

Alternative energy market in Russia: at the crossroads of interests and opportunities

Igor Aleksandrov^{1*}, Vitali Daroshka², Vyacheslav Trushkin³, Irina Chekhovskikh³, and Ekaterina Ol⁴

¹Petrozavodsk State University, Lenina 33, 185910, Petrozavodsk, Russia

²Belarusian Trade and Economic University of Consumer Cooperatives, Oktyabrya Avenue 50, 246012, Gomel, Belarus

³St. Petersburg State University of Veterinary Medicine, Chernigovskaya 5, 196084, St. Petersburg, Russia

⁴ St. Petersburg State Agrarian University, Komendantsky 42-1-3, 197373, St. Petersburg, Russia

Abstract. The development of an alternative energy market in Russia within the strategy of forming a green economy is more promising task due to the high level of regulation and closed for entry of private investors, as well as the sufficiency of fossil hydrocarbons. At the same time, Russia understands the importance of participation in the processes of green transition and decarbonization of the national economy due to the commitments under the Paris Climate Agreement, as well as the presence of trade risks in terms of export of traditional energy assets (oil, gas) to the EU, UK, and, starting in 2020, to the PRC and Japan (despite the fact that there are no trade risks in the energy sector). - China and Japan (despite the sanctions on Russia's energy sector, it still has the formal right to participate in tenders for international financing of "green projects"). The most promising proposals for the development of the alternative energy market and business activation are: the formation of a segment of "green finance" in the national stock market; the development of the practice of PPP models for the implementation of energy projects in the renewable energy sector; the formation of green finance departments on the basis of major banks; 4) the formation of export-oriented hydrogen production on the basis of oil and gas businesses.

1 Introduction

The extensive way humanity uses fossil energy resources increasingly acutely raises the question of their finitude and the need to find alternative energy sources. The world economy has different approaches to this issue, but summarizing the practice of leading countries we can say that the main emphasis is made, firstly, on the general decarbonization of national economies, i.e. reducing the participation of hydrocarbon sources in the formation of the final energy assets, and secondly, the development of alternative energy itself as a new stage of the energy supply of mankind. According to Bloomberg NEF, 58

* Corresponding author: a7830298@gmail.com

countries have declared the goal to become carbon-neutral, 18 of them have adopted official documents confirming those intentions.

For the Russian Federation strategy of alternative energy contains a certain dualism in the context of its practical implementation: on the one hand, the country has significant reserves of hydrocarbons (according to DeGolyer & MacNaughton, oil reserves are sufficient for 59-60 years, gas - for 103-105 years), which allows the energy market to feel more comfortable, on the other hand, the ratification of the Russian government Kyoto Protocol (2005) and the Paris Agreement on Climate Change (2019) impose certain obligations under the Annex to the Climate Change Treaty.

The aim of the scientific publication is to study the current state of alternative energy market in the Russian Federation and to identify opportunities and threats to its development in the context of green economy formation strategy.

The theoretical and methodological basis for the preparation of the scientific publication is a review of scientific publications of experts : T. Koenig; G. Wustenhagen, M. Bilharz; Jean Abrell, S. Rauch, K. Streitberg - specializing in the issues of alternative energy, green economy and sustainable development. Information and analytical basis of the scientific publication were public statistical and analytical reports of Russian energy companies (PJSC Gazprom, PJSC Rosneft; SC Rosatom) and specialized domestic and foreign consulting agencies (KMPG, Bloomberg NEF; Consulting Group "Tekart").

The scientific research was prepared using general scientific (observation, comparison, measurement, analysis and synthesis, method of logical reasoning) and special (abstraction, formalization, synthesis, deduction) methods. The validity and reliability of the results of scientific research is provided by the correctness and rigor of the construction of the logic and research scheme, as well as the use of verified Internet sources, officially published regulatory documents related to the formation of green economy and its innovative development.

2 Experience in the organization of the "green transition" of the energy industry in the Russian Federation and the world's leading countries: a comparative analysis

A critical review of the scientific literature and topical publications by experts and analysts in the field of evolution of the energy paradigm of mankind has shown that interest in the formation of a low-carbon economy and decarbonization of business processes of energy assets production is not unambiguous in terms of goals pursued, as might seem at first glance. Undoubtedly, the initial driver of interest in alternative energy is the aggravation of global environmental problems of mankind and depletion of fossil hydrocarbons, but further there is not only a bifurcation of interests, but also a rapid increase in the number of stakeholders, despite the specificity and intrinsic complexity of energy as a sector of the world economy, which is clearly demonstrated by the comparative analysis of the organization of "green transition" energy industry in Russia and the world leaders: for Russia For the US, the drivers are as follows: cyclical recurrence of energy shortages; lobbying for a "green agenda" in Congress and its popularization in society; the formation of an independent class of "green investors"; the transition to the model of local renewable energy centers. For the EU countries and the UK, the drivers are: the initiation of the all-union agreement on the decarbonization of the economy by 2050. "Green Deal"; the launch of a supranational green economy financing platform; curing dependence on the Russian "energy needle"; for China – the adoption of the "Blue Sky" program to decarbonize the economy by 2060; the formation of a national market of green energy projects; application of ESG principles of energy development [1 – 3].

The second criterion of comparative analysis is to study the most important differences between business models of alternative energy market formation: in Russia the major oil and gas businesses and state corporations form subsidiary business units to implement projects in the field of alternative energy within the energy holding company, in the U.S. management companies (oil and gas businesses; banks; investment funds) use the MBI (purchase of shares in the company in exchange for loan capital) or MBO (project financing with subsequent sale of shares in the comp.

The final criterion of the comparative analysis is the sources of financing used: in Russia they are mainly represented by state capital (federal programs and targeted budget funds; credit funds of state sustainable development corporations (SC "VEB.RF"); own investment funds of oil and gas companies; special tax regimes. In the USA, the sources of financing include: collective investments raised in the ESG segment of the stock exchange; funds of corporate investment and innovation funds; a system of tax benefits and preferences, as well as budget allocations [2; 4; 5].

In the EU and the UK: funds of green economy framework programs; funds of international financial and banking organizations; loans via the Green Bonds Exchange segment; bank project financing; investment funds, in China the PPP model of financing alternative energy programs in the BOT (Build-Own-Transfer), BOOT (Build-Own-Operate-Transfer) format prevails. The key donors are the Bank of China, China Construction Bank, and investment funds of energy companies.

As follows from the results of the comparative analysis, the development of alternative energy market in Russia is a more promising task than the goal of the coming years, in addition, it is in Russian practice the energy sector is the most regulated and closed to private investors, and implemented projects in alternative energy are conducted almost entirely by oil and gas industry flagships as part of corporate strategies of proactive development and diversification of their own business portfolio. The second point of interest is the receipt by such companies of financial support from the state, much less often – within the framework of international EU programs to reduce the carbon footprint and decarbonization of hydrocarbon production processes (despite the sanctions pressure on the Russian energy sector, the formal right to participate in competitions for the so-called “green projects” funding it still has) [4 – 6].

3 Quantitative analysis of the alternative energy market in Russia

Based on the established features of the landscape of the Russian alternative energy market, the next stage of scientific research is the study of its quantitative characteristics of development and assessment of prospects. Quantitative characterization of the Russian alternative energy market begins with an analysis of the dynamics of key indicators of its development, which by aggregating data from statistical reporting and thematic publications of major domestic energy companies are presented in comparison with the world (for individual items) in Table 1.

Table 1. Key indicators of the development of the Russian alternative energy market in 2015 - 2020 (compared with global indicators for individual items).

Indicators	2015	2016	2017	2018	2019	2020
1. Share of alternative energy in power generation. in %	23.1	24.1	24.8	25.6	28.4	38.7
1.1 World as a whole	13.6	15.3	17.4	17.5	18.3	18.8
1.2 UNITED STATES	24.1	25.3	25.7	26.3	29.2	31.8

1.3 China	29.9	30.1	30.4	32.7	33.5	34.6
1.4 EU	16.0	17.2	17.0	17.2	17.9	18.2
1.5 RUSSIAN FEDERATION						
2. Aggregate capacity of alternative energy sources. MW	1893	2006	2017	2351	2537	2799
2.1 World	51.3	51.3	54.3	54.6	55.2	60.1
2.2 RUSSIAN FEDERATION						
Investments in alternative energy development (including R&D expenditures). \$ millions. USD	3670	7180	3150	2792	2820	3030
3.1 World	233.3	583.3	816.7	957.1	1250.0	1366.7
4. Dynamics of commissioning of alternative energy generating assets in the Russian Federation. total. units. <i>Including:</i>	61	70	160	342	644	432
4.1 WES	6	-	35	50	-	278
4.2 SSES	55	70	104	290	594	84
4.3 SHPP (including accumulated deferred inputs)	-	-	21	-	50	70

Source: [9 – 12].

As it follows from the table data, in Russia development processes of alternative energy have low dynamics which is confirmed by stability of a specific weight of alternative energy in electric power production: in 2020 in comparison with 2015 it has changed from 16,0 to 18.2 % (growth rate – 113.8 %), while in the world growth was 15,6 p.p. or 167.5 %. The same situation is observed in terms of analysis of alternative energy sources capacity: in the Russian Federation growth over 6 years amounted to 8.8 GW (growth rate - 117.2%), in the world – 906 GW (147.9%). However, when analysing the volume of investments, the specific weight of investments in alternative energy is particularly significant in 2019–2020 (the specific weight of Russian investments amounted to 44.3% and 45.1% respectively).

However, such growth of investments is not directly related to the desire of the country's leadership to make a green transition, it is due to the construction of the industry almost from scratch; secondly, given the worsening of sanctions pressure, decisions were made to form their own production base for the production of infrastructure for alternative energy generation; thirdly, a high share is taken by preinvestment costs associated with the preparation of areas for energy infrastructure construction (a number of facilities are in the areas with extreme

In the structure of introductions of alternative energy generating assets, we should note the market interest in SPS, which dominated during the entire period of analysis, and the interest in WPP formed significantly later: thus, the peak of construction and commissioning of WPP was observed only in 2020. It should also be noted that the creation of SPS is a highly regional solution, designed to solve the problem of energy supply in the southern regions of Russia, as well as to reduce the cost of its consumption, primarily by

businesses in the agricultural sector, i.e., the solution is largely a point, industry-specific nature.

4 Problems and prospects for the development of the alternative energy market in Russia

Based on the analytical data presented above on the state of the alternative energy market, key barriers and stop-factors of its development in the near future were identified:

1. Concentration of interests and financial means in a narrow circle of state corporations and development programs – according to the authors' assessment on the basis of statistical reports on the fuel and energy complex development, 75.0% of all investments are funds of the program to support renewable energy sources (RES) 2.0 development, and only 8.5-10% are corporate investments of the leading oil and gas businesses (for example, Gazprom Neft is building renewable energy infrastructure to increase the autonomy of its own sources) [7].

2. Comparatively lower level of development of the institute of ESG-standards and environmental requirements to energy businesses - in Russia the corporate paradigm of ESG-standards application is only being formed, one aspect of which is development of alternative energy as a measure for decarbonization of national economy, but real application of ESG-standards is reduced exclusively to obtaining benefits and preferences from industry regulators, reduction of costs when exporting products to foreign markets (EU, UK), as well as access to international financing at preferential "green" rates [7; 8].

3. High level of import dependence in terms of technologies and components transfer for creation of alternative energy generating assets – according to various estimates (expert estimates of Rusnano State Corporation; RBC) the share of imported components in the production of a final energy generating asset is 49.3-54.8%, especially in digital control systems (microcircuits, controllers, IoT-network elements), which in the context of growing trade restrictions and embargoes negatively affects the final cost of the project, and also results in postponed launch of production facilities.

4. Weak involvement of oil and gas businesses in processes of alternative energy development as financial donors of projects – a distinctive problem feature of alternative energy market development in Russia is a passive position of oil and gas businesses and even availability of indirect lobbying resistance to processes of increasing the number and scale of projects in the sphere of alternative energy-generating assets formation. In world practice, this group of businesses, by contrast, is the main financial donor of such projects, receiving not only the economic effect of diversifying the business portfolio, but also access to the segment “green finance” to improve their own positions in the investment ratings and lengthening the life cycle of their own companies [13].

Based on the identified key problems of alternative energy market development, in the conclusion of the research the following proposals were formulated (table 2)

Table 2. Main proposals for the development of the alternative energy market in Russia (taking into account global trends).

Proposal	Description of proposal, opportunity / threat assessment, examples of good practice
1. Formation of the "green finance" segment in the national fund market	<p><i>Description of the proposal:</i> the issue of developing alternative energy is capital-intensive, but the burden of financing can be shared by forming pools of collective investments, including through bank instruments of investment and savings (for example, the so-called green bonds, shares of specialized energy companies-operators of alternative energy generating assets and their infrastructure.</p> <p><i>Opportunities/ threats:</i> as advantages should be noted the diversification of</p>

	<p>investments, the possibility of attracting foreign funds and companies interested in alternative energy development, harmonization of national and international experience in the practice of "green finance" and the inclusion of domestic companies in special ratings; as threats should be noted the weakening of the state monopoly in the energy sector, the need to develop the portfolio of tax and regulatory preferences, indirect risks</p> <p><i>Examples of good practices</i> : JSC Atomenergoprom placed an issue of green bonds in the amount of 10 billion rubles on the Moscow Exchange in 2020 to refinance previously incurred costs for the program "Wind Energy"; a second example is the credit line to Enelt to build a SES park in the Republic of Yakutia.</p>
<p>2. Development of PPP models for the implementation of energy projects in the field of RES</p>	<p><i>Description of the proposal</i>: for the systematic and long-term involvement of investors and businesses in the development of energy projects in the field of RES an attractive and transparent landscape of parties' interests should be formed, and PPP allows the most flexible balancing them on the long-term horizon: the state will provide tax incentives and procedures to protect investors' interests, the business - the ability to implement the energy project. The most suitable implementation options are: Build-Own-Operate-Transfer (BOT); Build-Own-Operate (BOO).</p> <p><i>Opportunity/threats assessment</i>: 1) for businesses, the use of PPPs means protection of their own interests, as well as a stable planning horizon for the business model of the operation of energy generating assets and their infrastructure; 2) for the state - reduction of financial costs for the full cycle of work on the commissioning of RES facilities; 3) for the market as a whole - increasing transparency and structuring of participants and project portfolio, and the development of complex financing instruments (project, mezzanine, concessional); 4) the main drawbacks are point practice application</p> <p><i>Examples of good practices</i> : CJSC Nord Hydro implemented a project for the construction of MGPP in the Altai Republic within the framework of the VOO model; GK Rosnano and Renova Group created a subsidiary company for the production of solar panels "Havel" (BOT format) within the framework of the concession.</p>
<p>3. Formation of green financing departments on the basis of major banks</p>	<p><i>Description of the proposal</i>: to form a trajectory of sustainable development of the alternative energy market it is recommended on the basis of major banks (Sberbank PJSC; VTB Bank PJSC; Rosselkhozbank PJSC) and development bank (State Corporation VEB.RF) to form independent business structures that manage the life cycle of energy generation assets projects in the following formats: Design-Build-Operate (DBO, full design cycle, financing, and construction of the facility while maintaining the right to</p> <p><i>Opportunity/Threats Assessment</i>: 1) Involvement of major banks in long-term investment projects; 2) Better quality and strict control over all business processes of the project involving qualified experts; 3) Diversification of project risks between the state, banks, and developers; 4) Disadvantages include the need to allow the private sector to share profits from the project, and possible scenario of privatization of the facility (buying out rights from the state) in favour of private investors, including foreign ones; availability of such participation is limited to the following</p> <p><i>Examples of good practice</i> : in 2020 Sberbank, VTB Bank, Gazprombank signed a syndicated loan agreement with the Wind Energy Development Fund for the construction of a wind power park in the Rostov region.</p>
<p>4. Formation of export-oriented hydrogen production on the basis of oil and gas businesses</p>	<p><i>Description of the proposal</i>: Given the available natural gas reserves and the availability of domestic technologies for its processing, it is advisable to include in the corporate strategies of Gazprom, Rosneft, LukOil the formation and development of an independent business area of hydrogen production as the cleanest energy source with subsequent export to the EU through the existing pipeline infrastructure.</p> <p><i>Opportunity/threats assessment</i>: hydrogen is one of the promising energy</p>

	<p>sources in the EU within the green transition by 2050; oil and gas companies from Russia have the most favorable logistics of supplying such product to the EU; hydrogen production from natural gas is the most environmentally friendly way of its production; disadvantages include significant start-up costs to form the production infrastructure, there are risks of refusal (embargo) of EU countries from the Russian hydrogen supplies within the sanctions policy.</p> <p><i>Examples of good practice:</i> currently Ministry of Energy has prepared a roadmap for hydrogen energy in 2020 - 2024, which identified Gazprom, NOVATEK and Rosatom as major producers. It is planned to finance the implementation of this initiative in the amount of 88.5 billion rubles, including 45.0 billion rubles. - budget allocations.</p>
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Source: compiled by the author.

Thus, to form a full-fledged market of alternative energy in Russia, it is necessary to make many efforts on the part of both the state regulators of the energy industry, and the corporate business in the oil and gas sector and independent non-hydrocarbon businesses, which in turn requires developing a mechanism of economic stimulation of interest in implementing "green initiatives" and the adoption of environmental responsible thinking, which is a global trend of the XXI century.

5 Conclusion

According to the results of the research, it was found that the development of alternative energy market in Russia within the strategy of forming a green economy is more promising task due to the high level of regulation and closed to private investors, as well as the sufficiency of fossil hydrocarbons. At the same time, Russia understands the importance of participation in the processes of green transition and decarbonization of the national economy due to the commitments under the Paris Climate Agreement, as well as the presence of trade risks in terms of export of traditional energy assets (oil, gas) to the EU, UK, and, starting in 2020, to the PRC and Japan (despite the fact that Russia is the largest energy exporter). — China and Japan (despite the sanctions on Russia's energy sector, it still has the formal right to participate in tenders for international financing of "green projects"). Based on the above analytical data on the state of the alternative energy market, key barriers and stop-factors of its development in the near future were identified: the concentration of interests and financial resources in a narrow circle of state corporations and development programs; a relatively lower level of development of ESG-standards and environmental requirements imposed on energy businesses; high level of import dependence in terms of transfer of technologies and components to form alternative energy generation. The most promising proposals for the development of alternative energy market and business activation are : the formation of a "green finance" segment in the national fund market; development of PPP models for the implementation of energy projects in the renewable energy sector; formation of green finance departments on the basis of major banks; formation of export-oriented hydrogen production on the basis of oil and gas businesses.

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