Implementation of the New Climate Policy

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Abstract. In addition to public policies, the availability or availability of new clean energy technologies will be critical to the transition to resource efficiency and sustainable development. Some clean energy technologies in our country have already been widely used or are under research and development. In Russia and in the world, there is also a high level of readiness for technologies for enhanced oil recovery by injection of carbon dioxide into the reservoir, technologies for hydrostorage of electric energy, the use of hydro- and geothermal energy, and energy-saving lighting. Technologies that are already widespread in world markets, but not yet in Russia, include energy-efficient solutions for the processing of copper and copper-bearing raw materials, carbon capture in the production of ammonia, fluidized bed boilers for biomass combustion (for thermal energy production), lithium-ion batteries for various modes of transport, the use of ammonia and hydrogen as a fuel in transport, hot water storage systems for households, building technologies that reduce the energy consumption of buildings.

1 Introduction

In order to achieve national environmental goals and the goals of the Paris Agreement, as well as to solve the problems of radically increasing the resource efficiency of the Russian economy, it is necessary to implement a set of measures to accelerate Russia's transition to clean energy. The country already has a good start in this area due to the high proportion of large hydroelectric power plants, nuclear power plants and efficient gas-fired thermal power plants [1]. Along with achieving climate goals, the transition to low-carbon energy technologies will increase energy security and technological independence, as well as reduce the negative effects on the health and quality of life of citizens. Even a partial replacement of diesel fuel with renewable energy sources in the polar regions, where northern delivery is carried out, will significantly reduce energy supply costs. However, the preservation of the existing energy policy or incremental changes will not allow us to solve the set tasks. In the coming years, subsidies for fossil fuels will need to be reduced or eliminated, especially against the backdrop of high prices for them on world markets. With the availability and accessibility of new technologies, a gradual abandonment of coal for domestic consumption is necessary, starting from 2026. The transition to a qualitatively different economic growth and structural transformation of the fuel and energy complex

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involves investment in research and development, own production and dissemination of technologies [2]:

- RES (including large hydroelectric power plants);
- lead-cooled nuclear reactors and 4th generation power plants (with a closed fuel cycle);
- carbon capture, storage and use for power plants and industrial processes;
- highly efficient thermal power plants running on natural gas;
- energy efficient solutions in the economy as a whole.

Priority should be given to the implementation of projects with the greatest social and economic impact, including those that will create new high-tech jobs and contribute to the technological transformation of the economy. Other selection criteria may be a high degree of localization of technologies and a minimum foreign exchange component in costs, a high export potential. Some solutions will require the creation and development of new infrastructure (eg hydrogen) [3]. To increase the financial attractiveness of new clean energy projects, it will be necessary to revise regulatory requirements (including the approval of lower risk ratios for loans taking into account the industry, maturities and customer rating) and reduce the required coefficients for calculating the reserve liabilities of credit institutions.

2 Research Methodology

The multifactor nature of climate change and the diversity of their consequences for the environment, sectors of the economy and the quality of life of the population determine the need to develop and implement systemic and coordinated adaptation measures, taking into account regional and sectoral specifics [4]. The climate and carbon agenda in the next few years should be integrated into the development strategies of the largest Russian companies in all sectors of the economy. It is necessary to qualitatively expand and adjust the set of measures for adaptation to climate change in the forestry (including reforestation practices) and agricultural sectors. It is necessary to develop national standards for the implementation of natural and climate projects, harmonized with existing and future international standards used in the global carbon markets. It is necessary to supplement the range of PKPs implemented in Russia (including within the framework of the taxonomy of green projects) with projects on voluntary forest conservation, watering wetlands, and make the list of project types open in the National Register of Climate Projects being developed [5]. It is necessary to remove regulatory and legal restrictions on the implementation of various types of natural and climatic projects (introduce leasing for the implementation of forest and climate projects as a new type of forest management, ensure the investor's ownership of the resulting emission reduction units, remove legal barriers to the implementation of LCP on unused agricultural land, etc. .d.). A coherent policy is needed to support various low-carbon agriculture practices (organic, adaptive, agro-ecological, etc.) [6]. It is necessary to integrate territorially differentiated assessments of vulnerability to climate change, as well as various types of natural and climatic solutions, into federal, regional and city strategic planning systems [7].

Climate policy is becoming one of the main components of the implementation of the green growth strategy and an instrument of competition. It is carried out most actively by developed countries [12]. In the study points to the fact that one of the key roles in shaping the international climate regime is played by the European Union (EU). The EU is currently moving at a steady pace towards achieving "climate neutrality" by 20505. At the end of 2020, European leaders agreed on a new, more ambitious goal to reduce greenhouse gas emissions. By 2030, greenhouse gas emissions should be reduced by at least 55% from 1990 levels, while the original target was 40% [6]. By 2050, the EU intends to phase out

fossil fuels and replace oil and natural gas with "decarbonized" gases, primarily hydrogen. The decarbonization of the EU energy system, including measures to improve energy efficiency, increase the share of energy consumption from renewable sources and create a fully integrated energy market, has a leading role in achieving the climate goals of 2030 and 2050 [8]. To do this, the EU is redirecting capital flows to climate projects, which has already led to concrete results. According to the annual report of the British think tank Ember and the German Agora Energiewende6, in 2020, for the first time in history, the share of renewable energy (38%) in energy generation in Europe exceeded the share of fossil fuels (37%). However, in 2021, European countries faced a shortage of electricity, which requires taking into account all the factors affecting the energy balance [9]. In the scientific literature, climate finance is one of the hottest topics at the present time and is being considered in a number of areas. Considerable attention is paid to the impact of climate-related risks on the cost of capital and companies' access to finance. For example, a group of Italian researchers [10] studied the relationship between carbon risk and the cost of borrowed capital based on the analysis of companies included in the Euro Stoxx 600 index, as a result of which they obtained interesting data. On average, a 100 basis point reduction in carbon intensity results in a 16 basis point decrease in the total cost of debt of large European companies. This allowed the authors to draw the following conclusions: (1) European financial markets now take into account the exposure of companies to carbon risks; (2) the cost of debt financing is related to the carbon intensity of companies. Another study in this area is of interest [11]. Its authors concluded that, on average, the cost of debt capital for companies in countries with high climate risks is higher compared to countries with low climate risks due to vulnerability to climate change. They point out that this fact has significant implications for the economic development of developing countries vulnerable to climate change. A number of studies reveal the impact of climate risks on the financial sector of the economy. The article [9] identifies two main channels for the impact of climate change on the financial system: the first channel is associated with material risks (damage to property, infrastructure and land), and the second channel is associated with transitional risks caused by changes in climate policy, technologies and market sentiment in the course of adaptation to a low-carbon economy. The study [8] highlights the growing awareness of transitional risks among the world's finance ministers, as evidenced by their joining an international coalition to advance climate action (The Coalition of Finance Ministers for Climate Action) through integrating climate change issues into financial policy. The article [10] notes the importance of government regulation in solving the problem of climate change, taking into account market failures.

3 Results and Discussions

In the scientific literature, climate finance is one of the hottest topics at the present time and is being considered in a number of areas. Considerable attention is paid to the impact of climate-related risks on the cost of capital and companies' access to finance. For example, a group of Italian researchers [8] studied the relationship between carbon risk and the cost of borrowed capital based on the analysis of companies included in the Euro Stoxx 600 index, as a result of which they obtained interesting data. On average, a 100 basis point reduction in carbon intensity results in a 16 basis point decrease in the total cost of debt of large European companies. This allowed the authors to draw the following conclusions: (1) European financial markets now take into account the exposure of companies to carbon risks; (2) the cost of debt financing is related to the carbon intensity of companies. Another study in this area is of interest [6]. Its authors concluded that, on average, the cost of debt capital for companies in countries with high climate risks is higher compared to countries with low climate risks due to vulnerability to climate change. They point out that this fact

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- improving energy efficiency, developing carbon-free energy (RES, NPPs, HPPs);
- application of carbon capture, storage and use technologies;
- radical reduction of methane emissions in the oil and gas and coal industries;
- transition to carbon-free modes of transport (transport using biofuels, hydrogen, electricity, environmentally friendly public transport);
- modernization and implementation of modern technologies in metallurgy, chemical and cement industries;
- improvement of forestry and agriculture methods, introduction of climate-oriented technologies and practices in them, which allow preventing carbon losses in forest biomass and soils, and provide additional carbon sequestration by ecosystems.

These measures will reduce the carbon footprint of key industries, including export-oriented industries, which are facing increasingly stringent carbon regulation and carbon pricing [15]. For example, the EU's cross-border carbon regulation mechanism provides for the introduction of fees for the carbon footprint of imported products, including metals, chemical fertilizers, ammonia, cement, and electricity. The total carbon footprint of Russian exports exceeds 2 billion tons of CO2, with most of it going to countries where carbon strict regulation exists or is planned, and carbon pricing initiatives are in place (for example, the EU, USA, Canada, Japan, China, South Korea). At the beginning of 2022, the price of carbon credits in the EU exceeded 90 EUR/tCO2 [13]. While most anthropogenic sources of greenhouse gases are considered in the development of scenarios, some natural sources of their release into the atmosphere remain poorly understood. Perhaps the most significant risks are associated with the consequences of climate change in the Arctic zone. The MVA and the Kara Sea contain more than 80% of all underwater permafrost on the planet, as well as planetary hydrocarbon reserves, including gas hydrates. At the same time, an amount of

methane enters the atmosphere from the MVA shelf, which is a multiple of the methane emission from the entire World Ocean [11-12]. A mixed (biogenic, thermogenic, and possibly abiogenic) origin of methane in MVA with an increase in the fraction of thermogenic methane in the direction from the coast to the continental slope has been proven. Further comprehensive study of this phenomenon is needed. As part of the implementation of the state scientific and technical policy in the field of environmental development of the Russian Federation and climate change (Decree of the President of the Russian Federation of February 8, 2021 No. 76), it is advisable to create a National Center for the Study of Climatic and Environmental Consequences of Permafrost Degradation, within the framework of which to study and quantify assess the MVA shelf (and the Kara Sea) as a source of methane in the present and near future. An important challenge is the development of representative predictive models that will form the basis for taking measures to adapt to the expected rapid climate change. New studies of feedbacks in the Arctic climate system may lead to a revision of the carbon budgets used as the basis for calculating allowable national CO2 emission allowances [13]. Forecasts and scenarios should also take into account significant regional differences, not only in terms of reducing greenhouse gas emissions, but also in terms of adapting to inevitable changes. The regions and municipalities of Russia differ sharply in their vulnerability to shocks and risks associated with climate change as such and global climate policy as a response to these changes. These differences are determined by the current natural and climatic conditions, the structure of regional and local economies, and nature management practices. In the future, the vulnerability of the population to adverse climatic conditions will decrease due to the outflow of the population from the northern and eastern regions with unfavorable living conditions to the southern and western regions, as well as climate warming. However, in general, the vulnerability of the population, infrastructure and sectors of the economy to extreme natural and climatic events, as well as to the risks of losing the competitiveness of companies due to the consequences of global climate policy, will increase. To compensate for these risks, Russia's significant RCC potential can be used [10]. RCCs play a key role in the RF Low-Carbon Development Strategy by more than doubling carbon uptake by forests. However, the measures provided for in the Climate Change Adaptation Plan in the field of nature management, the Strategy for the Development of the Forestry Complex, and the Sectoral Agro-Industrial Adaptation Plan are insufficient and in some cases ineffective [11]. The implementation of adequate approaches to adaptation to climate change, which changes natural conditions for agriculture and forestry, and to global climate policy, which requires a transition to low-carbon practices, will ensure the long-term competitiveness of these sectors of the Russian economy. The implementation of natural and climatic projects (forest-climatic, agro-climatic, etc.), subject to their compliance with international standards, will provide additional income in the global carbon markets, contribute to the decarbonization of Russian business and increase the resilience of local communities, economies and landscapes. The climate and carbon agenda in the next few years should be integrated into the development strategies of the largest Russian companies in all sectors of the economy [12]. First, it is necessary to qualitatively expand and adjust the set of measures for adaptation to climate change in the forestry (including reforestation practices) and agricultural sectors. Secondly, it is required to develop national standards for the implementation of natural and climate projects, harmonized with existing and prospective international standards used in the global carbon markets. Thirdly, it is important to supplement the range of PKPs implemented in Russia (including within the framework of the taxonomy of green projects) with projects on voluntary forest conservation, watering wetlands, and make the list of project types open in the National Register of Climate Projects being developed. Fourthly, it is necessary to remove regulatory and legal

restrictions on the implementation of various types of natural and climatic projects (introduce leasing for the implementation of forest and climate projects as a new type of forest management, ensure the investor's ownership of the resulting emission reduction units, remove legal barriers to the implementation of LCP on unused lands agricultural purpose, etc.) [8-9]. Fifth, a consistent policy is needed to support various low-carbon agriculture practices (organic, regenerative, etc.). Sixth, it is important to ensure the integration into federal, regional and city strategic planning systems of territorially differentiated assessments of vulnerability to climate change, as well as various types of natural and climatic solutions. The economic crisis, like any crisis, is a source of not only problems, but also opportunities. A decrease in economic activity always means a decrease in energy consumption. With the dominance of fossil energy resources in the energy mix, this leads to a decrease in emissions of greenhouse gases and other pollutants, which was observed both during the financial and economic crisis of 2008–2009 and during the COVID-19 pandemic in 2020–2021 [10]. The crisis, while not a desirable development, nevertheless pushes businesses and citizens to rethink the principles of growth and reassess the resources used. Long-term forecasts and development strategies should provide for a more sustainable development path that will ensure balanced economic growth and development without a continuous increase in energy consumption.

4 Conclusions

The deep decarbonization scenario makes it possible to fulfill Russia's obligation to achieve the goal of the Paris Agreement to prevent a temperature increase by 1.5 °C. Such an ambitious reduction in GHG emissions can be achieved if, by 2050, total primary energy production is reduced by 27%, with significant changes in the structure of energy production and consumption in favor of carbon-free technologies and energy sources [9]. The production of second and third generation biofuels, green hydrogen20, the demand for which in the world has a great prospect, can become important areas for the development of green energy in Russia. Russia's potential in these niches of the growing world market of "sustainable energy" is enormous, and the world's largest renewable energy resources can be used as the energy basis for development21. The forestry and land use sectors can play a significant role in the transition to a low-carbon economic model. There is great potential to increase the carbon storage capacity of forest ecosystems and to move towards low-carbon agriculture. However, climate change, intensive logging and insufficiently efficient forest management practices have an extremely negative impact on the potential of CO2 absorption in the country's forestry [16]: according to the National Greenhouse Gas Inventory, for the period 2009-2019. net carbon uptake by forests has decreased from 750 to about 600 million tons of CO2 per year22. Obviously, the risks of forest fires, the spread of diseases and pests will increase as the average annual temperature rises further. Therefore, large-scale measures are needed to reduce fire and other negative impacts on forest ecosystems, to use the potential of nature-based solutions to increase carbon sequestration and reduce greenhouse gas emissions in the land use and forestry sectors.

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