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Impact of External Factors on National Energy Security

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The article examines both external and internal threats to national energy security, formulates the tasks of increasing energy security, discloses modern challenges, as well as measures to level them.

In recent years, Russian economy has felt the growing influence of external threats and risks: unfair competition in world markets, high politicization of energy issues, and attempts to prevent Russia from monetizing national energy reserves. Influence of the use of renewable energy sources on national energy security, growth of liquefied natural gas production, stricter environmental requirements, changes in the demand for petroleum products, and introduction of anti-Russian sanctions are analyzed. The influence of internal risks is no less significant: quality of hydrocarbon reserves in the Russian Federation is declining, effectiveness of geological exploration is insufficient, and the share of hard-to-recover reserves is increasing.

Energy security assessments are recommended taking into account modern challenges and on the basis of parameters such as ratio of the annual increase in the balance values of primary fuel and energy resources to the volume of their production, share of natural gas in the balance structure of primary fuel and energy resources, implementation of investment programs by fuel and energy sectors, change in the specific energy intensity of GDP, prices and etc.

Key words: energy security; risks; criteria; energy market; unfair competition; assessment

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Introduction. Fuel and energy complex is an important part of the Russian economy, energy companies are major customers for national business. The Russian balance of payments is largely dependent on energy prices. The national fuel and energy complex (FEC) brings about 5 trillion rubles annual investment: almost 40 % of all investments in the Russian economy. Huge reserves of energy resources provide national economy with opportunity to cover domestic energy needs, and export of energy resources brings Russia not only income, but also allows it to remain the most important guarantor of world energy security.

Studies of the prospects for development of energy industry in Russia, taking into account volatility of the global energy market, demonstrate new external challenges and threats to national energy security with significant changes in functioning of the fuel and energy complex within the country. Attempts to unfair competition in world markets, high politicization of energy issues, instability in the main regions of energy production have a negative impact on the development and growth of energy companies. Threats to energy security of the Russian Federation have increased, they are related to new sources of satisfying energy needs, expanding the use of renewable energy sources, banning nuclear energy in some countries, developing production of liquefied natural gas (LNG), tightening environmental requirements and changing the structure of oil products. The main external risks are associated with implementation of the Paris Agreement, development of shale technologies in the United States, growth of green energy, as well as introduction of new rules and sanctions [11, 13].

The Russian fuel and energy complex, being a global part of the energy market, contributes to maintaining global energy security and guarantees a stable supply to many energy consumers. Traditionally, these are European gas consumers [5]. However, other challenges have emerged in recent years.

Due to the shortage of heavy grades of oil (sanctions were imposed against the oil industry of Iran and Venezuela; parties to the agreement on the regulation of oil production (OPEC+) mainly reduce production of «heavy» grades of oil) the role of Russian companies in ensuring global en-

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ergy security has increased. Replacing the heavy oil of Iran and Venezuela, companies that supply Urals brand oil to the world market are winning. By the beginning of 2019, a Urals barrel was cheaper than a Brent barrel, and by May of this year, Urals was selling at a premium. This trend will continue in the near future.

In the world energy market, in recent years, the structure of demand for produced petroleum products has changed, in particular, due to toughening requirements for environmental protection. Depending on market conditions, Russian energy companies are changing the range of products: cracking and reforming technological units can be reoriented to production of raw materials for petrochemicals, and not to production of gasoline components.

A multicriteria analysis of the global energy market shows that problems of Russian energy security are caused not only by external, but also by no less significant internal factors. Investments in Russian exploration are growing (in excess of 450 billion rubles is expected in 2019), but the quality of hydrocarbon reserves is declining. The effectiveness of geological exploration is insufficient, the share of hard-to-recover reserves is increasing. Some of the huge deposits with relatively cheap gas (Urengoy, Yamburg, Medvezhye) have already been significantly developed. A number of other fields are at the peak of production with the prospect of reduced production. Entering fields with deep-lying gas (up to 4.5 km) into the West Arctic zone will make production more expensive. Fuel and energy companies are experiencing high depreciation of fixed assets, low rates of their renewal, and old infrastructure in heat generation. In the Russian economy, there are no major shifts in energy conservation, and investments and diversification of the country's fuel and energy balance structure are insufficient [9]. Economic policy leads to higher energy prices for final customers.

In the context of global energy market development (growth in both supply and demand), tolling financing schemes, increased spot sales, etc. are becoming more widespread. Vertically integrated projects – the main model of the energy business – are inferior to other forms that create not only new opportunities, but also risks.

Energy security risks dictate the need to justify adjustments to Russian programs (doctrine of energy security, transport strategy, energy strategy, general scheme for development of the gas industry). Such national documents lay foundation of the future development of the national economy, based on its current state, available developments and best international practices in the energy sector [1]. The task is to objectively and comprehensively assess both current and potential challenges facing the Russian energy sector, and on this basis to determine additional measures that will allow timely response to such threats. Documents of a programmatic nature determine the development vector taking into account interests of the state and business.

Problems of ensuring energy security. Ensuring energy security in an ever-changing relationship between energy exporters and importers is one of the key issues for most countries in the modern world [7, 16]. Moreover, an assessment of the level of energy security of both a country and its regions requires monitoring based on a certain set of criteria [18]. Such indicators should demonstrate various areas of energy security of the national economy as a whole and in particular its parts. Most often, development indicators of individual fields of the fuel and energy sector, as well as energy companies are used as criteria. Monitoring is necessary to assess the situation and direction of trends, including negative ones [14]. But Russian energy security is associated with events taking place on the world market (diversification of energy exports, conjuncture of energy and financial markets), as well as politicization of energy solutions. A thorough analysis is hindered by unresolved methodological issues (selection of a comparison base, comparability of indicators, validity of target values of indicators), as well as the problems of organizing accounting and quantifying internal and external factors.

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When energy resources are limited and costs of their extraction are increased, in order to meet growing demand, it is necessary to search for sources of supply growth and analyze various approaches to energy development. After the oil crisis of the 1970s, it became obvious that military and economic power is not enough to ensure uninterrupted supply of energy resources. A reaction to the oil embargo was the creation by OECD countries of the International Energy Agency with a mandate on energy security (1974).

Desire of EU countries to diversify energy sources and their suppliers is increasing, the share of renewable energy sources (RES) in the energy balance is growing [6, 17]. Development of renewable energy sources becomes especially relevant against the background of continuous growth in energy consumption around the world, despite increase in energy efficiency. For the Russian economy it means increased risks in relation to vulnerability of the national economy and development of the Russian fuel and energy complex.

After the accident at the Fukushima-1 nuclear power plant, the German government canceled the decision (October 2010) to extend the life of nuclear power plants and plans to decommission all nuclear power plants by 2022. A number of EU countries have decided to decommission nuclear power units. In Italy, in a referendum, the majority voted against nuclear energy. In Switzerland, it was decided to close all nuclear power plants by 2034. About 30 % of the generated energy in the EU is generated at nuclear power plants. Thus, with the abandonment of nuclear energy, but with an increase in energy consumption in general, replacement of existing energy sources will be required. RES is expected to be such an alternative [2, 19].

RES and strategic energy reserves. World energy leaders with increased attention to traditional sources show interest in renewable energy technologies [6]. The reason is depletion of old and lack of new large deposits. According to a World Energy Council report, proven reserves of oil will last mankind for 56 years, gas for 55 years, coal for just over 100 years. To a no lesser extent, this is dictated by environmental requirements, energy security policies and formation of strategic reserves, as well as willingness of companies to search and develop new technological solutions. Investments in renewable energy (investments in green energy) exceed global investment in fossil fuels by almost 2 times and amount to about 300 billion US dollars [17]. Foreign companies are leaders in these matters. Thus, British Petroleum (BP) is developing green technologies, company has capacities for production of various types of energy. Among BP's renewable energy assets, Brazil's largest biogas plant, 16 US offshore wind farms that can fully provide a whole city comparable in size to Dallas in Texas, two wind farms in the Netherlands, and solar power in Germany and the United States with a total capacity of more than 45 MW. In 2016, a number of the world's largest oil and gas companies, including Shell and ExxonMobil, announced intention to increase their activity in the development of green energy, which in the near future should affect global trends in development of renewable energy. The prospects for clean energy are associated primarily with transition to biogas and hydrogen. The development of green energy is becoming a factor of competition for technological leadership.

In Russia, position of renewable energy is weaker than European. According to the draft energy strategy of Russia until 2035 [18], technology of the "energy revolution" includes renewable energy sources and energy storage devices. It is predicted that the share of energy production using renewable energy sources, equal to 1 % of the country's total energy generation, will be achieved by 2020. Such a small share conflicts with declarations of the importance of renewable energy sources.

Russian oil and gas companies are represented in corporate strategies as energy, which should mean increased attention not only to hydrocarbon production sector, but also to development of other areas of energy industry, including renewable energy [4, 5]. Russian companies, unlike the western ones on an industrial scale, invest little in the development of green energy. In the future,

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absence of such a direction of investment may mean the loss of technological prospects by Russian energy companies and even their ousting by other participants from the positions of world energy leaders. To ensure the share of renewable energy in the energy balance in accordance with the ES-2035 project (more than 3 % of the total electricity generation by 2035), it is necessary to invest at least 1.7 billion US dollars annually. Achieving 3 % by 2035 will only bring Russia closer to current indicators of developed economies.

The issue of green energy is relevant from the point of view of energy security for not so much the country as a whole, as its individual regions. For the same purpose, it is of interest to form a strategic reserve. State reserves are formed in most countries of the world leaders as a technology to support stability [10]. Today, not only importers, but also oil exporters, create and increase both state and commercial reserves. Energy companies, ensuring uninterrupted oil refining, are creating oil reserves. This allows to work continuously for two to three weeks in difficult situations. Among government reserves, the largest is the US State Strategic Petroleum Reserve (SPR). It is concentrated near large North American oil refining centers. Oil storages are formed by drilling and dissolving salt in the bowels of the pumped water. The volume of individual cavities is up to 6 million m^3. The US plans to bring the SPR to 1 billion barrels, and they are striving for this purposefully.

The degree of impact of material assets includes many factors except production and consumption, these are issues of pricing and tax policy, setting tariffs and duties, etc. The United States uses sales from its strategic oil reserve, as well as lifting its export ban to influence the global oil market, and therefore on energy security. Many countries have come to the conclusion that in order to maintain stability in crisis situations, it is necessary to form national strategic oil reserves. Feasibility of forming strategic oil reserves is one of the discussion and most important issues for Russian energy security and is definitely highly costly for the country's budget.

In the EU countries, the USA, China, and others, considerable experience has been accumulated in operation of intervention funds. Such funds operate independently of state reserves and are managed by relevant departments. Following the example of these countries, in addition to state and commercial reserves, interventional commodity funds have also been established, which are managed at the level of line ministries and departments. Domestic interventional commodity funds play an important role in providing resources in crisis situations.

Investing in inventories requires a lot of money. In modern business conditions, formation of material reserves takes into account the fact that private (commercial) reservation and intervention funds become an addition to state reserves. The justified size of reserves, diversification of sources, and their optimal territorial distribution will rationally solve the problem of reducing the risk of ensuring uninterrupted supply of resources. Particularly relevant is the issue of energy security for remote regions of Russia, where there is no connection to the main energy systems and installation of autonomous energy supply systems can be a solution for a remote region.

Diversification of energy supply for the EU. An increase in renewable energy production and an increase in energy efficiency are the EU's internal energy policy priorities, and, on the outside, this is liberalization of the market for energy suppliers. An increase in the share of biogas and hydrogen technologies should help European consumers reduce their dependence on export supplies of energy from Russia. Expansion of the geography of energy suppliers for the European consumer is limited by availability of infrastructure and level of energy prices. Despite existing differences and impact of new EU policy trends, Russian companies remain the largest exporters of oil and natural gas to European countries. For greater stability in the global energy market and increase the competitiveness of Russian gas, in addition to long-term contracts, spot settlements must be introduced. Russian coal is in competition because of its high quality and low price, even to European producers.

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The most important task for the development of Russian-European gas cooperation is diversification of supplies, including through development of gas transportation infrastructure. The Turkish Stream is being implemented, one line of which is intended for gas supplies to Turkish consumers, the other for gas supply to countries of Southern and Southeast Europe. Commissioning (end of 2019) will reduce transit through Ukraine. Nord Stream and Nord Stream-2 form the northern corridor for transporting gas to Western Europe with a total volume of 110 billion m^3 [12]. The advantages of the northern gas transmission corridor are a shorter gas transportation route compared to pipelines passing through Eastern and Central Europe, lower gas supply costs due to the use of the latest technologies that provide greater pressure, high transmission speed and reduced losses, as well as linking exports to giant (gas reserves) Bovanenkovo field.

Anti-Russian sanctions of the United States and its European allies as a threat to the energy security of Russia [3] are manifested in restricting the access of national energy companies to modern technologies and equipment. Unfriendly regulation in relation to the supply of Russian energy resources prevents monetization of national energy reserves. To minimize risks, it is necessary to diversify supplies through the formation of export infrastructure. A threat to energy security of the Russian Federation is also a ban on attracting long-term financing and organization of joint ventures with foreign companies.

Increasing environmental requirements. Environmental issues have a different impact on the position of Russian companies and their role in ensuring global energy security. Refusal of the EU countries from coal TPPs leads to increase in the generation of electricity at gas TPPs. The demand for Russian gas has increased and will not decline in the coming years.

Toughening of environmental protection requirements in the world dictated the need for transition of road transport from diesel to gasoline, and this led to revision of oil refining technological schemes and the need for a new stage in modernization of oil refineries. Held at the beginning of the XXI century, modernization of Russian oil refining technological units made it possible to ensure back in 2012 production of not only gasoline, but also diesel fuel in accordance with the Euro-5 standard much earlier than this standard became mandatory in Russia. In accordance with proclaimed goals, the share of secondary oil refining processes was increased at Russian refineries. At the leading Lukoil refineries, for example, it is higher than average European refineries. Over the past few years, this company has carried out construction of catalytic reforming and isomerization units, and hydrotreating diesel fuel. This allowed production of high-octane gasolines and diesel fuel with a reduced sulfur content. Technological installations were built in Ukhta, Volgograd, Perm, Nizhny Novgorod. The company decided to build a delayed coking unit, which will further increase production of light petroleum products by more than 10 %. The depth of processing at the plant in Nizhny Novgorod will increase to 80 %.

Prohibitions initiated in the world, for example, on the use of diesel cars in the city, are a factor that corrects many Russian development programs. Madrid, Paris and Athens will introduce prohibitive measures for the use of diesel engines in 2025, similar proposals are made in Stuttgart and Berlin. Restrictions are introduced on the sulfur content in marine fuel. As a result, imbalance in global oil products markets is possible. The diesel fuel market and fuel market for ships are the main export destinations in Europe for Russian companies, so in the future, modernization of Russian oil refineries must be carried out taking into account requirements of the energy market for the range of oil products.

The next stage in modernization of Russian oil refineries will require no less significant investments (approximately 700 billion rubles). Some of the results of Russian oil refining development may be unclaimed.

Suppliers of natural gas and LNG to the EU are required to include decarbonization process (carbon dioxide exemption) as part of the fight against carbon dioxide emissions. According to the

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Paris Climate Agreement, EU countries must reduce greenhouse gas emissions by 40 % by 2030. Russian companies, as the leading suppliers to the European market, need technologies for modifying natural gas, for example, using hydrogen, biogas, etc., to zero out carbon dioxide emissions gas to the atmosphere. Decarbonization as a technology for the creation of a new environmentally friendly type of fuel can affect prospects for financing renewable energy sources and will help to preserve the share of Russian companies in the global energy market leading role in ensuring global energy security.

Policy of a number of countries abandoning fossil fuels (including due to the price of hydrocarbons, and not just toughening environmental standards) will slow down the growth rate of demand for Russian energy [15]. Therefore, energy security issues are important for making managerial decisions at the national and corporate levels.

Conclusion. New energy exporters are appearing on the energy market, alternative energy is developing in the world, and the countries 'need for energy imports is changing. Developed countries are increasingly worried about reducing energy dependence on third countries, as well as the environmental aspect. In developing countries, there is a tendency to consume the cheapest energy. Under the influence of modern trends, the global market for fuel and energy resources is transforming. The need to change energy policies has affected many economies. Despite the desire of EU countries to diversify their imports, Russian energy resources in the European market cannot be replaced in the coming years. Also, the global economy, despite the development of renewable energy, still depends on traditional hydrocarbon resources. Limited reserves of energy resources in many ways determine political weight of the countries of the world. Russia has the most extensive resource base and plays one of the leading roles in ensuring global energy security.

Changes in norms and rules, as well as sanctions, have significantly weakened the significance of energy relations between Russia and the EU. Russian companies, being major suppliers of oil, natural gas and coal to the EU, have felt these changes. Unfriendly regulation of Russian energy resources supply prevents monetization of national energy reserves. To reduce the risks of not only consumers, but also suppliers, it is necessary to implement the task of diversifying energy supplies.

The fuel role of energy resources is evolving in raw materials for oil and gas chemistry and so on along the technological chain. It is no coincidence that foreign companies invest heavily in the latest technology. The inability of Russian energy companies to invest in new technologies, such as decarbonization, will push European consumers to choose electrification based on renewable energy sources rather than gas-based thermal power plants, and in the future, they will lose their leading role in the global energy market. The use of modern digital technologies in energy sector will be associated with achievement of greater flexibility, transparency and efficiency of relations between the supplier and consumer of energy resources.

Improving energy security, when energy consumer has reliable access to them, seller has access to its consumers, and implementation process is uninterrupted at stable and reasonable prices, requires a certain economic policy from both the state and business. Energy security is formed through the use of all regulatory mechanisms. To solve energy security tasks, measures are needed to protect Russian interests in global markets, to form the domestic renewable energy market, develop gas industry, increase LNG production and consumption, maintain the market for the latest technologies, etc.

A generalized assessment of energy security should be built taking into account modern challenges and risks based on the most important parameters of the state of the Russian economy, proceeding from analysis of target and current values of indicators such as ratio of the annual i ncrease in the balance values of primary fuel and energy resources to the volume of their production, the share of natural gas in the structure of the balance of primary Fuel and energy resources, implementation of investment programs by fuel and energy sectors, changes in specific energy intensity of GDP, prices, etc.

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