

Low-carbon Energy Development: Threats for Russia and Opportunities to Overcome Them

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Abstract: The article discusses the low-carbon development of energy, the energy transition, which is the energy basis for transforming the world to a low-carbon economy. The climate agenda of the European Union is analyzed. Threats and risks for Russia associated with cross-border carbon regulation in the EU, shrinkage of global fossil fuel markets, and increased competition on them. The possibilities of Russia's international cooperation in the provision of fossil fuels are being explored. Approaches that reduce threats to Russia in the process of transition to a low-carbon economy are considered.

1 INTRODUCTION

The transition to a low-carbon economy in recent years has become an important direction in the development of many countries of the world community, which largely determines the possibilities for economic growth, the direction and effectiveness of international cooperation.

A low-carbon economy is characterized by low consumption of fossil fuels. The need for a transition to such an economy is associated with global climate change caused by anthropogenic emissions of greenhouse gases into the atmosphere: such as carbon dioxide CO₂, methane CH₄, ozone O₃, etc. This leads to an increase in temperature on the planet, melting ice, rising sea level, brings irreversible damage to the environment, causing irreversible climate change. The greatest impact on the climate has an increase in the concentration of carbon dioxide CO₂ in the atmosphere. Methane (CH₄) and other greenhouse gases have a much lesser impact on climate change.

The global nature of the "transition" requires the combined efforts and coordinated approaches of countries at different levels of economic development, primarily in the energy sector. However, in the context of expanding and deepening international cooperation, the role of the political

factor in solving emerging problems is growing, and the transition to a low-carbon economy can become a hostage to political intrigues and big politics.

The situation is complicated by the SOUGO-19 coronavirus infection, as a result of which cooperation channels within the country are limited, borders between countries are closed, foreign economic relations are curtailed, and production chains are being destroyed. On world markets, as a result of the slowdown in production, demand for Russian energy carriers is decreasing.

The energy policy of the European Union, the United States, and a number of other countries of the world community is aimed at reducing the consumption of fossil fuels, and strict carbon regulation measures are being introduced. Under these conditions, Russia, which plays an important role in the global energy supply, in the near future may be under pressure from the compression of foreign markets for fossil fuels, strict measures of carbon regulation. There are risks and threats for the development of its economy.

To overcome them, systemic transformations of the Russian economy are needed, it is necessary to create capable institutions with effective tools and mechanisms for strategic planning that will make it possible to switch to a low-carbon economy and energy, to enter the trajectory of sustainable development.

2 MATERIALS AND METHODS

The energy basis for the transformation of the world to a low-carbon economy is the fourth energy transition. It is generally accepted that so far mankind has experienced three energy transitions to a new combination of energy carriers: from biomass (including firewood and waste) to the dominant position of coal, from coal to the decisive role of oil, and from oil to the increasing role of gas, hydropower and nuclear fuel.

And if earlier an important motive for switching from a combination of some energy sources to others was their efficiency and competitiveness of costs, now, in addition to these factors, decisive attention is paid to the decarbonization of the energy sector (reducing the share of fossil fuels in the energy balance, developing the electric power industry, and reducing the energy intensity of the economy).

The energy sector of the world economy, which accounts for the main greenhouse gas emissions, is central to the transition to a low-carbon economy. The energy sector in the world accounts for about 80% of all anthropogenic emissions of greenhouse gases into the atmosphere. Their main source is fossil fuels. In the global structure of energy consumption in 2020, it accounted for 83.1%, in Russia's energy consumption - 86.4%¹.

Energy decarbonization implies a reduction in carbon dioxide emissions per unit of energy produced, which is associated with technological modernization and significant structural changes in the economy (Glazyev, 2021). Without a new technological base, it is impossible to drastically reduce the use of fossil fuels, reduce greenhouse gas emissions, and reduce the share of industries with a high carbon footprint in the economy. With low-carbon development, it is necessary to close coal-fired thermal power plants, cement and glass production, metallurgical enterprises, and reduce the car park that uses fossil fuels. It is necessary to expand the use of electrical energy and improve the energy efficiency of the economy.

In Russia, energy is not only a carbon-intensive, but a backbone sector of the economy. In the process of transition to low-carbon development, energy is the core of structural and technological transformations, the adaptation of the Russian economy to the new climate agenda.

In the process of energy transition, the use of fossil fuels (primarily coal, oil, and in the more distant future, gas) is gradually decreasing in the structure of energy production, and the share of renewable energy sources (RES) in the energy balance is being

increased. Nuclear power is being developed in a number of countries. Much attention is paid to the development of electrification, the use of hydrogen as an energy carrier and energy storage, the modernization of the technological base at all stages of the energy flow.

An important technical content of the fourth energy transition is the fifth and sixth technological modes. The fifth mode is based on the achievements of microelectronics, information technology, genetic engineering, fiber optic communication systems. The sixth technological order is based on the development of nano- and biotechnology, nanoenergy, molecular and cellular technology. The emergence of new technologies makes it possible to ensure progress in the creation of efficient renewable energy sources, the use of hydrogen, the development of nuclear energy, and the creation of controlled thermonuclear installations. At the same time, they make it possible to drastically reduce the energy and material intensity of production, reduce emissions of greenhouse gases and other pollutants, i.e. ensure low-carbon development of the economy.

"As the next technological order develops, a new type of infrastructure is created that overcomes the limitations of the previous one, and a transition is made to new types of energy carriers that lay the resource base.

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The transition to a new combination of energy sources makes it possible to increase the efficiency of the use of energy resources, reduce the dependence of economic growth on energy consumption, switch to clean energy and the economy as a whole, and thereby prevent negative climate change associated with rising global temperatures. The transition to a new energy base will largely determine the success of the transformation of the world economy to a low-carbon economy (Gorodnitsky, 2019).

Limiting the global warming of the Earth's climate is one of the fundamental ideas that is at the heart of the need to move to low-carbon development. However, it should be noted that among scientists, politicians, economists there is no unambiguous view on the causes of global warming. According to a number of experts, global warming is a myth that frightens all of humanity. From their point of view, the cause of global warming is not associated with anthropogenic and man-made factors, with greenhouse gas emissions. It is associated primarily

with fluctuations in solar activity and other natural factors.

One can argue about whether the theory of global warming really reflects the processes that occur in the planet's atmosphere, but it gives a powerful impetus to the entire world community towards a more rational combination of energy sources, the transition to a new technological order. This allows us to significantly improve the technical level in all sectors of the economy, increase the efficiency of capital investment, and move to a new level of energy consumption. And in this sense, the idea of low-carbon development has many advantages.

However, if global warming is in no way or weakly related to anthropogenic emissions of greenhouse gases, then this fundamentally changes the approaches, methods and mechanisms for the transition to low-carbon development.

3 RESULTS AND DISCUSSION

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3.1 Energy Transition

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3.2 Climate Agenda

Global warming, climate change leads to the deterioration of the ecological situation on the planet, hinders the development of the world community. The global climate agenda is gaining more and more support among the countries of the world community. For the first time, the foundations of international climate policy were laid down in the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. Its ultimate goal is to "achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that excludes dangerous anthropogenic impact on the climate system."

An important step in the fight against negative climate change for the entire world community was the Paris Climate Agreement, which was adopted in December 2015 and entered into force in 2021.⁵ It is aimed at combating global warming, limiting greenhouse gas emissions and came to to succeed the 1997 Kyoto Protocol. It is intended to ensure that peak CO₂ emissions are reached as quickly as possible, to keep the increase in global average temperature "well below" 2°C, and to "make efforts" to limit the increase in temperature to 1.5°C⁶. As of November 2020, 194 states and the European Union have signed the agreement.

The most radical and ambitious measures for the transition to low-carbon development are being taken by the European Union. As part of the New Green Deal project 2019, it is planned to reduce greenhouse gas emissions (among which CO₂ is the main one) by 2030 by at least 55% compared to 1990. By 2050, it is planned to achieve carbon neutrality, that is, emissions of carbon dioxide and its analogues are offset by their absorption (carbon-negative projects).

The main ideas and provisions of the New Green Agenda project were further developed in two important strategic documents aimed at achieving climate neutrality. These include: Strategy for the integration development of the energy system

EU (An EU Strategy for Energy System Integration, Brussels, 8.7.20 208) and A Hydrogen Strategy for a Climate-Neutral Europe, Brussels, 8.7.20 209. They were submitted by the European Commission in July 2020.

Energy system integration refers to "the planning and operation of the energy system as a whole", covering many energy carriers, infrastructures and consumption sectors, by creating stronger links between them in order to provide low-carbon, reliable and resource-efficient energy services at the lowest possible cost to society"

The transition to a more integrated energy system will provide an opportunity to strengthen the interconnectedness of individual sectors of the EU energy economy. Regional and cross-border coordination among EU Member States will become increasingly important. It is planned to develop common market rules for various sectors of the energy economy, strengthen cooperation in the planning and management of electricity and gas networks, which is especially important in the context of the expected significant growth in demand for electricity during the transition to a climate-neutral economy. All this will help to improve the efficiency of energy use.

The share of electricity in final energy consumption is projected to increase from 23% in 2019 to about 30% in 2030 and to 50% by 2050. The basis of the growing demand for electricity will be renewable energy sources. By 2030, the share of renewable energy sources in the electricity mix may double to 55-60%, and by 2050 it will be about 84%. The need to increase the supply of electricity will be met through the operation of renewable energy sources not only on land, but also on the shelf. The potential of offshore wind power in the EU by 2050 will be 300-450 GW against today's capacity of about 12 GW.

In the future, the volume of natural gas consumption in the European Union will gradually decrease. However, it is assumed that gaseous fuels, as before, will continue to play an important role in the energy mix. Along with the traditional "fossil" natural gas, a mixture of gaseous energy carriers - biogas, biomethane, hydrogen, synthetic gases - will become more widespread. According to estimates, by 2050 the share of fossil natural gas in the total consumption of gaseous fuels will be reduced to 20%, and the remaining 80% will fall on a mixture of gaseous energy carriers (renewable gases, decarbonized gases). It is planned to revise the legislative framework in order to create a competitive market for decarbonized gas suitable for the use of renewable gases.

The integrated energy system opens up new opportunities for attracting investments in clean technologies, minimizes the costs of transition to climate neutrality, provides additional flexibility for the overall management of the energy system, and strengthens the EU's industrial leadership at the global level. Energy system integration, realizing the potential for energy efficiency, is essential to achieve higher climate goals by 2030 and climate neutrality by 2050.

The "Hydrogen Strategy for a Climate Neutral Europe" involves the widespread use of hydrogen, which can be used as a fuel or raw material in industry, transport, energy, construction and households. Hydrogen can be used to produce, store, store and deliver energy. The main difference between hydrogen and other energy carriers is that it does not emit CO₂ and, when used, almost does not pollute the air. The transportation of hydrogen through the existing transport network (pipelines) and its long-term large-scale storage, unlike electricity, can be well mastered, which allows creating, if necessary, energy reserves for their use at the right time. The share of hydrogen in the energy mix will be comparable to that currently occupied by certain

types of fossil fuels. The share of hydrogen in the EU energy balance is projected to grow from the current level of less than 2% in 2018 to 13-14% by 2050. The priority direction of the hydrogen strategy is the production of hydrogen using renewable energy sources - wind and solar. At the first stage it is supposed to use low-carbon hydrogen.

It is supposed to create an open and competitive EU market with unhindered cross-border trade in hydrogen, which will create conditions for deeper integration with other energy carriers. Hydrogen issues can be included in EU international agreements in the field of energy and diplomacy, as well as in the field of climate, research, trade and international cooperation. This will contribute to the emergence of a global competitive hydrogen market, international trade in hydrogen of the European Union with other countries.

Accelerating the transition to "green" energy, the European Union is taking measures to accelerate the development of renewable energy sources, reduce carbon dioxide emissions into the atmosphere, reduce the consumption of fossil fuels, and by 2050 to abandon its consumption. The plans are ambitious, and this does not mean that they will be fully implemented, but they do exist and they must be taken into account, taken into account when developing a strategy for Russia's long-term development.

By adopting the Paris Agreement, Russia has assumed voluntary limits on greenhouse gas emissions. But these restrictions are associated with significant risks for the national economy, primarily energy and energy-intensive industries (metallurgy, production of nitrogen fertilizers and cement). Russia has a significant part of its income from natural rent. In its export-oriented raw material model, an important place is played by the extraction of fuel and its supply abroad. If, when limiting their emissions, the real opportunities and interests of the Russian economy are not taken into account, if the effectiveness of measures that limit greenhouse emissions is not assessed, then this may lead to an increase in threats to the national security of the country of Russia (Glazyev, 2018).

Russia is the fourth country in the world in terms of greenhouse gas generation. Carbon dioxide CO₂ is used as an equivalent for estimating total emissions. In 2020, in terms of CO₂ emissions, Russia ranked fourth in the world (4.6%) of total carbon dioxide emissions among 65 countries that provide about 95% of all global emissions. In the first place in this indicator was China (30.7%), the second - the USA (13.8%), the third - India (7.1%).

In terms of the intensity of carbon dioxide emissions in kilograms per unit of GDP, Russia and China occupy leading positions in the world community. In

It presents two low-carbon development scenarios: inertial and targeted (intensive), which is proposed as the main one. Achievement of carbon neutrality of the Russian Federation is scheduled for 2060, but possibly even earlier. The carbon intensity of the economy should be more than halved. Net greenhouse gas emissions are reduced by 60% by 2050 compared to 2019. Increasing the absorptive capacity of Russian forests from the current 535 to 1200 million tons¹³ of carbon dioxide equivalent by 2050 is becoming an important way to achieve carbon neutrality.

3.2.1 Threats and Risks

Low-carbon development in the conditions of the existing world order (lack of balance of power in the world community and coherence of international processes) brings, first of all, benefits to those countries that do not have significant reserves of fossil fuels, but have leadership in scientific and technological progress, occupy leading positions in the knowledge economy.

The closest and real threat to the Russian economy is the cross-border carbon regulation (TCR), which is supposed to be introduced by the European Union. Cross-border carbon regulation (CTR) refers to the imposition of duties on carbon-intensive goods imported by the EU. This tax is introduced for exports from countries that do not charge for high CO₂ emissions.

European companies currently pay billions of euros annually for CO₂ emissions. They pay about 30 euros per tonne of CO₂ emissions. A similar carbon tax is expected to be introduced in the US and Canada. In order to create a level playing field for European companies and those outside the EU, it is proposed to impose duties on carbon-intensive goods imported by the EU. The introduction of EU transboundary carbon regulation aims the countries of the world community to reduce carbon emissions, directs them to reduce the carbon intensity of exports. However, such regulation can significantly change the structure and direction of international commodity flows, affecting all links in the value chains, as competitive advantages in the European market change (Nikoláeva, 2018).

A large-scale plan to introduce a carbon tax in the EU on imported goods has been in the process of development since March 2020. The COVID-19

pandemic has not slowed down work on the creation of new tax instruments, but has only accelerated it. The parameters of the carbon tax should be prepared by the European Commission and come into force by November 1, 2023¹⁴. The main indicators and mechanisms of this tax will be included in the European climate law. Cross-border carbon regulation makes it possible to ensure the competitiveness of relatively expensive products produced in the European Union, but with minimal CO₂ emissions, with goods from other countries that use cheaper, but carbon-intensive technologies, with significant greenhouse gas emissions.

World experience shows that for limiting and reducing greenhouse gas emissions, the most effective are economic instruments that form the price of carbon. These include carbon taxes and emissions trading systems (ETS). "This allows us to include in the cost of production those external costs that the economy and society as a whole will have to bear to overcome the consequences of emissions, "monetizing" the damage to the environment"

There are estimates according to which Russia ranks second in the world after China in terms of carbon-intensive exports to the EU: annually 150-200 million tons of exports of CO₂ equivalent for all goods and services. Depending on the calculation methodology, the level of the taxable base for tax collection can be significantly lower and amount to 100-160 million tons¹⁶. In this case, the calculation does not take into account some of the goods and services, for example, transport, which are not yet included in the EU ETS (Emission trading scheme - greenhouse gas emissions trading scheme). If we assume that the entire volume of emissions is taxed, and the possible value of the fee per ton of CO₂ emissions is estimated at 30 euros, then the additional tax burden for Russian exporters will be 3.0-4.8 billion euros per year. Other calculation options are also possible, when only the excess of emissions above the established level is taxed.

The carbon tax on imports reduces the competitiveness of Russian goods compared to their European counterparts, and such basic sectors of the Russian economy as the energy and chemical industries, ferrous and non-ferrous metallurgy are significantly affected. The competitive struggle of Russian goods in the EU market is escalating. A cross-border carbon tax could require additional costs for Russian oil and gas, coal and steel companies in the millions of euros per year. All of the above can become an important factor affecting the competitiveness of Russian products.

Under the current conditions, in order to adapt the economy to the introduction of EU transboundary carbon regulation in the short term, Russia could take the following steps:

- it is necessary to develop a national standard for carbon reporting in Russia so that it corresponds to international analogues that meet more stringent European environmental standards;
- evaluate the extent to which the proposed restrictions on international trade do not contradict international standards and comply with WTO rules. Cross-border carbon regulation should not create conditions for unfair competition, when EU companies acquire preferences from their governments, gaining advantages over Russian companies;
- it is necessary to create a national system for trading greenhouse gas emissions. For Russia, which has significant opportunities for natural absorption of CO₂ by forests and natural ecosystems, it is advisable to form a market for greenhouse gas emissions (carbon dioxide), introduce quotas for greenhouse gases, and create conditions for trading them.

With the transition to a low-carbon economy, the peak of demand for the main product that Russia produces and that is in demand abroad - fossil fuels is significantly approaching in time. After reaching it, there is a drop in demand for it. The global market for fossil fuels is shrinking. There are estimates according to which, as a result of the low-carbon development of the economy, the world coal consumption peak should occur in the 2020s and 2030s. - world peak oil consumption and 2040s. - world gas consumption peak¹⁷.

In the future, a situation may arise when there will be no place left in the external, as well as in the domestic, markets for fossil fuels, i.e. what Russia is rich in and on which its economic growth largely depends, will not be in demand. Keeping the focus on the raw material model focused on the export of fossil fuels in the conditions when the world is moving to a low-carbon economy, Russia will increasingly lag behind other countries in the world community, will lead to a slowdown in economic growth until they are completely zeroed, and then fall.

The contraction of the world markets for fossil fuels is accompanied by increased international competition on them. Such major transnational corporations as Saudi Aramco, National Iranian Oil Co, Gazprom, Exxon Mobil, PetroChina, Rosneft, BP, Royal Dutch/Shell, Chevron Texaco, Total, Kuwait Petroleum Corp. In the transition to a low-

carbon economy, competition is shifting from competition for resources, for access to the most efficient hydrocarbon deposits, to a fierce struggle for markets.

The result of the shrinkage of world energy markets, if we do not get away from the raw material export model, will be the strengthening of Russia's isolation in the world economy, the reduction of the opportunity to develop due to the advantages of the international division of labor. This will hit the economy of the country, which, after the collapse of the USSR, has significantly expanded foreign economic relations and become less self-sufficient, becoming largely dependent on Western technologies and equipment. It is impossible to develop hard-to-recover oil and gas fields without the use of advanced Western technologies. Import substitution can give some positive results in certain sectors of the economy, but in conditions of isolation it is difficult to overcome a significant technological gap. Much more development opportunities lie in the advantages of the international division of labor (Porfiriev, 2010).

In the process of transition to a low-carbon economy, Russia faces the risk of a fall (decrease) in the geopolitical potential of the country, which currently largely depends on the availability and volume of natural resources, primarily fossil fuels, with which the country is rich. Russia owns 6.2% of the world's oil reserves, 19.1% - gas, 15.2% - coal. Russia accounts for 11.5% of world oil production, 17.6% for gas, and 5.4% for coal¹⁸. Such a powerful energy base made it possible for Russia to supply energy carriers abroad on a significant scale and, through energy ties, to strengthen its position in the system of international relations. Today those times are passing. The transition to a low-carbon economy reduces the opportunities for international cooperation at the expense of fossil fuels. The internal reserves of economic development are also shrinking. As a result, Russia's geopolitical potential is decreasing. The country is losing its competitive position in the world community, in the formation of regional economic unions.

Summarizing the above, it should be noted that the transition to a low-carbon economy reduces the threats and risks for the world community associated with environmental degradation, depletion and uneven distribution of traditional fossil resources. However, for Russia, the transition to low-carbon development is a source of new threats and risks for its economy. The most significant of them include:

- the exhaustion of the export-raw material model of the development of the Russian economy in the conditions of unrealized

innovative growth factors, the loss of its investment attractiveness;

- contraction of world energy markets, increased international competition on them;
- strengthening the isolation of Russia in the world economy, reducing the opportunity to develop due to the advantages of the international division of labor;
- the loss of competitiveness of the Russian economy, the decrease in the profitability of its energy sector and a number of other sectors that produce products with a high carbon intensity;
- the fall of the geopolitical potential of Russia. The decline of its leadership positions in the formation of regional economic unions. Reducing Russia's ability to strengthen its position in the post-Soviet space, in the European Union and the world community.

To solve these problems, systemic transformations are required, both in the fuel and energy complex and in the country's economy as a whole. The Energy Strategy of the Russian Federation for the period up to 2035 (ES-2035) could become, but did not become, the basis for such transformations (Temnov, 1987).

4 CONCLUSIONS

The main drawback of ES-2035 is that it does not reflect the key issues of transition to a low-carbon economy, which requires systemic transformations in the energy complex and the country's economy. It does not have a clearly defined goal of phasing out the use of fossil fuels, and does not show the ways and mechanisms for the transition to low-carbon development. In ES-2035, as in previous strategies, the focus is on increasing the production of fossil fuels and ensuring a high level of its exports. A significant adjustment of the goals and objectives set in ES-2035 is required.

It is necessary to change the role of the state in regulating economic processes. The formed executive vertical of power allows the practice of manual control. Tactical managerial decisions are made at the very top, and the whole system becomes clumsy. In order for the management system to become mobile, tactical decisions must be transferred to a lower level. At the same time, it is necessary to strengthen the role of the state in strategic level of energy regulation. Without this, the system is not capable of either strategic planning or strategic vision. Hence, in reality, the planning horizon can only be short,

although the development of the fuel and energy complex requires a long-term vision.

We need systemic transformations in the energy sector, which include a wide range of issues related to demonopolization and the creation of a competitive environment, the liberalization of economic life, institutional and structural changes aimed at moving away from the raw material development model, and the integration of the energy sector into the system of world economic relations.

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