the fact that in fact the formula and the entire indexing mechanism does not cover the risks of investors. Especially this problem becomes relevant in the context of the geopolitical situation and turbulence in the currency markets, beyond the control of investors. In this regard, "Qazaq Green" RES Association, with the support of the Ministry of Energy of the Republic of Kazakhstan, conducted a survey among the players of the renewable energy market on possible options for improving the indexing mechanism, as well as existing problems faced by investors. The survey covered representatives of more than 50 organizations and companies: international financial institutions, national companies, domestic and foreign investors in the renewable energy sector. "Qazaq Green" RES Association presents the results of the survey.

At the beginning of the survey, Qazaq Green asked the players to give answers to the following questions.

A. What financial risks do you experience when implementing the project (for example, exchange rate volatility, lack of financing in the national currency, high loan rates, etc.)?

B. What are the main disadvantages of the current indexing mechanism?

C. How do these shortcomings of the indexing mechanism affect the financial stability of your project?

D. Are there any risks of project insolvency due to the lack of an indexing mechanism for the construction period?

E. Your suggestions for improving the indexing mechanism.

A. Ushurov, Development Director, Elcomtel LLP:
"Currency risks strongly affect all market participants".

Ye. U. Abubakirov, Deputy Director of Ak-su Kuat LLP:
"High loan rates and other bureaucracy".

Hsu Matthew, Head of Representative Office in Kazakhstan, Sungrow Renewables Development Co., Ltd., Director of Borey Energo LLP:

A. The biggest risk may be exchange rate volatility.

B. The current indexing mechanism cannot reflect actual exchange rate fluctuations, therefore it cannot cover the risk of a FOREX investor, since investors will use US dollars to purchase equipment during construction and will have to exchange tenge for US dollars during operation.

C. This can seriously affect the financial return of the project due to FOREX risks, such as the sharp depreciation of the tenge against the US dollar from the end of February 2022.

RESULTS OF A SURVEY OF RES BUSINESS COMMUNITY ON INDEXING AND MARGINAL AUCTION PRICES

1. Asian Development Bank
2. British Embassy, Trade Department
3. NC KazMunayGas JSC
4. Eurasian Resources Group, ERG
5. Samruk-Green Energy LLP
6. Total Eren Services Kazakhstan
7. Sungrow Renewables Development Co., Ltd.
8. Borey Energo LLP
9. HEVEL KAZAKHSTAN LLP
10. Kaz Green Tech Solar 1 LLP
11. KB Enterprises LLP
12. TechnoBazalt LLP
13. HEK-KT LLP
14. KZT Solar LLP
15. KapashagaiSolarPark LLP
16. First wind power station LLP
17. CP Zenchenko and K
18. Central Asian Renewable Energy Resources LLP
19. Elcomtel LLP
20. Eco Watt AKA LLP
21. Ak-su Kuat LLP
22. UNICASE
23. KPM Delta LLP
24. YUKSES 50 LLP
25. AlmatyEnergoProject LLP
26. EC ENERGY Qazaqstan LLP
27. ASPMK-519 LLP
28. Korinskaya HPP LLP
29. Agrofirma Kurma LLP
30. Energoinvest Ltd. LLP
31. NwComp-Solar
32. Energiya Alemi LLP
33. Hydro-Power LLP
34. Annar LLP
35. Nurly WPP LLP
36. Sarybulak WPP LLP
37. Sarybulak 2 WPP LLP
38. Kerbulak WPP LLP
39. Kerbulak 2 WPP LLP
40. Golden Energy Corp LLP
41. PF ElectroSetStroy LLP
42. Charsk Veter LLP
43. Wind Charsk LLP
44. WPP Charsk LLP
45. DES Consulting LLP
46. EastWindEnergy LLP
47. Ventum Energy LLP
48. Zheruyk Energo LLP
49. Engineering Arena LLP
50. Hyperborea LLP
51. KaDi Company LLP

D. Yes, I have. It will take about 4 years from the moment of signing the PPA to the first indexing in accordance with the current indexing mechanism.

V. Kashkarov, ASPMK-519 LLP:

A. Lack of long-term financing for a period of 7–10 years, lack of project financing providing for the use of future assets and cash flows for the project as collateral for the loan, high loan rates.

B. The current indexing mechanism has the following disadvantages:

- The tariff is not indexed during the design and implementation of CIW, i.e. by the time the facility is put into operation, the tariff becomes irrelevant and does not provide the required level of return on investment.
- The level and dynamics of the consumer price index (CPI) does not fully reflect the dynamics of changes in prices of industrial goods, works and services, as a result, tariff indexing may not be carried out in full.

C. Tariff indexing affects both the project payback parameters and the ability of the project initiator to provide loan servicing.

D. Yes. This is especially true for projects, implementation of which takes a long time (for example, the construction of hydroelectric power plants).

E. Indexing by the amount of exchange rate deviations, or switching to a fixed tariff pegged to a foreign currency with appropriate control of the validity of PPA and the payback period of the project.

M. A. Tukenov, Director of Korinskaya HPP LLP:

A. Lack of long-term financing (7 years or more), high loan rates.

B. The current indexing mechanism has the following disadvantages:

- The tariff is not indexed during the design and implementation of CIW, i.e. by the time the facility is put into operation, the tariff becomes irrelevant and does not provide the required level of return on investment.
- The CPI level does not fully reflect the dynamics of changes in prices of industrial goods, works and services, as a result, tariff indexing may not be carried out in full.

C. Tariff indexing directly affects the project payback parameters.

D. Absolutely, yes. This is especially true for hydraulic engineering projects due to a long-term of implementation.

S. Kaspakov, Head of biogas plant, Agrofirma Kurma LLP:

"It is necessary to raise the tariff for BioPP, since it is completely unprofitable to build such facilities."

A.V. Shkarupa, Energoinvest Ltd LLP:

A. Unambiguously low level of marginal RES tariffs, exchange rate volatility, high credit rates.

The existing indexation "fait accompli after 9 months" leads to losses of RES in the current period and often to the inability to fulfill obligations to banks due to the time lag and the significant influence of the exchange rate...

D. Definitely exist, since the main equipment is purchased for foreign currency and the delivery time from the moment of loan approval to the actual delivery can reach 12 months...

E. Set tariffs in US dollars.

M. Davreshev, Founder of NwComp-Solar:

"Exchange rate volatility, lack of financing in the national currency, high loan rates in the national currency".

R. Raisov, Director of Hydro-Power LLP:

A. Exchange rate volatility, high interest rates on the loan, the difficulty of obtaining a loan for a long time, no repayment holidays before the launch of the project.

B. Different tariffs – for different types of power plants and their indexing.

C. Increase in the payback period of the project.

D. Yes.

E. Creation of the same market conditions for all types of power plants, a single tariff and a single method of their indexing.

Omasheva A., Director, "Annar" LLP, "WPP Nurly" LLP, "WPP Sarybulak" LLP, "WPP Sarybulak 2" LLP, "WPP Kerbulak" LLP, "WPP Kerbulak 2" LLP, "Golden Energy Corp" LLP, "PF Electrosetstroy" LLP, "Charsk Veter" LLP, "Wind Charsk" LLP, "WPP Charsk" LLP, "DES Consulting" LLP, "EastWindEnergy" LLP, "Ventum Energy" LLP, "Zheruyk Energo" LLP:

"We see big risks in the volatility of the exchange rate because we buy equipment in foreign currency, and there is also a shortage of equipment, which leads to higher prices. Our suggestion is that any project at any stage of the project should be indexed. We, as a group of companies, unfortunately, have already terminated contracts with SFC of RE LLP for 2 HPP projects with tariffs of 15 KZT because the projects today are economically unprofitable, because of this we lost the funds that were provided for the issuance of guarantees".

S. Agafonov, Head of SM, First Wind power Station LLP:

"Increase in capital costs, as equipment and spare parts are imported and directly depend on KZT in relation to foreign currencies".

I. Chernodarov, Executive Director of Total Eren Services Kazakhstan:

A. The main risks are the volatility of the national currency, which, in turn, affects the high interest rates on loans in tenge and their insignificant volumes.

B. The main drawback of the current auction price indexation formula is the use of the average rate when calculating the exchange rate change. This approach is absolutely not objective and distorts the result of indexing.

C. Specified above.

D. Given the current instability of the economic situation, the lack of indexation for the construction period clearly increases the risk of project insolvency.

E. The indexing mechanism influences the decision-making when calculating the optimal price when participating in an auction. All the risks of project insolvency as a result of biased indexing lead either to a higher auction price, or to the non-implementation of projects that won the auction as a result of price dumping, which does not allow eventually achieving the targets for the development of renewable energy.

In this regard, we believe that it is necessary to adopt a mechanism for indexing the tariff for the construction period and adjusting the current formula regarding the application of the rate at the end of the period (not the average for the period), as well as to provide for the possibility of quarterly indexing.

A. B. Abylkalikov, Deputy Director for the energy market of HEVEL KAZAKHSTAN LLP, authorized representative of KapashagaiSolarPark LLP, TechnoBazalt LLP, KZT Solar LLP, HEK-KT LLP, Kaz Green Tech Solar 1 LLP, KB Enterprises LLP:

A. Exchange rate volatility, lack of financing in the national currency at low loan rates.

B. The difference in the exchange rate from the date of the auction (investment decision) and the date of commissioning of the facility (the period of actual investment in the project) is not taken into account; A sharp change in the base rate of the National Bank of the Republic of Kazakhstan is not taken into account.

C. The risk of critical decrease in the profitability of the project (up to its unprofitability), and, accordingly, increased rates for attracting project financing (at the time of attracting financing) and sharp increase in the credit rate in the event of a sharp increase in the base rate of the National Bank of the Republic of Kazakhstan.

D. Exist, since all loans for the implementation of projects are issued in foreign currency.

E. Introduce the price adjustment under the contract, taking into account the change in KZT/USD exchange rate. In case of a sharp decrease in KZT value to USD value (more than 10% in a calendar month) – provide for price indexing within 1 month after such a decrease.

The possibility of choosing the indexing method annually.

The maximum auction rate is determined according to the maximum rate of the last auction, taking into account the indexation at the exchange rate for this period.

D. V. Zaitsev, General Director, AlmatyEnergoProject LLP, Engineering Arena LLP, KaDi Company LLP, Hyperborea LLP:

A. After the auction in November 2021, there was a significant change in macroeconomic conditions in terms of a decrease in the tenge exchange rate, an increase in the cost of financing and the availability of financing on the international market. In fact, all financial risks were realized at the same time to an extreme extent.

In addition, renewable energy projects of significant capacity do not fall under the criteria of key state support programs (DAMU, Baiterek).

B. **Firstly**, there is no indexation of the tariff during the investment period of the project. Taking into account the fact that the auction tariff is fixed in tenge, and the investment cost of the project is almost completely denominated in hard world currencies, the depreciation of the tenge in the investment phase leads to an imbalance between the tariff and the amount of capital expenditures. Thus, with a sharp decline in the tenge exchange rate, projects that are in the investment phase become difficult to implement.

C. **Secondly**, there is a disadvantage in the current tariff indexation formula in the operational phase in peg to KZT/USD exchange rate, which consists in comparing the exchange rate on the date (October 1) to the average rate for the previous 12 months – this entails risks that, under certain conditions, the tariff indexation may lag behind the actual depreciation (for example, if the exchange rate dropped significantly immediately after October 1). This disadvantage prevents the widespread attraction of financing in foreign currencies, since investors and banks do not see full protection from exchange rate shocks in the current formula.

Third, the indexing formula implicitly implies that costs denominated in US dollars do not increase over time. At the same time, in fact, the cost of maintenance and repair of equipment by suppliers in practice is fixed in dollars/euros and is subject to indexing to

the inflation rate in the US/EU, respectively. In the context of increasing global inflation, this also leads to an imbalance between the tariff level and the investor's costs in renewable energy.

D. Yes, significant.

E. Introduction of tariff indexation from the auction period to the commissioning period – for the actual change in the KZT/USD exchange rate.

From the date of commercial operation – introduction of two indexing options for the investor's choice:

- quarterly indexation of the tariff at KZT/USD exchange rate with annual additional indexation for the level of dollar inflation;
- application of coefficient to the tariff reflecting the change in the current base rate of the National Bank of the Republic of Kazakhstan relative to the value on the date of the auction.

The modified indexing mechanism should be applied to all projects selected at auctions after January 1, 2021 (to be able to implement these projects, taking into account sudden unforeseen changes in macroeconomic conditions).

Question 1

At the moment, the Ministry of Energy of the Republic of Kazakhstan proposes to apply the following measures in terms of indexing renewable energy tariffs: increase the rate of tariff indexation in relation to the change in KZT/USD exchange rate from the current 70 to 100%, while rejecting the annual indexation of the tariff by the inflation rate in this formula (the 30% peg to the CPI is canceled). At the same time, when signing the PPA contract, it is assumed that it is possible to choose either the above formula with peg to the currency, or the existing indexing formula with peg to the CPI. Which indexing option would you prefer?

● 100% peg to change in CIP
● 100% peg to exchange difference

● 100% peg to the change in the consumer price index (inflation)? Formula: $T_t+1 = T_t * CPI$, where T_t+1 is the indexed auction price calculated according to the above formula, rounded down to whole tiyns; T_t is the auction price taking into account the previously conducted indexing; CPI_t is the consumer price index accumulated over the twelve months preceding October 1 of the year of indexing, determined according to the data of the state statistics authorized body.

● 100% peg to the change in KZT/USD exchange rate? Formula:

$$T_{t+1} = T_t \times (1 + \frac{(USD_{t+1} - USD_t)}{USD_t})$$

where T_t+1 is the indexed auction price calculated according to the above formula, rounded down to whole tiyns; T_t is the auction price taking into account the previously conducted indexing; USD_t+1 is the current KZT/USD exchange rate effective on October 1 of the year of indexing, established by the National Bank of the Republic of Kazakhstan; USD_t is KZT/USD exchange rate as of October 1 of the previous year, established by National Bank of the Republic of Kazakhstan.

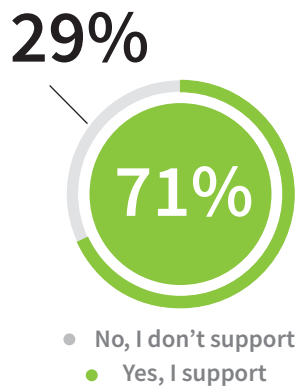
Question 2

As it is known, according to the current indexing standards for projects with credit obligations in foreign currency, auction prices are indexed once a year on October 1, taking into account inflation and changes in the exchange rate of the national currency to convertible currencies. At the same time, the average KZT/USD exchange

rate is taken as a basis, calculated for the period of 12 months preceding the date of indexing, established by National Bank of the Republic of Kazakhstan. The Ministry of Energy of the Republic of Kazakhstan proposes to adopt a rate which takes the exchange rate of the day of the previous year (October 1 of the previous year) and the day of the current year (October 1 of the current year), in which the indexation is calculated. Do you support this proposal?

Question 3

The preference for peg to changes in the level of inflation or the KZT/USD exchange rate depends on the currency of the loan of the company implementing the renewable energy project. At the same time, during the life cycle of the project, conditions may occur under which pegging to the dollar exchange rate will be preferable at the early stages of the project (for example, during the construction period), and then, for example, after the delivery of the facility, pegging to inflation will be more preferable. Do you support an option which provides the company implementing a renewable energy project with the opportunity to change the indexing peg 1 time during the life cycle (the validity period of the PPA contract) of the project?



Question 4

"Qazaq Green" RES Association has recently been receiving appeals on the risks of investors during the construction period on a regular basis. As it is known, at the moment, the indexing mechanism does not affect this part of the project lifecycle. Which of the options would be preferable for you?

- Indexing 1 year after the auction according to the current formula.
- Following the auction, fix the auction price in US dollar cents (at the exchange rate effective on the date of the auction) and receive payments for construction period at KZT/USD rate, and after commissioning switch to the tenge tariff and receive indexation pegged to inflation or exchange rate difference.

Question 5

The Ministry of Energy of the Republic of Kazakhstan is working on the development of the Auction Schedule. It is expected that the power output will be in the ratio of wind power – 80%, SPP – 20% (for every 1 MW of solar energy – 4 MW of wind energy). At the same time, a number of technical requirements will be imposed on the WPP and SPP projects, including the equipment of energy storage systems. Thus, at the first stage, it is proposed to use an energy storage system with a capacity of at least 20% of the installed capacity of WPP/SPP and capacity sufficient for the full output of storage capacity during two hours. It is proposed to determine the maximum auction prices for WPP and SPP at a fixed tariff for SPP – 34.61 tg/kWh, for HPP (according to UNICASE) – 41.23 tg/kWh, for BioES at the current tariff – 32.15 tg/kWh. Do you agree with this level of marginal auction prices?

SURVEY RESULTS

The results of the survey identified a range of major problems related to currency and investment risks:

- High volatility of the national currency due to geopolitical factors beyond the control of the investor (force majeure).
- The current indexing mechanism does not cover investors' risks, the level and dynamics of the consumer price index (CPI) does not fully reflect the dynamics of changes in prices of industrial goods, works and services, the application of the average annual rate distorts the results of indexing.
- There is no practice of indexing for the construction period, whereas capital expenditures are spent during this period.
- Lack of long-term financing.
- High interest rates on loans.

According to the RES market players, the following measures may be potential solutions:

- At the time of the auction, record their results in US cents and make payments and indexation in the national currency based on the current KZT/USD exchange rate of the National Bank of the Republic of Kazakhstan.
- To carry out indexing for the period of construction of the renewable energy facility.
- Provide companies with the opportunity to choose the indexing method (pegging to the CPI or to the exchange rate difference) before conducting the next annual indexation. This choice should be based on the currency structure of the project financing.
- Despite the fact that 89% of respondents supported the issue of indexing taking into account specific dates (October 1 of the previous and current year), according to experts, there are risks that this approach will not take into account fluctuations in the exchange rate during the year. Some survey participants also note that quarterly indexing will also not cover all currency risks, especially during the construction period. Substantiating calculations are needed in this matter. All survey participants supported the need to peg the tariff to US cents.
- It is necessary to introduce the practice of open marginal auction prices, including for projects with energy storage systems. The application of marginal auction prices should take into account the change in the exchange rate.
- We need a program for long-term returnable financing (15–20 years) with low interest rates (3–4%) for renewable energy and maneuverable capacities through domestic development institutions.
- Low marginal auction tariffs, including the irrelevance of fixed tariffs used for the first auctions of 2018, including due to changes in KZT/USD exchange rate from 2018.

PLATFORM FOR NATIONAL AND INTERNATIONAL PLAYERS IN RENEWABLE ENERGY SOURCES

QAZAQ GREEN Association

ASSOCIATION AS INFORMATIONAL RESOURCE

The Association is a resource that will allow members of the Association to receive information about changes in legislation immediately.

Association is a resource that creates public opinion, and also contributes to the promotion of renewable energy. It will allow you to form a positive image around an event in the activities of both a member of the Association and the Association itself.

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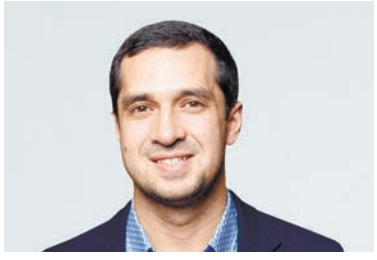
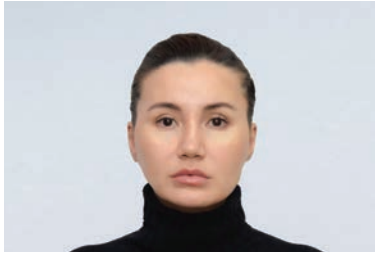
Independent Director



ARTYOM SLESARENKO
Independent Director



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Executive Director

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The Representative Office of the Foundation in Kazakhstan began its work in 2007 at the invitation of the Government of the Republic of Kazakhstan. The Foundation works in partnership with government agencies, the Parliament of the Republic of Kazakhstan, civil society organizations, universities, political parties and enterprises.

The main purpose of the Foundation's activities in the Republic of Kazakhstan is to strengthen mutual understanding and partnership between the Federal Republic of Germany and the Republic of Kazakhstan through cooperation in the field of political, educational, social, cultural and economic development, thus contributing to the further development and prosperity of Kazakhstan.

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