

The Energy Component in the System of Economic and National Security of a State

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ABSTRACT: This research article examines the theoretical aspects of the formation of energy security as a component of the national security complex of a country. The study provides a general description of the energy block and financial resources, as well as their relationship with national security. The main directions of the influence of energy security on the national security of the Russian Federation are formed, including aspects of sustainable development and protection of economic interests. A comprehensive assessment of the impact of the energy component on the state of national security of the Russian Federation is carried out based on the analysis of statistical data, a retrospective analysis of the interaction of the subsystems of the national security system, and an integral assessment model supported by expert evaluation. The analysis covered data for 2017–2023 and demonstrated that the degree of dependence between the energy component and national security remains at a high to critical level (integral score range 2.4–3.0). The findings contribute a structured methodological framework for assessing the influence of the fuel and energy complex on national security and provide practical recommendations for mitigating excessive dependence and ensuring sustainable development. The results of the analysis can be used for the purpose of further regulation of the level of influence of the fuel and energy complex on the state of energy and national security of the Russian Federation, as well as overcoming their close relationship.

Keywords: economic security, energy security, oil and gas sector of the Russian economy, oil and gas complex, integrated assessment, expert assessment.

I. INTRODUCTION

The modern global economy, characterized by increasing geopolitical tensions and structural transformations, has placed the issue of economic security at the forefront of national strategies. For resource-

rich nations like the Russian Federation, this prioritization translates into a critical research problem, which is the systemic vulnerability of national security to fluctuations in the energy sector. Studies have shown that increased global reliance on imports, supply chain instability, geopolitical tensions, extreme weather events, and cyber threats has led to economic instability, weakened defense capabilities, and reduced national resilience. Geopolitical maneuvers among nations will alter the supply and demand dynamics of many energy kinds, resulting in pronounced price volatility and substantially affecting the energy market and its participants. Also, Historical oil crises, such the Fourth Middle Eastern War and the Iran-Iraq War, have caused substantial disruptions in oil supply and pronounced increases in oil prices, resulting in extensive ramifications for the world economy [1-3].

All subjects, at the beginning of their life path, are confronted with a kind of "irritants", which represent a certain range of risks for them and, in the future, threats to their normal development, and sometimes even to their very existence. In order to be able to resist these obstacles, the subjects must first gain a minimum of experience in dealing with and neutralizing the dangers. Having analyzed the first "attempts" to overcome obstacles, i.e. the accumulated experience, the subjects form their own system. In the future, this system will allow them to react in time or even avoid threats that impede the realization of their interests. The stages that the subject goes through in the process of forming methods and models of interaction with risk may vary depending on the conditions in which this process was initiated. But despite the significant differences, they will together form the concept of "security".

Based on this, it should be noted that security itself will be individual for each subject, since their approach to responding to crisis phenomena varies significantly. Such a spread of initial data in the formation of the final variable in the form of security itself determines its division into various components. Security develops and improves together with the subject, "absorbing" the experience of interaction with the operating environment, which often creates obstacles in the subject's path. Thus, the larger the subject becomes, the more the concept of security is fragmented. The state is one of the subjects whose experience in counteracting risks and threats is colossal, and thus the security system itself.

In recent years, countries around the world have faced many economic fluctuations. In the context of increasing globalization, this again raises issues of economic security and requires its rethinking. These changes encourage states to seek new policy approaches to strengthen economic security in modern conditions. Realists question its effectiveness in normalizing international relations. Neoliberals, on the other hand, argue that increased economic interdependence can promote cooperation among states, despite the high costs of exiting the system. This interdependence can also exacerbate the differences between developed and developing countries. State security can be conventionally represented as the root system of a plant. Each branch corresponds to the country's sphere of activity and forms a separate security block, for example, economic, environmental, financial, food, energy and other components of national security. Analysis of studies by foreign authors allows us to identify separate thematic clusters in understanding the phenomenological field of the concept of "national security". Here are the main ones:

- Military Security. Research in this area focuses on military-political aspects, including threats from other states and defense organizations [4-9].
- Economic security. This cluster covers issues of protecting the economic interests of the state, including resilience to economic crises and external economic threats [10, 11].
- Social security. Research focuses on aspects of social stability, including migration, demographic change, and internal conflicts that may threaten national security [12].
- Environmental security. This cluster considers the impact of environmental factors on national security, including climate change, natural resources and their depletion [13].
- Cybersecurity. Current research focuses on threats in cyberspace, including cyberattacks, protection of information infrastructure, and data security [14].
- Global security. This cluster includes issues of global cooperation, international institutions, and collective security in the context of global threats [15].

Within the framework of domestic approaches to considering the same issue of the phenomenological field of the concept of "national security", several research clusters can be distinguished below, which reveal the semantic content of this concept.

- Military security. Russian researchers focus on military-strategic aspects, including threats from NATO and other states, as well as the role of the army in ensuring security [16].
- Economic security. This cluster considers issues of protecting the economic interests of the state, including resilience to external economic sanctions and crises [17-21].
- Social security. Research focuses on aspects of social stability, such as demographic changes, migration and internal conflicts [22-24].
- Information security. This cluster includes issues of information security, cyber threats and protection of information infrastructure from external and internal threats [25, 26].
- Environmental security. Russian researchers focus on the impact of environmental factors, such as natural disasters and climate change, on national security [27-29].
- Global security. This cluster examines issues of international cooperation, Russia's role in global security and the influence of international organizations [1, 30].

II. RELATED WORK

Recent studies have explored the interdependence between energy and national security. Mara et al. [31] conducted an assessment of the energy and national security sector and highlighted the shortage or the absence of long-term cross-state indices or models that reflect energy, economic, and national security. In general, their research sought to monitor how energy security is addressed in national security. However, from a practical standpoint, the analysis revealed that there is no apparent link between energy and national security indicators in general, implying that energy cannot be considered the foundation of national security but rather one of several components that contribute to it. But this result is constrained by the shortage of statistical data and the absence of a model that addressed geographical pressure, alternative energy sources except electricity, and the shortage of indices of national and economic security. These inadequacies undermine the study's comprehensibility, and our study seeks to fill that gap [31].

Gitelman et al. [7] conducted a comprehensive analysis of contemporary challenges and remedies, including thermal and wind turbine energy. The authors support the claim that energy security is a complex category that expresses the ability of the region's fuel and energy complex to supply the required amount and range of energy resources to the domestic market at stable and reasonable prices, to promptly mitigate unexpected fluctuations in demand for fuel and energy resources, and to ensure continuous energy supply and energy carrier parameters in real time. Based on an examination of scholarly articles and actual energy security models, the authors created theoretical provisions, methodological principles, and management tools for energy security that satisfy modern standards. A shortcoming of this study is that, while climatic and other elements were examined, geographical implications were overlooked, and a full model was merely suggested rather than thoroughly developed. Godzimirski [17] emphasized the need to revisit Russia's current economic model because factors such as increased price volatility on global markets, changes in global demand patterns for energy resources, development of energy-saving technologies, lower material intensity of new products, and the development of green technologies may undermine its viability. He advised increasing the Russian economy's energy efficiency, developing energy infrastructure, and implementing energy-saving technology; however, as a result of the present sanctions on Russia, geographical implications may be limited.

This research seeks to provide a structured, quantitative, and historically informed framework to evaluate the impact of the energy sector on national security in Russia, addressing existing gaps and the necessity for a practical model, underpinned by recent data and expert analysis. It aims to offer concrete recommendations customized to the prevailing geopolitical and economic landscape, rendering it both an academic and policy-relevant analysis. These thematic clusters emphasize the multifaceted nature of the concept of national security and the need for an integrated approach to understanding and researching it. Each block is closely related to the "apex", i.e. the country's national security, which is why the slightest changes within the block will affect the entire system. Energy security has been of the greatest interest in the last 20-30 years, which is historically conditioned for the Russian Federation, since the state is one of the largest suppliers of energy resources. Therefore, the main objective of this research was to comprehensively evaluate the extent to which

the energy component influences the overall level of national security in the Russian Federation by applying an integral assessment model that combines statistical data and expert analysis, as well as to propose the further development of measures to fully or partially overcome the identified level of influence of the energy sector on national security.

The research hypothesis is as follows: the energy component of national security is one of the key criteria for the effective development and functioning of the Russian Federation in the international arena. The self-sufficiency of the Russian economy is a concept that describes the country's ability to meet its needs and develop the economy without significant dependence on external factors, such as the import of goods, technology or financial resources. In the context of Russia, this may also mean the country's energy security, as it possesses large reserves of natural resources such as oil and gas, and seeks to use its resources to ensure energy independence and sustainable development.

III. MATERIAL AND METHOD

1. RESEARCH DESIGN

To determine the degree of influence of a particular block on the state of national security, an integral assessment indicator is developed, which can then be interpreted on the basis of the final value according to the following scale in Table 1.

Table 1. Boundaries of the indicator of the integral assessment of the influence of a certain component on the state of national economic security.

Degree (level) of dependence	Total score
Critical level	3,00 and above
High level	2,40-2,99
Acceptable level	1,80-2,39
Normal level	1,20-1,79
Low level	1,19 and below

Source: Compiled by the authors based on the materials of the study

2. THEORETICAL FRAMEWORK

It is advisable to turn to the theoretical aspects of the study, namely the features of the formation of the very concept of "national security" and its elements in order to analyze the influence of a certain component (block) on the state of national security of the state. Consider the national security system of the Russian Federation and its components. The Russian Federation as a security subject is a complex and multifaceted object of research, since the experience of the formation and development of the state security system is great and includes many stages, as shown in Figure 1 [32].

The concept of "security" is formed and developed together with the subject that has the corresponding need. That is why the study of the national security system of the Russian Federation must begin from the moment of the state's birth. The era of Ancient Rus saw the emergence of state security. As such, at that time there was no national security system, but the first prerequisites for its formation and legislative consolidation appear. This process is reflected in the documents containing the priorities of state policy, in particular in the treaties with Byzantium in 912-945. The treaties provided a kind of guarantee for the peaceful stay of foreigners on the territory of one of the countries.

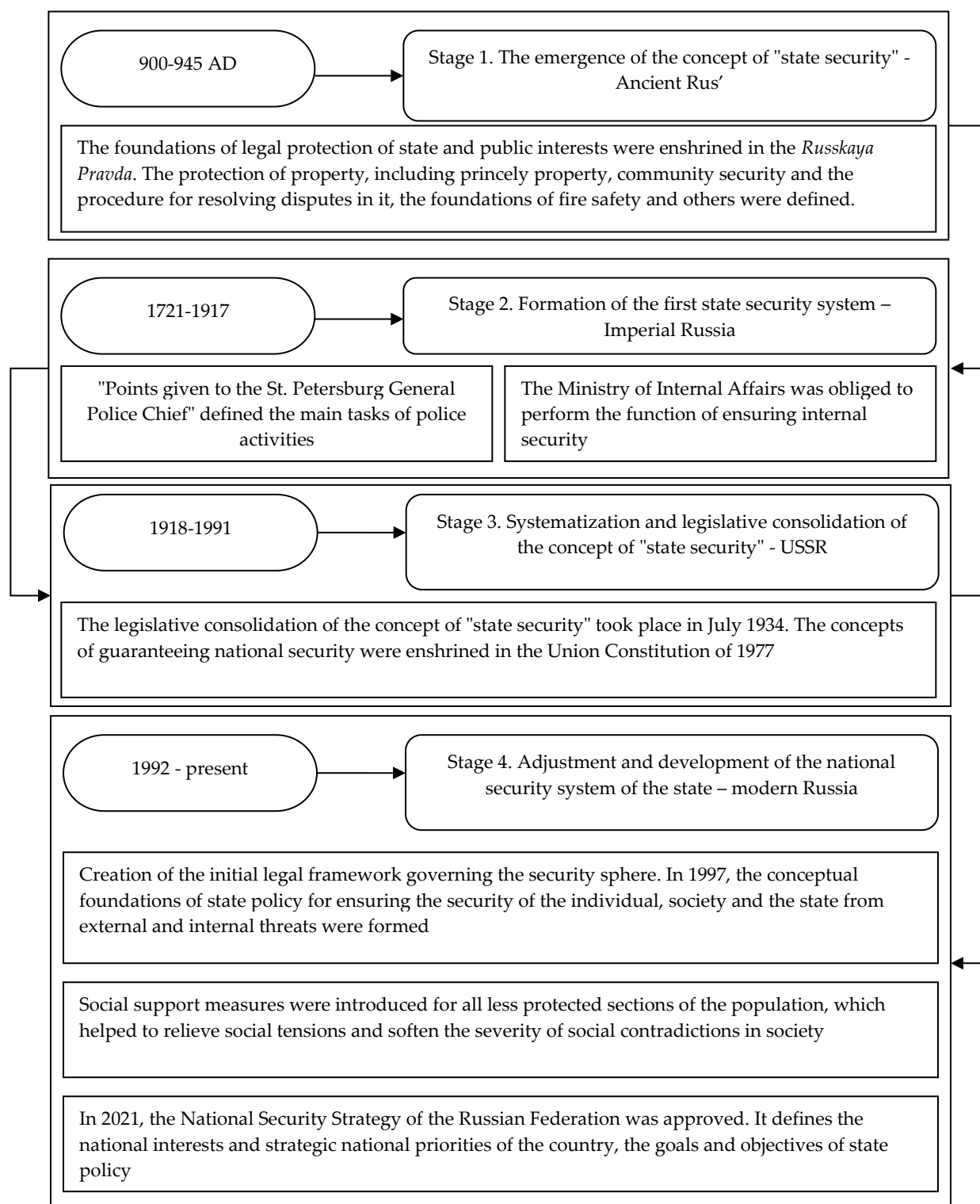


FIGURE 1. Stages of formation and development of the national security system of the Russian Federation, from the Ancient Rus' to the modern period

The further development of the security system is reflected in the Russkaya Pravda - the first legal code. Here, security is first delineated by spheres of influence, which is reflected in Figure 2 [33, 34]. According to Figure 2, the first national security system was quite primitive, but already included the functional blocks that exist today. The key issues in this "system" were state, public and personal security.

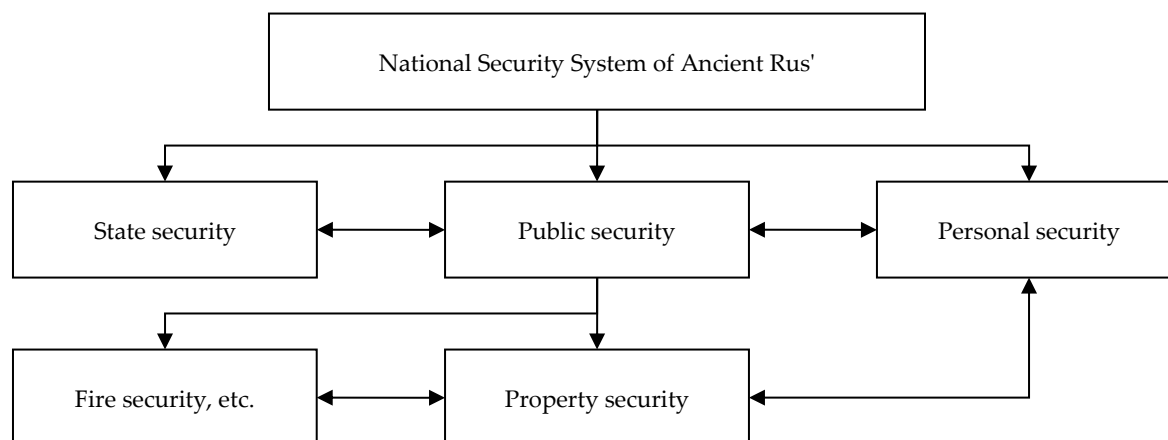


FIGURE 2. Scheme of interaction of subsystems of the national security system of the state of Ancient Rus'.

This system was an attempt to consolidate the foundations of legal protection of the interests of the individual, society and the state. For example, in the Russkaya Pravda, the goal of forming the property security block was listed as "protection of princely property" from criminal encroachments, and for public safety - "protection of the interests of the community and settlement of disputes within it." At the legislative level, the concept of "security" or "public safety" was defined in the Regulation "On Measures to Maintain State Order and Public Peace" [35], adopted after the assassination of Alexander II. This document does not provide a definition or any clear formulations of the concept of "security", but it forms the directions and features of ensuring state security, and also provides for measures of responsibility for illegal acts.

Directly in the Russian Federation, the concept of "security" received final "rooting" and was reflected in a whole block of regulatory legal acts, the list of which is formed and annually updated by a separate Security Council of the Russian Federation. At the present stage of the state development, the concept of "security" has received wide significance. Today, it accompanies all areas of activity of the Russian Federation. The basis for theoretical and practical activities in the field of direct national security in Russia was the Law No. 2446-1 [36]. The law introduced the concepts of "personal security" and "social security" with the indication of a clear relationship: "personal security - social security - state security". In economic science, the following blocks of national security of the Russian Federation are distinguished (Figure 3).



Source: Compiled by the authors based on the materials of Security Council of the Russian Federation [37].

FIGURE 3. Scheme of branching and interaction of functional blocks of national security of the Russian Federation.

Each of the blocks is formed in accordance with the development priorities of the state, as well as key areas of the functioning of the Russian Federation on the world stage.

3. DEFINITION AND SCOPE OF ENERGY SECURITY

Energy security has acquired the greatest interest in the last 20-30 years, which is historically conditioned for the Russian Federation, since the state is one of the largest suppliers of energy resources. Energy security is understood as the state of protection of the economy and population of the country from threats to national security in the energy sector, it includes:

- reliable provision of the domestic market with the required number of resources - oil, gas, coal, oil products;
- creation of the necessary reserves and back-ups in case of an increase in peak consumption.

In addition to the state, national security entities directly in the energy sector may include organizations of the fuel and energy complex and organizations operating in related sectors of the economy, implementing a set of legal, organizational, political, production and other measures aimed at prompt response to challenges and threats to the energy component of the national security of the Russian Federation. There are also alternative definitions of energy security [30], for example, as the state of protection of citizens, society, the state and the economy from the threat of a deficit in meeting their energy needs with economically accessible energy resources of acceptable quality, from the threat of disruptions in the uninterrupted power supply. The official position on issues of state energy security is formulated in the Doctrine of Energy Security of the Russian Federation, according to which the main areas of ensuring energy security are:

- improving public administration in the field of security;
- maintaining the mineral resource base and fixed production assets of organizations of the fuel and energy complex (hereinafter referred to as the FEC) at the level necessary to ensure energy security;
- improving the territorial and production structure of the FEC taking into account the need to strengthen the unity of the country's economic space;
- ensuring international legal protection of the interests of Russian organizations of the FEC and power engineering, supporting the export of their products, technologies and services;
- ensuring the technological independence of the FEC and increasing its competitiveness.

4. DATA COLLECTION, ANALYTICAL INDICATORS AND CALCULATION PROCEDURES

Statistical data (Table 2) can be used as initial indicators for conducting an integrated assessment of the impact of the energy component on the state of national security of the Russian Federation. The indicators shown in Table 2 can be used as initial indicators for conducting an integrated assessment of the impact of the energy component on the state of national security of the Russian Federation. With regard to the indicators, it is important to note that most of them are disclosed by the official statistical bodies of the country and its subjects, and individual specific indicators are calculated using the following formulas:

- For the indicator "Gross value added by activity type" formula 1 is used:

$$GVACTE_{t_1 p_t} = GVACE_{t_1 p_t}^{NK} + GVACE_{t_1 p_t}^{DH} + GVACE_{t_1 p_t}^{GU} + GVACE_{t_1 p_t}^{NKO}, \quad (1)$$

where $GVACE_{t_1 p_t}^{NK}$ - Gross value added (GVA) of the economy at current basic prices, created by economic entities of the sector "Non-financial corporations", for the reporting year at current prices; $GVACE_{t_1 p_t}^{DH}$ - Gross value added (GVA) of the economy at current basic prices, created by economic entities of the sector "Households", for the reporting year at current prices; $GVACE_{t_1 p_t}^{GU}$ - Gross value added (GVA) of the economy at current basic prices, created by economic entities of the "Public Administration" sector, for the reporting year at current prices; $GVACE_{t_1 p_t}^{NKO}$ - Gross value added (GVA) of the economy at current basic prices, created by economic entities of the sector "Non-profit organizations serving households", for the reporting year at current prices.

- For the indicator "Average revenue by industry per year", formula 2 is used:

$$A_R = \frac{T_R}{Q}, \quad (2)$$

Where A_R - average revenue of the economy (industry) in current basic prices for the reporting year; T_R - total revenue of all enterprises in the economy (industry) in current basic prices for the reporting year; Q - the total volume of output by all enterprises in the economy (industry) at current basic prices for the reporting year.

- For the indicator "Investments in fixed capital" formula 3 is applicable:

$$I_{o_e} = I_{K_t} \times k, \quad (3)$$

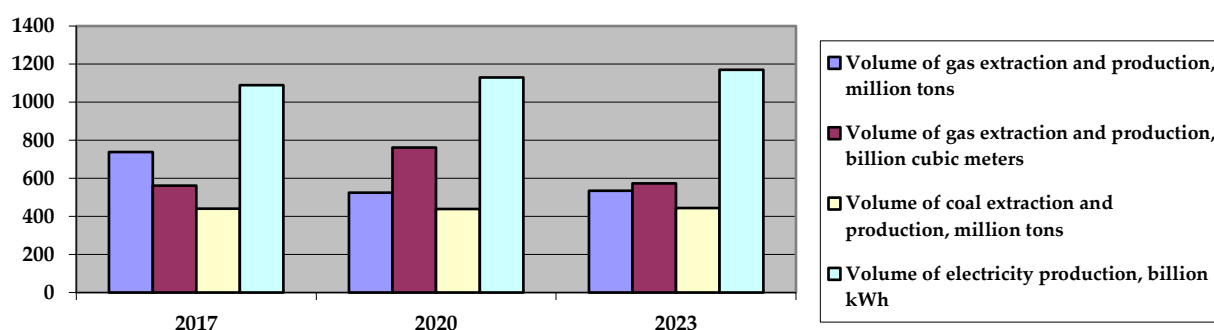
Where I_{K_T} - the volume of investments in fixed capital by organizations not related to small business entities for the period from the beginning of the reporting year; k - coefficient for calculating the volume of investments in fixed capital for a full range of economic entities. The dynamics of some indicators of Table 2 are presented in Figure 4.

Table 2. Initial data for conducting an integrated assessment of the impact of the energy component on the state of national security of the Russian Federation for 2017-2023.

No Item	Indicator	2017	2020	2023	Growth, %	Optimal value
1	Gross value added by activity type "Mining", in trillion rubles	9,03	9,19	19,33	1,8	2,1 times
2	Average revenue by industry per year, million rubles	32,7	24,1	37,8	-26,3	1,6 times

3	Average price of Brent oil, dollars per barrel	71,3	41,8	80,1	-41,4	1,9 times	Negative dynamics
4	Share of oil and gas sector in Russia's GDP, %	16,9	15,2	16,5	-10,1	2,5 times	
5	Share of oil and gas revenues in the federal budget, %	39,6	39,3	28,0	-0,8	-28,8	
6	Share of oil and gas in commodity exports, %	54,1	56,2	44,6	+3,9	-20,6	
7	Volume of gas extraction and production, million tons	738	524	535	-6,5	+2,1	Positive dynamics
8	Volume of gas extraction and production, billion cubic meters	561	762	573	+13,6	-24,8	
9	Volume of coal extraction and production, million tons	441	438	444	-1,7	+1,4	
10	Volume of electricity production, trillion kWh	1,09	1,13	1,17	+3,7	+3,5	
11	Investments in fixed capital of the fuel and energy complex, billion rubles	155	180	214	+16,1	+18,9	

Source: Compiled by the authors based on the materials of the study



Source: Compiled by the authors based on the materials of the study

FIGURE 4. Dynamics of the volume of extraction and production of the main types of energy resources for 2017-2023.

5. SECTORAL CONTEXT OF THE FUEL AND ENERGY COMPLEX (FEC)

Since energy security is directly related to the production and sale of energy resources in the Russian Federation, it is advisable to assess the impact of the energy component on the country's national security based on the state of the fuel and energy sector of the economy [18]. The Russian FEC includes the oil, gas, coal and peat industries, electricity and heat supply, and plays a key role in generating revenues for the Russian budgetary system. The share of the FEC in Russia's GDP is usually around 18-20%, and in the area of the fixed capital investments, the share of the fuel and energy complex accounts for about a third (39%) of the total investment volume. In the structure of budget revenues at all levels of the country's budget system, revenues from the production and sale of energy resources are estimated at 52% of all revenues.

IV. DATA ANALYSIS

1. ANALYTICAL APPROACH

A comprehensive assessment of the impact of the energy component on the state of national security of the Russian Federation was carried out on the basis of an analysis of statistical data, a retrospective analysis of the

interaction of the subsystems of the national security system, and an integrated assessment of the impact of the energy component on the state of national security of the Russian Federation. Based on the data provided in Table 2, the following trends in the development of the Russian FEC can be identified:

- The general decrease in the volumes of extraction and production of energy resources (except electricity), starting from 2020, is due to the unstable situation in the world markets, which in 2019-2021 was associated with the COVID-19 pandemic, and in 2022-2023 - with an unfavorable political situation.
- The volume of oil and gas exports has a stable downward trend. In 2020, the total volume of Russian oil exported from the customs territory of the Russian Federation amounted to 232 million tons, decreasing by -34 million tons (-12.7%) compared to 2017. In 2023, oil exports decreased by only -2 million tons (-0.8%), while Russian gas exports decreased by -112 million tons (-43.6%).
- The growth of investments in fixed assets of fuel and energy complex enterprises is due to their high importance for the Russian economy. In addition, as one of the capital-intensive industries, FEC requires constant state and investment support.

In general, the events of 2020 and 2022 turned out to be the most critical for the Russian FEC. In the first case, the complex faced falling demand for energy resources, in the second - with a technological blockade and increased dependence on foreign capital. In total, about 10 thousand restrictions were imposed on the country (2695 - before 02/22/2022, 8225 - after 02/22/2022).

Russian oil and gas companies had to leave their foreign subsidiaries (Gazprom Germania, Gazprom Marketing & Trading, Gazprom UK) with a ban on the use of trademarks in the EU and the United States. Subsequent packages of sanctions restrictions to some extent duplicated or supplemented the first three, for example, Canada imposed sanctions against Lukoil, Transneft and other organizations. Import duties on oil, gas and coal were also increased (up to 35% in some countries). In addition, the key problem of the country's fuel and energy complex remains the high depreciation of fixed assets, which is inherent in almost all material-intensive industries. The average depreciation for 2017-2023 was about 57.9% for the type of economic activity "mining" and 51.6% for the type of activity "provision of electricity, gas and steam". The challenges and threats to the functioning of the FEC pose a threat to the country's energy security, which in the future may negatively affect the national security of the Russian Federation and the functioning of the state as a self-sufficient entity as a whole.

2. EXPERT ASSESSMENT OF ENERGY COMPONENT INFLUENCE

An expert assessment of the impact of the energy component on the state of national economic security is given in Table 3 and Table 4.

Table 3. Expert assessment required to conduct an integrated assessment of the impact of the energy component on the state of national security of the Russian Federation for 2017-2023.

№ Item	Indicator	Specific gravity, %	Expert 1			Specific gravity, %	Expert 2			Specific gravity, %	Expert 3		
			2017	2020	2023		2017	2020	2023		2017	2020	2023
1	Gross value added by activity type "Mining", in trillion rubles	0,1	3	3	4	0,12	3	3	3	0,1	2	2	3
2	Average revenue by industry per year, million rubles	0,1	3	2	3	0,08	2	2	2	0,1	2	1	2
3	Average price of Brent oil, dollars per barrel	0,1	2	1	4	0,12	2	2	2	0,07	1	1	3

4	Share of oil and gas sector in Russia's GDP, %	0,1	3	3	1	0,08	3	3	3	0,1	2	2	1
5	Share of oil and gas revenues in the federal budget, %	0,15	2	2	4	0,08	3	3	3	0,1	1	1	3
6	Share of oil and gas in commodity exports, %	0,1	1	1	3	0,08	2	2	2	0,1	1	1	2
7	Volume of gas extraction and production, million tons	0,05	2	1	3	0,12	2	2	2	0,07	1	1	2
8	Volume of gas extraction and production, billion cubic meters	0,05	3	3	1	0,06	2	2	2	0,07	2	2	1
9	Volume of coal extraction and production, million tons	0,05	2	2	3	0,06	2	2	2	0,07	1	1	2
10	Volume of electricity production, trillion kWh	0,05	2	2	2	0,08	2	2	2	0,07	1	1	1
11	Investments in fixed capital of the fuel and energy complex, billion rubles	0,15	3	3	3	0,12	3	3	3	0,15	2	2	2
TOTAL		1	26	23	31	1	26	26	26	1	16	15	22

Source: Compiled by the authors based on the materials of the study

Table 4. Integrated assessment of the impact of the energy component on the state of national security of the Russian Federation for 2017-2023.

№ Item	Indicator	Expert 1			Expert 2			Expert 3		
		2017	2020	2023	2017	2020	2023	2017	2020	2023
1	Gross value added by activity type "Mining", in trillion rubles	0,3	0,3	0,4	0,36	0,36	0,36	0,2	0,2	0,3
2	Average revenue by industry per year, million rubles	0,3	0,2	0,3	0,16	0,16	0,16	0,2	0,1	0,2
3	Average price of Brent oil, dollars per barrel	0,2	0,1	0,4	0,24	0,24	0,24	0,07	0,07	0,21
4	Share of oil and gas sector in Russia's GDP, %	0,3	0,3	0,1	0,24	0,24	0,24	0,2	0,2	0,1
5	Share of oil and gas revenues in the federal budget, %	0,3	0,3	0,6	0,24	0,24	0,24	0,1	0,1	0,3
6	Share of oil and gas in commodity exports, %	0,1	0,1	0,3	0,16	0,16	0,16	0,1	0,1	0,2

7	Volume of gas extraction and production, million tons	0,1	0,05	0,15	0,24	0,24	0,24	0,07	0,07	0,14
8	Volume of gas extraction and production, billion cubic meters	0,15	0,15	0,05	0,12	0,12	0,12	0,14	0,14	0,07
9	Volume of coal extraction and production, million tons	0,1	0,1	0,15	0,12	0,12	0,12	0,07	0,07	0,14
10	Volume of electricity production, trillion kWh	0,1	0,1	0,1	0,16	0,16	0,16	0,07	0,07	0,07
11	Investments in fixed capital of the fuel and energy complex, billion rubles	0,45	0,45	0,45	0,36	0,36	0,36	0,3	0,3	0,3
	Total integral assessment	2,4	2,15	3	2,4	2,4	2,4	1,52	1,42	2,03
	Average assessment for the period under study		2,52			2,4			1,66	

Source: Compiled by the authors based on the materials of the study

3. INTEGRATED ASSESSMENT RESULTS

Based on the results of this assessment, the following values of the final integral indicator for 2017-2023 were obtained:

- the score of expert No. 1 showed that the degree of influence of energy security on the state of national security of the Russian Federation is within the high level of dependence, which initially tends to decrease (2020), but then acquires the value of the critical level of dependence (3.00 - 2023);
- the score of expert No. 2 showed a stable tendency to maintain a high level of dependence of national security on the energy sector. The value remained at 2.40 for the entire period;
- the score of expert No. 3 differs significantly from those presented above, since according to it, the level of dependence of the studied variables tended to decrease, being within the normal value (1.52 - 2017, 1.42 - 2020), and then increased to 2.03, that is, an acceptable level of dependence.

The results of the analysis can be used for the purpose of further regulation of the level of influence of the fuel and energy complex on the state of energy and national security of the Russian Federation, as well as for overcoming their close relationship.

4. VALIDATION OF ANALYTICAL RESULTS

To ensure the reliability and validity of the results, a verification procedure was implemented. Expert evaluations were carried out independently by three specialists from different research institutions, and the consistency of their assessments was examined using an agreement index (Kendall's $W = 0.82$), which indicates a high level of concordance among experts. In addition, correlation analysis ($r = 0.88$) confirmed a strong alignment between the study's derived values and observed national energy performance.

V. DISCUSSION

The study revealed a high degree of dependence of the state of national security of the Russian Federation on its energy component, which confirms the hypothesis formulated above, which consisted in placing the energy component on a par with the key and most significant components of the national security of the state. This aligns with the study of Žuk and Žuk [38] suggested that in an approach to promote nationalism and national energy security, in conjunction to fiscal policies, military might, and state administration, energy management becomes central to state authority and is employed to replicate and solidify order within a state's borders. According to Hussain [21], the factors of national security might vary based on one's point of view and perception. The factors of national security are linked to the elements of national power. The non-military components of national security include economic, environmental, and energy security.

Such an indicator of the level of dependence cannot be interpreted as purely negative or positive. For the national security of the Russian Federation, it is advisable to interpret it depending on the time and state of the world economic system at the time of the study and at the moment of direct application of measures and

integration of the proposals formulated by the authors. Due to its extreme vulnerability to changes in the global energy market and geopolitical pressure, which can be harmful to its economy and international relations, Russia's heavy reliance on energy security is generally seen negatively [19]. Maleki and Shokri [32] concluded that the 2022 sanctions have a major influence on Russia's energy security. In terms of dollar value, Russian natural gas exports fell the most. Despite the constraints, Russia was able to maintain its oil shipments. Using Russia as a case study, Yasmeen and Shah (2025) believes that the dependence on energy security is negative but considering the time of research (post-sanction era), they believe that the conflict has caused a shift and a reduction in dependence on fossil fuel from Russia but an increase in renewable energy. Furthermore, highlighting the influence of geographical influences.

In addition, the leading role in the interpretation of the results of the study is played by the methodology used within its framework. Thus, the integrated assessment, although it allows analyzing a wide range of factual data for compliance with their threshold values, however, includes such a stage as the expert assessment of the obtained results. The expert assessment itself acts as a subjective research method, i.e. the results depend almost entirely on the person conducting the assessment. For example, if an expert, based on his convictions and internal motives, decides that the arguments presented in the previously conducted studies are not reliable, then his opinion within the framework of his own study will also contradict them. This aligns with the study of Von Soest [39] who believed that expert opinions and assessments are always subjective. He further recommended that by combining expert interviews, experimental approaches, and internet interviewing, one can significantly increase the evidentiary value of this crucial data collection strategy. This intrinsic subjectivity emphasizes how difficult it is to make a firm judgment on a complicated topic like energy security. Therefore, this methodological constraint must be taken into consideration in any interpretation of Russia's energy dependence.

In order to eliminate subjectivity in further studies in the field chosen by the authors, it is advisable to use the methods of mathematical modeling, which, although not completely, exclude the subjective factor, since they use precise formulas and formulations of rules. This is consistent with current research, which suggests that mathematical models give an objective framework for analysis and prediction, allowing researchers to quantify variables and test hypotheses systematically. Researchers can explore complicated phenomena more objectively and consistently by expressing a system with mathematical equations and concepts [40].

For example, Fedorchenko and Fedorchenko [13] propose the use of several variants of the integral assessment methodology based on mathematical and statistical indicators and coefficients. Fedorchenko and Fedorchenko [13] make a brief calculation for each of the proposed methods using the corresponding formulas. The result for each of them is approximately at the same level, which corresponds to a fairly low indicator of energy security and, accordingly, the presence of high risks for the national security of the country. Thus, the results of the research of Fedorchenko and Fedorchenko [13] approximately coincide with the results of the above study, conducted by calculating the integral assessment of economic security.

The assessment conducted by the authors is more objective and can be presented not only to the scientific community, but also to the authorities of the Russian Federation as a source for identifying and forming a list of threats to the national security of the country. Existing Russian energy security models are still constrained by simplistic assumptions and insufficient connections, despite the growing awareness of the connection between climate change, energy, and security. For instance, IAM-based analyses of climate impacts in Russia yield wildly disparate results, ranging from significant economic losses to possible gains, according to Porfiriev et al. [41], who specifically warn that these "crude" estimates leave out important adaptation measures. Similarly, Pacillo et al. [42] stress that a lot of research on climate security assumes direct, linear relationships and disregards intermediate mechanisms and contextual factors. Therefore, current assessments underestimate the potential for climate stressors (wildfires, permafrost thawing, and extreme weather) to increase the risks associated with the energy supply.

The importance of energy storage has also been underestimated; according to recent modeling of solar projects in Russia, only scenarios with battery storage had positive net present value (NPV), while all other variants without storage (and without special tariff support) failed to recover costs over 25-year lifetimes [43]. In summary, renewable energy sources face challenges in the absence of market and storage reforms. In the Russian context, the switch to renewable energy poses particular risks. Domestic wind and solar industries are

still in their infancy, and projects continue to rely heavily on subsidies. Only two out of seven scenarios in one study produced positive returns; those two scenarios included storage, indicating that the majority of renewable energy projects are currently unprofitable [43].

The main limitation of this study lies in the lack of disaggregated regional data on the fuel and energy complex, which restricts the precision of the integral assessment and limits the ability to capture regional variations in energy security across the Russian Federation. At the same time, the study provides one of the most comprehensive analyses of the relationship between energy and national security in Russia, integrating statistical, historical, and expert-based methods within a single framework.

Future studies should develop integrated climate, energy, and security models specifically for Russia to overcome these constraints. These models should explicitly link sociopolitical security dynamics with geophysical impacts, such as permafrost loss and shifting hydrology. As recommended by Pacillo et al. [42], these models must use mixed qualitative–quantitative frameworks and include uncertainty analysis and adaptation strategies. To capture supply chain risks and flexibility benefits, empirical research should systematically assess critical material constraints and energy storage pathways (batteries, pumped hydro, hydrogen). Strategic reforms are required on the policy side [44, 45]. Energy and climate doctrines should be aligned to treat climate change as a primary energy security issue, and low-carbon and storage-equipped projects should be rewarded through support mechanisms.

VI. CONCLUSION

The obtained results of the study allowed us to develop possible recommended measures to neutralize threats to energy security and reduce the close connection between it and the national security of the Russian Federation. Strategically important for ensuring the energy security of the Russian FEC is overcoming technical and technological threats that were caused by the high depreciation of fixed assets, as well as the lack of our own developments in this area. In general, the following measures can be used to neutralize the threat:

- deepening the processing and extraction of energy resources, especially oil, which will increase the industry's profits by selling not raw materials, but finished products, the cost of which is much higher;
- development and modernization of Russian oil refineries. In Russia, there are 37 large oil refineries with a processing capacity of more than 1 million tons per year, as well as mini-refineries;
- increasing the supply of Russian energy resources to the domestic market.

In addition, it is strategically important for the Russian FEC to build business relations with China and India, since these countries are large markets for Russian energy resources. In order to neutralize the growing influence of the FEC on the country's economy, the following measures can be taken: Reduce the production of fuel and energy products by reducing their exports, while expanding the level of their domestic consumption with simultaneous outpacing growth of GDP. This will free up investment funds that are being spent on the development of extractive industries and redirect them to the development of manufacturing industries.

- Actively implement advanced technologies at Russian enterprises. For example, combined-cycle plants and combined heat and power plants in the electric power industry, engines running on electricity, hydrogen and natural gas in the transportation sector.
- Improve the regulatory framework in the FEC. This will reduce administrative barriers, increase investment attractiveness and efficiency of the FEC.
- Stimulate measures to reduce the negative impact on the environment based on domestic technologies.
- Accelerate the implementation and expansion of import substitution programs in order to resolve the issue of technological independence of the country.
- Take into account socio-economic monitoring in the country's FEC. It will allow to track and record the maximum permissible levels of deviation from the norm of controlled indicators.

In modern conditions, when Russia is receiving more and more challenges from the United States and the EU countries, it is worth thinking about and revising the importance of energy security as the main component of economic and financial security. Now the Russian Federation is facing a choice on which its further prosperity and development depend. One of the options for Russia's further development could be the opportunity to reach agreements with the West and Europe. Another path is the creation of a strong,

prosperous state that is independent of external partners and capable of defending its national and international interests.

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Conceptualization, AA and DS; methodology, SZ; software, KT; validation, AA, DS, LR and SZ; formal analysis, SZ; investigation, DS; resources, AA; data curation, AM; writing—original draft preparation, SZ; writing—review and editing, AA, EK; visualization, AM and KT; supervision, project administration, DS. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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