Comparative characteristics of the fuel and energy balances of Algeria and Russia and directions for improving their structure

V N Pulyaeva, N A Kharitonova and A Messaoudene

Financial University under the Government of the Russian Federation, 49, Leningradsky Prospekt, Moscow, 125993, Russia

E-mail: kharitonovana1951@gmail.com

Abstract. This study discovers the problem of stable and reliable functioning of the Algerian and Russian energy and fuel complexes. The analysis of structural changing in the composition of the energy and fuel balances of the countries under consideration allowed the authors of the article to conclude that there is a need for a wider use of secondary energy resources, which requires government support measures aimed at attracting investments and switching to providing own secondary energy resources. The possibilities of Algeria in the development of solar and wind energy are shown. For Russia, the relevance of the wider use of biomass, in particular, wood processing waste, was noted. At the end of the work, the conditions are defined, compliance with which will allow the governments of both countries to carry out the necessary transformation of national fuel and energy complexes.

1. Introduction

One of the directions of the economic policy of any state is to ensure the energy efficiency of the national economy, which is determined, inter alia, by the structure of energy and fuel balance (hereinafter - the energy and fuel budget) of the country. The article discusses the features of the structure of fuel and energy and the directions of its improvement for Russia and Algeria. Despite the fact that countries are not comparable in climate and in the industry structure of the national economy, they are united by one thing - a high share of oil and gas revenues in the state budget [1].

For Russia, which occupies the 2nd place in the world in production, as well as in the average daily export of oil and natural gas, oil and gas revenues in the federal budget fluctuate at a level of 40-50% depending on the dynamics of world prices for carbon resources. For Algeria, which is part of the first 20 countries in oil production and in the top ten in terms of its daily exports, and gas in the top ten countries, the share of oil and gas revenues often reaches 60% of the national budget. Before the development of shale oil production, the United States was Algeria's main partner in export deliveries of “black gold”. Algeria currently has six oil refineries with a total capacity of 618 thousand barrels per day, which allows exporting products with a higher share of benefit. Over a quarter of the gas exported by Algeria is delivered to consumers in a liquefied state (fifth position in the world ranking) [1-2].

Since 2014, Russia and Algeria have been cooperating in the field of energy. At the same time, a course has been taken to expand bilateral cooperation in the electric power and gas and oil sectors, as well as in the field of renewable energy sources. In addition, it is planned to implement mutually beneficial projects in the field of nuclear energy in Algeria.
2. Materials and methods
A retrospective analysis of the evolution of the energy and fuel complex of Russia, taking into account the dynamics of production, the presence of current and forecast reserves of combustible minerals, as well as trends in world energy, indicates the emergence of a new paradigm for the functioning of the country's energy and fuel complex, the basis of which is the balanced development of the complex until 2040. At the same time, it is assumed not only the extraction of all types of energy carriers, but also their deeper processing, while maintaining the dominant role of gas. For Algeria, which has exclusively oil and gas reserves of energy resources, the immediate prospects for the development of the country's fuel and energy sector are mainly associated with the mining of gas and oil, as well as their deeper processing.

The fuel and energy balance as an instrument of strategic planning for the development of industries and complexes, links production and consumption of various types of energy resources based on a single methodology, generally accepted indicators, according to the approved units of measurement and generally accepted classifications. Fuel and energy complex is developed both in physical units (t, m, kW/h), and in conventional units, which allows using the information contained in it for the purposes of state and municipal administration.

3. Results
The framework of the energy and fuel complex reflects the contribution of each of the types of energy resources to the country's economy, determining to a large extent the directions of its development and the production efficiency of certain areas of industrial and economic activity. It is generally accepted that natural gas is the most economical type of boiler and stove fuel, since it is 2.5–3 times cheaper than coal, 35–40% cheaper than black oil, and 3.5–4 times cheaper than shale oil [4]. Currently, the structure of the fuel and energy complex of the countries under consideration differs significantly from the global level (table 1) [3], which suggests the development of the feasibility of mutually beneficial cooperation in the field of the use of RES.

| Primary resources | World | Russia | Algeria |
|-------------------|-------|--------|---------|
| Coal              | 30    | 15     | -       |
| Oil               | 26    | 22     | 46      |
| Gas               | 27    | 52     | 54      |
| Atom              | 3     | 6      | -       |
| Hydro             | 4     | 4      | -       |
| Bio               | 4     | 1      | -       |
| Other types of renewable energy sources | 6 | 1 | |

According to forecasts, the total energy consumption around the world will increase by almost 40% by 2050, will be substantially transformed into the structure of the world energy balance in favor of non-carbon sources (figure 1) [3], which will naturally affect the export opportunities of the countries under consideration.

A promising direction in the development of the global energy market is its transformation, which implies a steady increase in the share of renewable energy sources (hereinafter RES). The main reason for the increased attention to the development of non-carbon energy is due to the need to reduce CO₂ emissions, which should prevent further serious climate change on planet. It should be emphasized that decarburization of the fuel and energy sector requires urgent action on a global scale, which should help reduce carbon emissions and mitigate the effects of climate change. At the same time, energy transformation can be ensured not only thanks to technical and technological developments, the use of modern information and intellectual technologies, but also the wider development of the state policy of supporting the use of renewable energy sources through the use of various market tools.
Experts from the International Renewable Energy Agency (IRENA) analyzed possible ways of decarbonization, and in their study identified the potential for countries, regions and the world as a whole to expand the use of renewable energy sources with an increase in their share in the global fuel and energy sector. It is RES that will satisfy almost 30% of the demand for electricity in 2023, compared with 24% in 2017. It should be emphasized that at present, the use of renewable energy resources is associated mainly with hydropower. At the same time, in the near future (5-10 years) RES will account for more than 70% of the global increase in electricity production. The expected growth will be achieved due to the development of solar, wind energy, as well as bioenergy.

According to the International Renewable Energy Agency, by 2050, electricity could become the most important energy carrier, with a share in the structure of final consumption of energy resources of about 50% (against 20% at present).

Experts suggest that global demand for electricity will be met in the near future due to hydropower at 16% of wind energy - at 6%, solar energy - at 4%, and bioenergy - at 3%.

4. Discussion

Thus, the dynamic development of Russia and Algeria in the near future will be largely determined by the desire of most countries importing energy resources to diversify the structure of their energy market, make more wide use of non-carbon energy sources, focusing on local, renewable energy sources, which will certainly slow down growth hydrocarbon imports, narrowing market niches for both countries under consideration. The transformation taking place in the world energy industry presupposes not only increased competition between producers of fuel and energy resources, but also the demand for fundamentally new technologies in industrial production. As a result, the nature of energy relations between different states will change. Already, most countries are striving for energy self-sufficiency through the use of the latest technological advances, which affects their energy independence and security [4-5].

As for the exporting countries of primary fuel and energy resources, they are moving from a policy of reducing their own production and increasing imports to the maximum use of energy resources in the domestic market, achieving deeper processing of hydrocarbons. For Russia and Algeria, the ongoing energy transformation is associated not only with deeper processing of energy resources, but also with the development of the renewable energy sector.
Emphasizing the huge potential of Algeria in the field of solar energy, it is advisable to note that the country needs a new policy that can ensure the transition from the use of fossil fuels to renewable energy sources as part of the country's sustainable economic development strategy. Despite the fact that currently in the total amount of installed energy capacity, the share of solar energy is less than 1%, the state program involves increasing the capacity of power of solar-powered plants more than twice in the next 5 years. At the same time, a pilot project is being implemented within the framework of the state wind energy program, according to which it is planned to commission 639 MWt of corresponding capacities by 2023.

To stimulate the development of the renewable energy sector in Russia, the Government of the Russian Federation has developed a set of regulatory documents aimed at creating a new energy paradigm in the country. For the first time, a support mechanism for the renewable energy sector was launched in the country in 2011 through the legalization of the installed capacity market, which allows generating facilities operating on renewable energy sources to fully participate in it. However, according to the authors, the predicted value of the renewable energy share indicator, equal to 4.5% in 2024, will be provided mainly due to the more accelerated development of small hydropower.

Among renewable energy sources, a special place is occupied by biomass obtained from wood processing wastes, which is a CO$_2$-neutral fuel, since biomass emits CO$_2$ equivalent to that absorbed by the plant during its growth. For Algeria, the issue of reforestation is currently relevant, which is being implemented in accordance with the national reforestation plan, which will allow to increase the production of wood products by 2025, which will require a modern approach to the disposal of the resulting waste.

It should be emphasized that Russia has enormous forest reserves - almost a quarter of the world's resources, which allowed the development of the forestry, pulp and paper and processing industries, which play an important role not only in the economy of the Russian Federation, but other countries with which Russia sells timber. However, existing technologies for wood harvesting and processing are characterized by the formation of a large amount of waste (table 2) [3-4], which are divided into several categories (slab, ends and trimmings, residues of finished materials during the repair of buildings, wood chips and wood dust) depending on their origin or condition.

| Type of production            | Finished product | Waste | Losses |
|------------------------------|------------------|-------|--------|
| Forestry                     | 63-80            | 20-37 | -      |
| Wood processing              | 45-55            | 38-48 | 7      |
| Wood board production        | 85-90            | 5-10  | 5      |
| Plywood production           | 40-50            | 42-52 | 8      |
| Wood chemical production     | 62-68            | 35-38 | -      |

The Russian government has identified the regions where municipal facilities for the production of steam and hot water working on wood waste will be built for the first time. In particular, in the Moscow region it is planned to build such boiler houses with a total capacity of about 280 MWt, and in the Republic of Tatarstan - 55 MWt. However, a more modern approach to the disposal of wood waste is the production of charcoal and pellets. Currently, Russia exports about 1 million tons of wood waste pellets, which are currently shipped mainly to EU countries. With regard to the further development of mutually beneficial cooperation with Algeria, it is of interest to expand trade relations in the supply of charcoal from Russia, as well as pellets, which will make it possible to introduce adjustments to the country's fuel and energy complex in favor of using biomass [6-10].
from what the market could achieve without government intervention. In addition, states need to find the best options for attracting private investment.

5. Conclusion
Thus, current trends in the formation of fuel and energy indicators, as an instrument of industry and territorial planning and management, include:

- An increase in the share of renewable energy sources (sun, wind) in meeting the energy needs of society (for Algeria and Russia);
- Development of new environmentally friendly technologies for the use of coal (for Russia);
- Increasing the production of energy products with a high share of added value (for Russia and Algeria).

The tasks set can be successfully solved through the implementation of a number of specific measures, as well as the mechanism of state energy policy, inextricably linked with the industrial policy implemented by the government of the countries in question with a view to the sustainable development of their economy:

- Creation of conditions ensuring effective competition of interchangeable energy carriers (gas, coal, renewable energy sources);
- Direct state support for the development of nuclear energy;
- Stimulating the sustainable growth of the coal-chemical and petrochemical industries;
- Creating conditions for attracting investments for the development of bioenergy and wider use of renewable energy sources.

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