Challenges to the National Energy Security of Resource Economy in Terms of the Russian Energy Doctrine

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Abstract**—**The author analyzes current challenges and shows measures to overcome them. Energy security in the world is provided not only by sufficient supply and transit volumes for consumers, but also by price levels. Due to the high capital intensity of energy production and transportation, security must be complemented by the ability of suppliers to use long-term contracts and have non-discriminatory access to distribution networks and the spot market. The author examines external and internal threats to national energy security in relation to raw material economies (in terms of Russia), reveals modern challenges, and shows measures to neutralize them. The volatility of the global energy market is demonstrated by uprising of new and escalation of existing challenges to national energy security. Energy security also depends on internal factors. Geographical diversification of export supplies of energy resources from Russia is insufficient, the product range is limited, and the European vector prevails in exports. The quality of hydrocarbon reserves is declining, and the share of hard-to-recover reserves is growing. The article analyzes the impact of renewable energy sources, liquefied natural gas, stricter requirements for environmental protection, the structure of demand in the world market of petroleum products and anti-Russian sanctions on national energy security. The energy sector provides the Russian economy with the opportunity to fully satisfy domestic energy needs, and exports allow Russia to remain the most important guarantor of global energy security. Energy security risks dictate the importance of fine-tuning state development programs. Economic policy measures aimed at increasing the potential of the Russian energy complex and ensuring stable development of the national economy are considered. The necessity of diversification of energy sources, formation of the renewable energy sources market, development of the gas industry, and growth of liquefied natural gas production is shown. The overall assessment of energy security is based on the most important indicators. The analysis of national energy security should be based on the estimated threshold and the current values of such indicators as the ratio of the annual increase in the balance data of primary energy to the volume of their production, the share of natural gas in the structure of primary energy mix, the implementation of investment programs of energy companies and fluctuation of the specific energy consumption.

Keywords**—**Energy security, challenges and risks, global energy market, renewable energy, liquefied natural gas, refining, anti-russian sanctions, ecology, oil service.

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I. Introduction

ENERGY security is the most important factor in infrastructure for the sustainable economic development. It includes adequacy of resources, economic accessibility, environmental acceptance, and technological feasibility to balanced demand and supply for the relevant energy resources. Russian national energy security doctrine sets out the principles, mechanisms and responsibilities to provide energy security on the territory of Russia, as well as to comply with external conditions, that prevent geopolitical, financial, technological and economic threats. Energy security risks had created the importance of Russian government programs changes (energy security doctrine, transport strategy, energy strategy, general scheme for the gas industry development) [1]. Based on its current state, national documents are the key for the future development of the Russian economy. The energy sector provides an opportunity to meet internal energy demand for the national economy, and Russia can also remain the most important guarantor of global energy security due to its export.

Global energy market volatility has shown the emergence of new challenges to national energy security. The result of Russia's participation in the OPEC+ deal to limit oil production slows down the commissioning activity of new Russian fields. Commissioning of new pipeline capacities will lead to an increase in shale oil production in the United States, which will impact on oil prices in the current (2020) year. External risks are related to the implementation of the Paris agreement, restrictions on usage of hydrocarbon resources, growth of "green energy", prohibition of nuclear energy in certain countries, tightening environmental requirements and changes in production structure of oil products [10], as well as the desire to impede global trade of Russian energy and access to new technologies in the light of high politicization of energy issues and instability in the regions of energy resources extraction.

Global energy security is provided by adequate supply and trade volumes leading to appropriate price level. Due to high capital intensity of its production and transportation, security for energy resources supplier should be complemented by long-term contracts and non-discriminatory access to distribution networks and to spot market of energy resources and services.

Russian energy security depends not only on external factors, but also on equally important internal factors.

Geographical diversification of export of energy resources from Russia is insufficient, product range is limited, and focus on export to the European market is strong. Asian direction has only started to develop in recent years. Quality of Russian hydrocarbon reserves is declining. The efficiency of geological exploration is insufficient, and the share of hard-to-recover reserves is growing. Some of the huge fields with cheap gas (Urengoy, Yamburg, Medvezhye) have been developed.

Russian companies need to develop fields with hard-to-recover reserves for sustainable energy supply for internal and external consumers. However, the development of such fields (for example, the Western Arctic zone with a deep gas deposit of up to 4.5 km) will lead to an increase in the cost of production. Russian mining companies also face with other challenges: high depreciation of fixed assets, low renewal rates and old heat generation infrastructure. Now there are no significant changes in the national energy conservation, and investment is insufficient. However significant changes in external economic environment and decrease in export revenues from energy resources may increase difficulties in development and implementation of Russian national projects, or fatally undermine it.

II. Main Clauses of the National Energy Security Doctrine

Ensuring energy security is also a mandatory requirement for any organization level of the Russian energy economy [7], [9]. To achieve it at the level of economic entities, that implement vital social and state functions (military, transport, information, financial, political, medical, etc.), existence of its own autonomous resources of energy supply and backup fuel supply is compulsory.

Regional authorities encourage development of local energy resources, small power energy facilities, reliability of distribution networks and substations, replacement of unilateral power consumers on a connected system of energy supply, accumulation of a sufficient reserve of fuel, energy resources, equipment and materials to ensure energy security. Ensuring energy security is achieved not only by creating reserves of capacity and volume of energy resources [23], but also by developing organization and management of energy flows, as well as quick recovery of normal energy supply to all consumers. Evaluation of the state, threats and measures to ensure energy security is carried out regularly, regulated and reflected in company's energy passport. Federal agencies monitor energy security situation and possible threats. For this purpose, Gosenergonadzor of Russia is being created. Energy security indicators are important in system of activities assessments for Russian governors and municipal leaders.

When the energy strategy of Russia, general schemes of energy projects development and location, federal investment programs, foreing trade agreement and other state documents were developing, energy security was key point: resource base, fixed assets status, development of equipment production, technology development and service organization, renewal energy, development of centralized and decentralized power supply systems. [20] Energy companies and energy industries' development indicators are used as a criterion for energy security. The most important factors are global market processes (energy exports diversification, energy and financial market conditions), as well as the politicization of decisions on global energy market.

III. Risks of Ensuring Energy Security

Military and economic power is not enough to ensure uninterrupted energy supplies. In 1974 OECD countries established the International energy Agency with a mandate for energy security as a response to the oil embargo. EU countries' desire to diversify energy resources and their suppliers, and share of renewable energy resources (RES) in the energy balance is increasing [14]. Renewable energy development becomes relevant, despite of energy efficiency increase. It means increasing risks for Russia to vulnerability of its economy and development of energy companies.

In the light of high priority to traditional resources, energy companies are interested in renewable energy technologies [6], [21]. The reason is depletion of old and lack of new large deposits. It is dictated by environmental requirements, policy of stockpiling, and also readiness to search and develop new technological solutions. Development of RES becomes a factor of competition for technological leadership. According to the draft of Russian Energy strategy until 2035 [13], it is expected that the share of energy output using RES, equal to 1% of total energy generation in the country, will be reached in 2020. There is a conflict with declarations of RES importance.

After accident at the Fukushima-1 nuclear power plant, the German government overturned the decision (in October 2010) to extend useful life of nuclear power facility, so now Germany plans to start decommissioning all nuclear power facilities by the end of 2022. Several EU countries took a decision on decommissioning of nuclear power facilities. In Italy in referendum the majority voted against nuclear power. In Switzerland was decided to close all nuclear power facilities by 2034. It should be noted that about 30% of all EU energy is generated at nuclear power facilities. Thus, if nuclear energy is abandoned, and at the same time there is increasing of energy consumption, existing energy resources will need to be replaced. It is predicted that RES will be an alternative source [15]. RES takes a significant place, for example, BP has a biogas plant in Brazil, 16 onshore wind farms in the United States, as well as solar power plants in Germany and the United States.

In contrast to Western companies, Russian oil and gas companies invest not so much in the development of "green" energy. In the future, lack of this investment direction for Russian companies can be the reason of losing technological prospects and leader positions on the global energy market. To reach the share of RES in the energy balance, according to draft of Russian Energy strategy (more than 3% of total electricity generation by 2035), it is necessary to invest at least $ 1.7 billion USD annually. The achievement of 3% by 2035 brings Russia closer to indicators of developed economies

[13].

In terms of energy security of the country and its individual regions, it is interesting to develop strategic reserves. State reserves are developed in most global leaders as a technology to support economic stability. Providing uninterrupted oil refining, companies create oil materials reserves (it allows to work continuously for 2-3 weeks in difficult situations). The largest reserve is the American state oil reserve (Strategic Petroleum Reserve, SPR). It is near of the major North American refining centers. Oil storage facilities are developed by drilling and dissolving salt with water. The volume of individual cavities is up to 6 million m^3. US plans to increase SPR to 1 billion barrels, and they are purposefully going to this goal. According to the US Department of energy, oil volume in SPR rose to 726 million barrels in 2010, and in 2011 reserve decreased due to the sale of 30.64 million barrels, because of losing production in Libya. In the following years, SPR has been grown.

Anti-Russian sanctions from the United States and Europe are aimed at restriction of access for national energy companies to new technologies and equipment, so it is a threat to Russian energy security [3]. As a threat to Russian energy security there is also prohibition on attracting long-term financing and on organizing joint ventures with foreign companies. Measures for national production development are well known for a long time — tax incentives, reimbursement of part of lending rate, accelerated depreciation and simplification of customs regime.

IV. Diversification of Energy Resources Supply

Geographical expansion of energy suppliers for European consumer is limited by availability of infrastructure and prices level.

Less than half of the EU gross domestic consumption is in European producers, while the rest of it covers by imports from third countries. Russia is the main exporter of oil, natural gas and coal. EU and Russia are convinced that there is a need to create an energy dialogue to discuss and solve problems related to energy trade, as well as opportunities to attract investment in Russian energy development. Disagreements over the third energy package made things tense between Russia and the EU.

Increasing of RES and energy efficiency are internal priorities of energy policy in most global economies, while outside it is liberalization of the market for energy suppliers.

For global processes in the EU, the third energy package acts as an internal document, defining rules of the game in the European market by influencing on business models, strategies and long-term supplies of external contractors. Package of laws can also be described as antitrust. Owner of mining assets is limited to own and transport energy resources. It divides companies vertically, separating from production, transport and sales components. In Russian companies' business strategies norms of the third energy package are taken into account, as it makes the most important decisions about construction of new gas pipelines, possibility of full usage of OPAL capacity and connection to TRANS-Adriatic pipeline. Responsibility for delivering gas to EU market falls on European operators, which reduces costs of Russian companies for infrastructure development.

It is necessary to do spot calculations to increase competitiveness of Russian gas. Russian coal continues to compete due to its quality and price, compare with European coal.

Aggravation of Russian-Ukrainian relations creates difficulties for energy resources transition through the Ukraine territory [4], [5]. Since the export gas transportation system (GTS) was concentrated on Ukrainian territory during the Soviet period, after 1991, Russia depends on cooperation with the EU: there was a need for contracts to transport gas through the Ukraine territory. Therefore, the most important case for development of Russian-European gas cooperation is to diversify supply by developing gas transport infrastructure. "Turkish stream" is being implemented; one line is intended for gas supply to Turkish consumers, the other for gas supply to countries of southern and south-eastern Europe. It allows to reduce transit through Ukraine. Nord stream and Nord stream-2 create the Northern corridor for gas transportation to Western Europe with a total volume of 110 billion m^3 [11]. Advantages of the northern gas transport corridor are shorter gas transportation route length compared with pipelines that pass through Eastern and Central Europe, lower costs for gas supply due to usage of latest technologies, providing greater pressure, high transmission speed and reduction of losses, as well as linking exports to giant (gas reserves) Bovanenkovskoye field [12]. The European energy Commission [16] insists on continuing Ukrainian GTS usage and concluding a long-term transit contract. It is necessary to highlight not only political, but also technical high risks due to the level of Ukrainian GTS amortization.

V. Increasing Environmental Requirements

Development of the Europe-2030 strategy has prejudged way of energy development in EU. Efforts to prevent global warming and possibility of imposing protective import duties from key trade partners have made issue of reducing CO_2 emissions as one of the most important issues in preparation of energy security programs. The Europe 2030 strategy plans to reduce greenhouse gas emissions by 40% of 1990 level by 2030. To achieve this goal, it is need to renounce usage of hydrocarbons and increase share of RES in European consumption up to 27% by 2030. In the light of current trends, European energy market transformes relations with energy suppliers [2]. Russia faced with these changes first, as the main supplier of oil, natural gas and coal to the EU.

Tightening requirements for environmental protection is the reason of changing auto transport from diesel fuel to gasoline, and this led to revision of technological schemes for oil refining and modernization of Russian refineries. At the beginning of the 21st century, modernization of Russian technological installations made it possible to start producing not only gasoline, but also diesel fuel in accordance with the Euro-5 standard in 2012 — much earlier than this standard became mandatory in Russia.

Global initiated prohibitions, for example, on limited usage of diesel cars in the city, are factor, correcting many Russian development programs. Madrid, Paris and Athens will prohibit in 2025, similar proposals in Stuttgart and Berlin. Restrictions on sulfur content in ship fuel are being introduced. As a result, it is possible to unbalance global markets for petroleum products. European diesel fuel market, as well as ship fuel market, are main export destinations for Russian companies, so in the future, modernization of Russian oil refineries should be carried out, according with requirements of global energy market.

In the future, several development results of Russian oil refining business may be unclaimed [19]. Abandoning fossil fuels policy in countries (due to hydrocarbons price, not just tightening environmental regulations) will slow down growth of demand for Russian energy resources. Therefore, at the national level and at the level of Russian companies, energy security issues are important for making management decisions, not only for energy resources consumers, but also for their suppliers.

VI. Russian oil service market

Lack of competitive national oil service market is the reason for technological lag between Russian service divisions and Western partners [22]. In the light of anti-Russian sanctions resource base deterioration became problem of Russian oil service. National service divisions can't cover almost half of exploitation work on fields with hard-to-recover reserves. In terms of supplying high-tech equipment dominance of international oil service companies increases the risks of dependence on technological import [17].

Until recently, development of Russian oilfield services market was characterized by consolidation of all activities within united production structure of separate company: apart from oil production, processing and transportation, companies and production associations carried out all types of work on exploration, well design, drilling, cementing, capital and current repairs, and other types of work. Russian oil service market appeared in the early 90's as an independent unit of industry.

Russian companies are still trying to make maximum engage of their affiliated service divisions to cover all range of field operations. Oilfield service contractors are engaged to cover requirements for high-tech services, equipment, software, and resources, because they do not have their own resources [3]. For example, apart from international oilfield services company, including well geophysical research, more than 70 service divisions of field operator and small national service companies are involved in the Vankor field.

Oilfield services markets in developed countries, represented by the largest international oilfield service corporations (the "Big four" - Schlumberger, Halliburton, Weatherford, Baker Huges), can be described as formed and competitive [18]. In the US or UK, the oilfield services industry was formed as an independent sector, however associated with the extractive industry. This approach allows to develop deposits faster and to respond more effectively to changes in different development dynamics [8].

VII. Conclusion

Developed countries mostly care about reducing energy dependence on third countries, as well as an environmental aspect. In developing countries, there is a trend to consume the cheapest energy. Under the influence of modern trends, the world market of fuel and energy resources is being transformed. New energy exporters enter the energy market, alternative energy is developing in the world, and energy resources import requirement for countries is changing.

Despite of EU countries desire to diversify their imports, now Russian energy resources cannot be replaced on the European market. Anti-Russian sanctions have significantly weakened energy relations between Russia and EU. Russian companies faced with these changes, as suppliers of oil, natural gas and coal to European market.

When consumer of energy resources has reliable access to them, the seller has access to its consumers, and implementation process is uninterrupted at stable and reasonable prices, improving energy security requires a certain economic policy from consumer-States and from supplier-States, as well as from business. Energy security is based on applying of all regulatory mechanisms.

In order to solve problems of energy security, measures are necessary to protect national interests on global markets, as well as measures to diversify sources in the energy balance, develop the RES market, develop gas industry [8], and increase LNG.

Taking into account external factors helps to reduce risks on the Russian economy. Following proposed business principles can lead to economic efficiency decrease of national business. Direct imposition of external conditions has it negative effect. For example, Gazprom's feature and one of its advantages is that it is both a producer and a supplier of energy resources. Gazprom has a strong resource base and diversified gas transport infrastructure. Due to Russia's geographical location, Gazprom has an opportunity to be an energy bridge between European and Asian markets, supplying its own gas and providing gas transit services to other producers.

The remoteness of Russian fields from points of consumption, limited logistics of approach to deposit, extreme depth of occurrence and other factors are characteristics of hard-to-recover reserves, and the problem of extracting is the most important in the national oil and gas sector. Lack of a competitive oil service market is the reason of technological lag between Russian service divisions and Western partners. The deterioration of resource base in the light of anti-Russian sanctions has exacerbated Russian oil service's problems. As suppliers of integrated solutions for most projects, attracting international oilfield service companies bears risks. Energy companies are becoming mostly dependent on foreign technologies in the Russian oilfield services market. Imposition of sectoral sanctions by the US and EU countries has become an illustration of potential technological dependence threat and also lag in this market. Most of the leading international oil service companies, such as

Halliburton, Weatherford, and Baker Huges, refused to implement projects in Russia [12]. Searching for alternatives bears risks of production failures, bad equipment quality, equipment configuration, and overcharging.

Energy security overall assessment should be based on most important state indicators' status. In the future, analysis of national energy security should be based on current values, such as annual increase ratio of primary energy to the volume of their production, natural gas share in structure of primary energy balance, investment programs implementation by energy companies, change in energy use as per unit, etc.

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