

УДК 338.49

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THE MULTIFACETED DEVELOPMENT SCENARIOS OF THE DOMESTIC GAS INDUSTRY MAKE IT DIFFICULT TO RESTORE ITS POTENTIAL

The article analyzes the economic state of the Russian gas industry, including Gazprom, from the perspective of financial sufficiency to complete the national social gasification / regasification program. It examines the reorientation of gas exports to the East, the development of LNG infrastructure and an icebreaker fleet to access new markets. The study aims at a comprehensive economic assessment of regional development programs based on hydrocarbons: gas liquefaction clusters, deep gas processing, innovative high-tech production, and environmental protection. The findings rely on non-public official data on identified industry problems. Research methods include activity-based comparative studies and statistics; the conceptual approaches have been cross-reviewed. The article concludes with three interim conclusions.

Keywords: pre-gasification; global market; gas standoff; supply routes; logistics connections; gas chemistry; ESG principles.

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МНОГОЛИКИЕ СЦЕНАРИИ РАЗВИТИЯ ОТЕЧЕСТВЕННОЙ ГАЗОВОЙ ОТРАСЛИ ЗАТРУДНЯЮТ ВОССТАНОВЛЕНИЕ ЕЁ ПОТЕНЦИАЛА

В статье анализируется экономическое состояние российской газовой отрасли, включая ПАО «Газпром», с точки зрения достаточности финансовых ресурсов для завершения программы социальной газификации/догазификации регионов. Рассматриваются переориентация газового экспорта на Восток, создание комплекса СПГ и ледокольного флота для его транспортировки на новые рынки. Цель исследования — комплексная экономическая оценка реализации государственных программ регионального развития на базе углеводородов: создание газовых кластеров по сжижению, глубокой переработке газа, выпуску инновационной продукции и экологической защите. Результаты основаны на анализе непубличной ведомственной информации по выявленным проблемам отрасли. Методы исследования — деятельностная компаративистика и статистика; концептуальные подходы прошли перекрёстное обсуждение. Статья завершается тремя промежуточными выводами.

Ключевые слова: догазификация; глобальный рынок; газовое противостояние; маршруты поставок; логистика связей; газохимия; принципы ESG.

DOI: 10.36807/2411-7269-2026-2-45-109-116

Introduction. Currently, the Russian gas industry is faced with the need to quickly develop a concept for reorienting the development strategy of the entire domestic gas complex and implementing global gasification of the country while implementing many national projects. Thus, at the plenary session of the International Forum "Russian Energy Week" on September 26, 2024, Russian President V.V. Putin devoted a significant part of his report to these problems. He clarified that the country is expanding the geography and scale of energy cooperation; at the same time, new routes are being built to dynamically growing and attractively capacious markets, including the countries of the Eurasian Economic Community, the CIS, and southern Eurasia. Accordingly, supplies via the Power of Siberia gas pipeline are increasing. Exports of liquefied natural gas (hereinafter referred to as LNG [Tsatsulin, Bykov, 2023]) continue to grow. On our own behalf, we note that in the context of the gas confrontation on the European market, during 2024, the share of LNG in global gas consumption increased from 30% to 48%³, and the prospect of overstocking the global LNG market even loomed ahead.

As part of the already mentioned Russian Energy Week, the President of the Russian Federation noted that important strategic changes are being implemented in the gas industry, related not so

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³ Plenary session of the XIII International Gas Forum St. Petersburg "Gas Market-2024: Contours of the New World Order". <https://rutube.ru/video/6e3c439c68e13e7020eccc70069ac0b7/>.

much to the switching of export gas supplies from the West (the European market alone consumed up to 155 billion m³ annually) to the East, but rather to a significant increase in supplies to the domestic market, including the social gasification/pre-gasification program, which has been in full swing since the beginning of 2021. The recognized leader in the implementation of this state program is PJSC Gazprom, which, together with the Government of the Russian Federation, has developed a ten-year plan for the development of the gas industry. Such a long-term plan, according to current, of course, ideas, in case of its full implementation will allow not only to ensure sustainable development of the gas corporation itself, but also to create a new modern infrastructure adapted to changing vectors of supply geography, and will also provide an opportunity to improve the existing gas networks, organize logistics of new connections, rationalize transport routes, sharply increase the volumes of gas raw material processing by Russian capacities with a high level according to the established scale of production processes in favor of creating high-quality innovative and high-tech products for the open domestic market and the somewhat squeezed foreign market. True, for the successful implementation of all these urgent and useful initiatives, according to the authors' evaluative judgments, a radical institutional restructuring of the country's export-oriented complex is necessary.

1. Clarification of the problem and the purpose of the study

Here, an awkward question naturally arises: are there any real opportunities to solve such important declared tasks, which assume the actual availability of domestic means of high machinery and sufficient finances on the part of those structures that are currently responsible for their solutions. After all, after the start of the SVO, the conventional West introduced many sanctions restrictions, exceeding 31 thousand positions in 20 packages against our country (at the time of writing), including the sphere of LNG promotion to foreign markets. This massive and already felt by the Russian economy comprehensive western sanctions pressure resulted in a reduction in gas production by 7-8% and a drop in gas exports by 16% by the end of 2024¹. Although, as before, in the past year, friendly countries accounted for over 90% of Russia's energy exports. Thus, in June of this year, the following promising projects fell under such sensitive sanctions and restrictions for the domestic gas transportation complex: Arctic LNG-1 and Arctic LNG-3, Murmansk LNG, Gazprom Invest, Rusgazdobycha, Murmansk-Transgaz and OOO Ob Gas Chemical Complex. Moreover, our former pseudo- and quasi-market business partners in the globalized economy declared that they intend to limit the Russian budget's income from energy and hinder the development of already launched energy projects in the fuel and energy complex (hereinafter referred to as FEC). The Russian Cabinet of Ministers has approved an updated Strategy for the Development of the Mineral Resources Base until 2050. This was announced by Russian Prime Minister M.V. Mishustin while opening an operational meeting with his deputies. "The government has approved an updated Strategy for the Development of the Mineral Resources Base and has also extended planning in this important area for 15 years - until 2050," the Prime Minister said, adding that the document has updated the forecast technical and economic indicators, and the target scenario has formulated the main tasks. These include the discovery of new hydrocarbon deposits, for which it is necessary to increase efforts to comprehensively explore and develop explored territories, especially in hard-to-reach areas, including the Arctic and the Far East, despite the new risks and threats that have emerged [Imanov, 2023]. Today, there are 153 officially explored gas fields in the country. The development of a strategy "with a new geographical face" is extremely relevant, since, firstly, it is necessary to overcome the main uncertainties in the development of the oil and gas sector/complex of the Russian Federation for the next 20-25 years [Fomin et al., 2024]. Secondly, it is natural gas - today the most environmentally friendly, acceptably efficient hydrocarbon and still affordable - that accounts for 48% of the country's energy balance. Together with nuclear power (NPP), hydropower (HPP) and wind power (WPP), which have a minimal carbon footprint, this share is 85.2%.

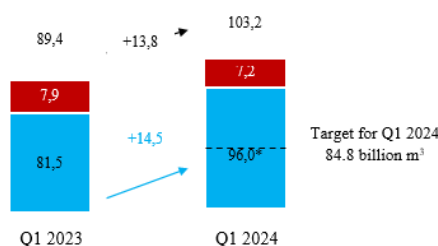
2. Results obtained

In the context of the seriousness of the listed problems, the sufficiency of financial capabilities of Russian gas flagships to start such significant transformations in the gas industry and implement truly large-scale projects comes to the fore. For example, in 2023, Gazprom had a net loss of RUB 639.0 billion according to RAS reporting and produced 156.0 billion m³ less natural gas than it had produced a year earlier. In the first half of 2024, Gazprom revealed a net loss of RUB 480.0 billion in its financial statements under Russian accounting standards, which is twice as much as this figure for the same period of the previous year. This loss of the corporation with a headcount approaching 500 thousand people is covered by the income of various structural divisions of the parent organization Gazpromneft (a significantly profitable asset of the holding, the management of which must be concerned about preserving the subsidiary) and Gazprombank. In general, according to the consolidated IFRS report-

¹ <https://rutube.ru/video/6e3c439c68e13e7020eccc70069ac0b7/>.

ing, the net profit of the PJSC has grown threefold over the same period, but it is technically difficult for analysts to isolate the financial component for gas, and reliable factorology is not always available.

Nevertheless, in all analytical estimates for the half-year for quantitative discrepancies, it is necessary to take into account the seasonality factors associated with the injection of gas into storage facilities for future sales. In addition to traditional seasonality, there are imbalance factors for the unevenness of production in an environmentally friendly way using renewable energy sources (solar, wind, hydropower, biomass, geothermal). It is also necessary to keep in mind the constant influential factor of the currency revaluation of the corporation's tangible and intangible assets. All of the above promises very strong volatility of gas prices in the spot market¹ and the so-called contractual obligations market in the coming months of 2024 and the first half of 2025. However, the authors of the article believe that the RAS methodology, from the point of view of the principles of its balance sheet consolidation, more accurately takes into account the profit and loss of PJSC Gazprom Group of Companies according to the presented official financial statements. However, despite this unfortunate circumstance, reflected in the RAS reporting and quarterly statistical reports, the plans for implementing the Gasification Program were not disrupted. Thus, following the results of the commercial closure, the volume of gas supplies in the first quarter of 2024 amounted to 96 billion m³, which is 11.2 billion m³ higher than Gazprom's target (84.8 billion m³) and 17.79% higher than a year ago*, as shown in Fig. 1. From other gas sources for the implementation of this program, on the contrary, supplies fell by 8.86%, but in general, the quarterly gas volumes involved in the program together increased by 15.44% over the year.



Blue – from Gazprom PJSC resources; Red – from other sources.

Fig. 1. Gas supplies by Gazprom Mezhhregiongaz Group in the first quarter of 2023-2024

Source of information: Gazprom Mezhhregiongaz.

Another obvious reason for the occurrence of the noted losses was overdue debts for supplied gas to end consumers, as evidenced by data broken down by individual subjects of the Russian Federation for the results of 2023. In total, gas is actually supplied by regional gas sales companies (hereinafter referred to as RGCs) and gas distribution organizations (hereinafter referred to as GDOs) in most subjects of the Russian Federation - more than 70. For most of these recipients, annoying payment arrears arose for various reasons, which was partially reflected in the diagrams in Fig. 2.

Over the five years by the end of 2023, the debt was reduced in 56 constituent entities of the Russian Federation, i.e. over the period 2018-2023, the number of regions that reduced their debt to Gazprom Group almost doubled. In 14 constituent entities of the Russian Federation by the beginning of 2024, the debt, despite the satisfactory dynamics of its repayment, remains at 4,200 million rubles, which reduces the standards of the required mobility of the holding's working capital.

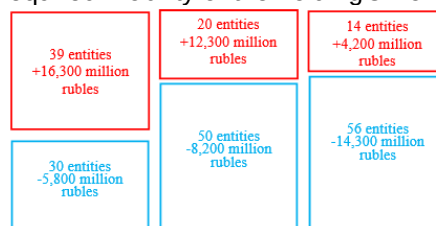


Fig. 2. Dynamics of overdue debt for supplied gas to end consumers by constituent entities of the Russian Federation, 2018-2023

Red – Debt increased; Blue – Debt decreased.

Source: Gazprom mezhregiongaz.

A more detailed picture of debt volatility in the context of the 5 leading constituent entities of the Federation according to the grouping indicator of increase/decrease is presented in Table 1; the general trend of the regional "fives" indicates some repayment of the incurred debt +3400 million rubles

¹ Thus, global gas prices in July-August 2024 fell compared to the previous year amid growing global reserves and declining demand forecasts. This, accordingly, affected the profitability of gas producers (decreasing margins), for example, the American company Cheniere Energy, whose net profit in the third quarter fell due to a decrease in margin by half - to \$ 893 million, and quarterly revenue in the gas segment fell by 12% - to \$ 3.55 billion.

against -2600 million rubles. At the same time, the implementation of the state program of social gasification / additional gasification in the country, which is supervised by the specialized structure of Gazprom, Mezhhregiongaz, is in full swing [Tsatsulin, Bykov, 2024]. Thus, on October 10, 2024, the head of Mezhhregiongaz S.V. Gustov launched 16 new regional networks of social gasification / additional gasification via teleconference at the International Forum "Gas Market-2024: Contours of the New World Order" in St. Petersburg¹. The dynamics of the implementation of the adopted plan and the prescribed forecast for 2024 for the implementation of contractual discipline for connecting households in the territory of the Russian Federation are shown in Fig. 3: the graph reflects the growing number of business contracts executed up to the boundaries of the applicants' plots, within the framework of the pre-gasification procedure, with a cumulative total; the dotted line indicates the forecast values of the main indicators for 2024.

Table 1 – The nature of overdue debt by subjects of the Russian Federation, million rubles

Subjects of the Federation with the largest annual increase in overdue debt	Amount of growth	Subjects of the Federation with the largest annual decrease in overdue debt	Amount of decrease
Tver Region	+900	Krasnodar Region	-800
Arkhangelsk Region	+800	Moscow Region	-700
Yaroslavl Region	+700	Perm Region	-500
North Ossetia – Alania	+600	Vladimir Region	-300
Primorsky Region	+400	Samara Region	-300
Total:	+3 400	Total:	-2 600

Source: Report of the management of Gazprom Mezhhregiongaz.

But in the near future, along with the implementation of gasification/pre-gasification plans, it is necessary to move on to solving the problems of sustainable and affordable energy supply, based on the use of the most rational options for such solutions among all available alternatives, taking into account the effectiveness of technological progress and regional characteristics of territories, breakthrough innovative achievements of scientific and technological progress, the pace of digitalization of the economy and even special promising developments in the field of artificial intelligence in relation to the gas industry [Bogatyrev, Tsatsulin, 2024].

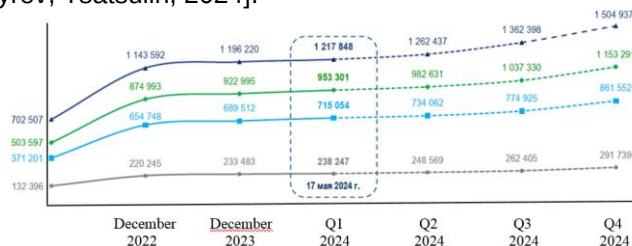


Fig. 3. Plan and forecast for 2024 for the execution of contracts for connecting households within the framework of pre-gasification as of 17.05.2024

- The created technical capability for connection taking into account the number of contracts executed up to the boundaries of the land plots of applicants in the Russian Federation as a whole;
- The number of contracts up to the boundaries of the land plots of applicants in the Russian Federation as a whole, including:
 - GC Gazprom Mezhhregiongaz;
 - Regional gasification operators, independent gas distribution organizations.

Source: Gazprom Mezhhregiongaz.

Thus, for purely economic reasons, the development of new fields in the Laptev Sea region has been suspended and exploratory drilling has been postponed for five years. The ultra-fast development of fields explored in the 1960s and 1970s, such as Samotlor in the Tyumen Region, Urengoy in the Yamal-Nenets Autonomous District, and other deposits during the period of the international "pipe-for-gas" deal, was to a certain extent the main reason for their barbaric exploitation. As a result, some of the fields were ruined by both the forced injection of water into the formations and the spontaneous flow of water from underground sources into the rapidly evacuated formations, that is, already completely freed from gas filling [Yalaletdinov et al., 2024].

The sad fate of many oil and gas fields can in no way be justified by the "fat years" of the economy of unrestrained consumption, which then fell into the period of stagnation. We have to recall these miscalculations of the previous leadership of the country now not in order to, by turning to the scientific heritage of the great scientist, Academician V. M. Bekhterev [Bekhterev, 1990], refute the attractive in its own way pragmatism of the complex in its image functional and at the same time behavioral, but absolutely irresponsible manifestation of the toxic meme "After us, at least later", popular in the minds of many. But to understand exclusively in this way that global challenges in the international hydrocarbon markets and the uncertain state of the world fuel and energy complex have created, paradoxically

¹ <https://musinlc.ru/peterburgskij-mezhdunarodnyj-gazovyj-forum-pmgf-2024>.

and as is typical for crisis circumstances, very favorable opportunities for a reasonable transformation of the Russian strategy for the development of the oil and gas sector for the next two to three decades. Here it is appropriate to recall the so-called first Russian turn to the East, which was fully formalized at the time (1905-1906) through the efforts of the first chairman of the Council of Ministers of the Russian Empire, S. Yu. Witte¹.

Nevertheless, during 2023, the processes of current financing under the Unified Gasification Operator (hereinafter referred to as the UGO, the official responsibility center) scheme and careful control over the expenditure of funds as economically justified expenses of Regional Energy Commissions (hereinafter referred to as RECs) were carried out steadily and systematically without any sporadic disruptions, which is reflected in the curves of the graph in Fig. 4. At the same time, the actual rates of financing of UGO events are quite consistent with the rates of expenditure of funds by the GRO RECs, and the indicator of the statistical summary of the analyzed technical and economic characteristics in the form of the distribution ratio (DR) is assessed at the end of the year as quite favorable: $DR_{REC/UGO} = 98,6 / 132,3 = 0,74528 \approx 74,53\%$.

However, here we cannot fail to take into account the recently sharply aggravated various problems of pipeline transportation of hydrocarbon raw materials. And if the transport sector of the economy is gradually leaving the era of oil dominance, then the fuel and energy sector economy is entering a new era of quite active interspecific fuel competition that has arisen on the basis of the targeted use of gas raw materials. Noteworthy is the sharp expansion of the scope of LNG application in gas-powered transport, including public transport (for example, in Volgograd, municipal buses are fueled with LNG), in agriculture, in particular, tractors and combines on LNG, moreover, in road transport - even hydrogen is used as a motor fuel² [Kulagin, Grushevenko, 2020].

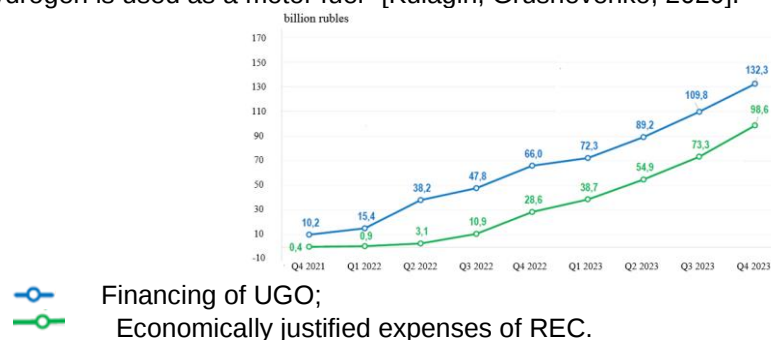


Fig. 4. Dynamics of financing and economically justified expenses according to REC decisions based on the results of 2023, billion rubles

Source: Gazprom Mezhhregiongaz.

Noting the scale of domestic supply of gas raw materials to consumers, Gazprom in 2024 continued to increase natural gas supplies from its own resources, provided that the official target supply indicator for 2023 was approved by the Board of Directors of PJSC Gazprom dated 20.12.2022 No. 3868 in the amount of 209.9 billion m³ and was exceeded by 0.76%. This is happening against the backdrop of a predicted decline in supplies from other market suppliers by 21.08%, which is clearly illustrated in Fig. 5.

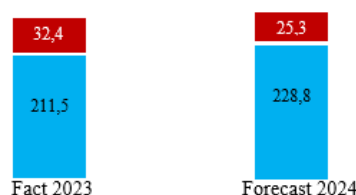


Fig. 5. Natural gas supplies by Gazprom Mezhhregiongaz Group in 2023-2024 (bln m³)
Blue – from the resources of PAO Gazprom; Red – other resource suppliers.

Source: Gazprom Mezhhregiongaz.

Of particular interest is the structure of consumption of gas raw materials for the needs of industrial sectors and social sector sectors in relation to the total volume of 243.9 billion m³ for the whole of

¹ <https://russiancouncil.ru/analytics-and-comments/analytics/sergey-vitte-i-pervyy-povorot-rossii-na-vostok/>.

² Although hydrogen energy has been considered an attractive path for the development of the fuel and energy complex since the mid-20th century, and research into the production and combustion of hydrogen has been conducted for about 200 years, nevertheless, as of 2024, the use of hydrogen as an energy source in the world is extremely insignificant. Almost all of its consumption occurs as a raw material in the production of ammonia and methanol, as well as in metallurgy, oil refining and petrochemistry. As a rule, hydrogen is an intermediate element in production chains - it is obtained in some technological processes and consumed in others within the same technological site [Global hydrogen trade ..., 2022]. The use of hydrogen as an automobile fuel was actively studied in the USSR during the Great Patriotic War, in particular by specialists from besieged Leningrad, for example, the inventor B.I. Shelishche [Brodsky, 1975].

2023. The role of gas raw materials in the schemes of its industrial processing, including primary processing, and its end-use products in the industries of the real sector of the economy looks relatively modest. This industrial restraint of possibilities is reflected in Fig. 6: with the separate use of gas raw materials as fuel for the electric power complex of the national economy at a level of 29.2% in metallurgy, petrochemistry, agroindustry and chemical products for agriculture, only about 18.7% of all supplied gas is consumed.

3. Cross-discussion. There is no objection to the assertions of industry experts and analysts that gas fields launched in the 60-70s of the last century are now significantly depleted. To revive them, it is necessary to drill through the earth's crust to gas-bearing strata to a depth of over 2 thousand meters, but these efforts will require other, more costly science-intensive and breakthrough technologies that the domestic oil and gas complex does not yet have [Plis et al., 2024].

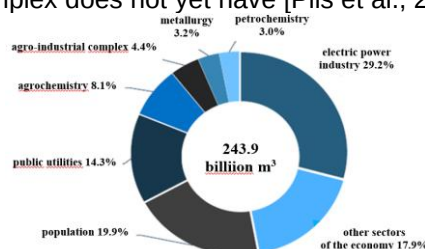


Fig. 6. Reported industry structure of gas supplies by Gazprom Mezhhregiongaz Group in 2024 (%)

Source: Gazprom Mezhhregiongaz.

Active revival of the specified project for these two countries can take place, according to the opinion of a team of highly qualified specialists and analysts of the Institute of Energy Research of the Russian Academy of Sciences, headed by the authoritative scientist Academician A.A. Makarov, only on the predicted horizon in the intermediate cutoff of 2035, when the PRC will consume more natural gas than all European countries combined. The total consumption of Asian countries that are not members of the Organization for Economic Cooperation and Development (OECD) will be equal to the volumes consumed in North America, and will confidently exceed it on the approach to 2050. According to the collective futurologist from the Institute of Energy Research of the Russian Academy of Sciences, the countries of South and Central America, including the new hydrocarbon player after 2015 – Guyana, will surpass the Asian countries that are members of the OECD in terms of their consumption volumes by 2050 [Forecast of Energy Development..., 2024]. As for the principles of forming the foreseeable future oil and gas market by 2050, it can be said that the market will remain conditionally based on "three pillars": North America (with the addition of Canada), the CIS countries and the Middle East, which together will provide over 70% of the world's hydrocarbon production. The authors of this article also looked at the forecast structural estimates of the gas component of the hydrocarbon market for three essentially classical scenarios for the development of the global fuel and energy complex by 2050: pessimistic ("fog" – in the terminology of the compilers of the ERI), optimal ("split"), optimistic ("key") – both in relation to global primary energy consumption by individual types, and in relation to global electricity production by types of energy resources in comparison with 2021 [Forecast for the Development of Energy..., 2024]. This year, obviously, served as the initial base, that is, the starting point for the implementation of procedures of either intricate extrapolation or correlation-regression modeling of an econometric type. The consumption and production structures projected for a quarter-century horizon, presented in Tables 2 and 3, were determined for the named scenarios, possibly taking into account a set of partial and pure coefficients of elasticity of the factorial influence of a group of pre-selected most significant causal features-factors on the already effective features-indicators¹. It is noteworthy that in all structural development scenarios recorded in the presented diagrams, the share of gas as an environmentally friendly natural asset of consumption is a stable 23% (Table 2). Here, in the interests of the correctness of the design of the calculations of the ERI RAS specialists shown in the work [Forecast of Energy Development..., 2024], it should be delicately noted that in most of the initial forecast characteristics for the structural scenarios included in the report, the final calculation of the "Structural Ratio (SR)" indicators by summation does not form a balance link for the totality of energy resources at a level of 100%, which, naturally, should have been eliminated by the authors of this article both in relation to the predicate of Table 2 and to Table 3.

¹ The modeling procedures, methods and tools of analytical calculations, as well as the author's forecasting concept are not provided in this ERI report, which is considered a generally accepted practice. Expert futurologists rarely specify the technique and details of their econometric modeling on the forecast horizon.

Table 2 – Forecast structure of global consumption by types of primary energy for 2050 in three scenarios for the development of the global fuel and energy complex, %

No. in order	Type of primary energy resource	Baseline extrapolation 2021	Forecast development scenario for 2050		
			pessimistic	optimal	optimistic
1	2	3	4	5	6
1	Oil	29	29	27	25
2	Gas	24	23	23	23
3	Coal	27	21	21	17
4	Atomic energy	5	6	6	6
5	Hydropower	3	3	3	3
6	Bioenergy	9	11	11	11
7	Other renewable energy sources	3	7	9	15
8	Total:	100	100	100	100

Source: compiled by co-authors, partly based on calculations [Forecast for the development of energy ..., 2024].

The forecast calculations of the structure of electricity generation in the global fuel and energy complex system for 2050 by sources of energy resources by the ERI RAS team demonstrate a noticeably lower share of gas among all types of energy resources from 22.5% to a range of 15-16% with a 1% variability level (Table 3), which is comparable to the value of statistical error. This downward trend, as it seems to the authors of the article, is most likely associated not only with the gradual depletion of gas fields everywhere, but also with the expected growth of market prices (up to 500 USD/thousand m³ in the assessment of the Chairman of the Management Board, Deputy Chairman of the Board of Directors of PJSC Gazprom A. B. Miller¹), as well as with the awkward, but further promotion of the green agenda against the background of long-term sanctions pressure in the context of global geopolitical and economic instability. An indicative comparative study can be considered the INEI forecast regarding the production of electricity by burning petroleum products, which dropped from 2.5 to 1% in all scenarios (Table 3). Apparently, the developers of the forecast left some types of fuel oil as an eternal fuel for small mobile objects for future periods. The fact of accomplishment at only a 1% level of statistical significance, expected in 2050, only confirms and strengthens the validity of the statement in the form of an aphorism by the outstanding scientist, Academician D. I. Mendeleev: "Burning oil is the same as heating a stove with banknotes."² In addition to the forecasted situation on the world market, which can naturally be adjusted and/or even distorted by future decisions of the forum of gas exporting countries, the work [Forecast of energy development ..., 2024] contains development scenarios separately for our country. In all the scenarios considered, gas consumption in the Russian Federation grows slightly and reaches 520-574 billion m³ by 2050, depending on the selected scenario.

Table 3 – Forecast structure of global electricity production by sources of origin for 2050 in three scenarios for the development of the global fuel and energy complex, %

No. in order	Type of source of electrical energy	Baseline extrapolation 2021	Forecast development scenario for 2050		
			pessimistic	optimal	optimistic
1	2	3	4	5	6
1	Petroleum products	2.5	1.5	1.0	1.0
2	Gas	22.5	16.0	16.0	15.0
3	Coal	36.0	25.0	23.5	14.0
4	Atomic energy	10.0	9.5	9.0	8.0
5	Hydropower	14.5	13.0	12.0	11.0
6	Bioenergy	3.0	4.0	3.5	3.0
7	Solar energy	4.0	16.0	18.0	24.0
8	Wind energy	7.0	14.0	16.0	23.0
9	Other renewable energy sources	0.5	1.0	1.0	1.0
10	Total:	100.0	100.0	100.0	100.0

Source: compiled by co-authors, partly based on calculations [Forecast for the development of energy ..., 2024].

The highest figures are, of course, found in the optimistic scenario (the "key"), where, despite increased efforts in the field of energy efficiency and energy saving, the required increase in gas use is stimulated by faster economic growth, especially in the east of the country. The presented forecast can also be interpreted by increased raw material consumption for own needs, including for the operation of LNG plants, greater use of gas fuels in the generation of electric energy due to the partial replacement of coal and increased demand for electricity. On our own behalf, we note that the indicator of the actual range of variation of the predicted gas consumption in the Russian Federation according to the three existing scenarios of 54 billion m³ per year in the time period of strategizing 2021-2050, estimated by the developers of the ERI RAS by the spread of forecast values in the range of 520-574

¹ <https://musinlc.ru/peterburgskij-mezhdunarodnyj-gazovyj-forum-pmgf-2024/>.

² <https://www.kron.spb.ru/press-center/likbez/neftepererabotka/>.

billion m³, practically coincides with the capacity of just one pipeline "Power of Siberia-2" of PJSC Gazprom to China in the amount of 50 billion m³ per year.

Conclusions

1. Growth Drivers & Consumption Volatility. With annual GDP growth in the range of 3.7–3.9%, active gasification programs, new pipeline infrastructure in the east, gas-powered transport, innovative technologies, and a partial coal-to-gas transition (while adhering to green principles), conditions are emerging to expand gas raw material use for domestic needs. Planned export projects will further increase sectoral gas consumption. Russia retains significant energy saving potential, the partial implementation of which could notably reduce gas costs. Depending on weather conditions, annual gas consumption may deviate by up to $\pm 15.0\%$.

2. Petrochemicals as a Growth Anchor. Russia's resource potential offers real opportunities to develop petrochemicals and related industries. The focus should not remain on initial production stages but shift toward high-value-added final products and new consumer goods. As noted in the President's address, gas chemistry deserves special attention: consumer demand will only grow, and price increases from raw materials to final products can reach a factor of 12.

3. Macroeconomic Position & Strategic Outlook. The necessary strategic shifts will stimulate GDP growth, technological innovation, and job creation. According to the IMF (2023 data), Russia's GDP at PPP ranks 4th globally with a 3.5% share — catching up with Japan (3.5%) and surpassing Germany (3.2%). Leaders remain China (18.8%), the USA (15.0%), and India (7.9%). Many derivative products also have a large domestic market (currently import-oriented). Global energy consumption continues to rise, digitalization of fuel and energy facilities accelerates, and enhancing competitiveness and energy security directly strengthens state sovereignty and helps overcome strategic uncertainty in the domestic gas industry.

References

1. Bekhterev V.M. (1990). Suggestion and its role in public life. *Priroda Magazine*, 7. <https://opentextnn.ru/old/man/index.html?id=1545>.
2. Bogatyrev I.S., Tsatsulin A.N. (2024). Taking into account human factor risks in the design of restoration work on immovable cultural heritage sites. *Economic Vector*, 3(38): 4-19.
3. Brodsky A.D. (1975) Hydrogen engines worked in besieged Leningrad. *Inventor and Innovator*, 5: 8-9.
4. Imanov R.R. Development of risk assessment methods in the implementation of geological exploration projects. *Strategic Decisions and Risk Management*, 14(3): 256-261.
5. Koryakin L.Yu., Zainullin I.I., Fazylov T.A. (2024). Improving the operational reliability and quality of wastewater treatment in the formation water treatment system at GKP-21. *Environmental Protection in the Oil and Gas Complex*, 5(320): 39-44.
6. Kulagin V.A., Grushevenko D.A. (2020). Can hydrogen become the fuel of the future? *Thermal Energy*, 4: 1-14.
7. Plis S.A., Idigova L.M., Israilova M.S. (2024). Strategy for the transition of the oil and gas industry to open innovation business projects. *Problems of Economics and Management of the Oil and Gas Complex*, 10(238): 10-14.
8. Makarov A.A., Kulagin V.A., Grushevenko D.A., Galkina A.A. (eds.) (2024). Forecast of the development of the energy sector in the world and Russia to 2024. Moscow, ERI RAS.
9. Fomin R.Yu., Zubakin V.A., Bessel V.V. (2024). The path to the East - Challenges facing the Russian energy industry. *Problems of Economics and Management of the Oil and Gas Complex*, 8(236): 5-10.
10. Tsatsulin A.N., Bykov A.I. (2023). Development of the Russian oil and gas complex in the structure of the country's economic security strategy. In: *Economic and information security of digital intelligent systems*. St. Petersburg, Polytech-press: 286-331.
11. Yalaletdinov R.R., Khusainov S.D., Ivanov D.A. (2024). Modernization of the industrial wastewater treatment system using the example of gas condensate field No. 5 of the Urengoy OGCF. *Environmental Protection in the Oil and Gas Complex*, 1(316): 13-18.
12. Global hydrogen trade to meet the 1.5°C climate goal (2022). Part II: Technology review of hydrogen carriers. Abu Dhabi, International Renewable Energy Agency.
13. Tsatsulin A.N., Bykov A.I. (2024). Social gasification helps overcome difficult times in the country's fuel and energy complex. *Economic vector*, 2(37): 19-40.