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Russia's Oil and Gas Complex: Uncertainty in Development and a Changing Role in the Country's Economy

L. V. Larchenko
Herzen University
191186 Saint Petersburg, 48 Moika Embankment, Russia
lubalar@mail.ru

Abstract— **This paper aims at analyzing the state of the art in Russia's oil and gas industry, which is now in an uncertain situation due to the unpredictability of oil prices, the sanctions, the geopolitical instability, as well as the industry's changing role in the country's economy and in forming the federal budget. The paper demonstrates that the last year has seen considerable changes in the development of the oil and gas complex: greater oil prices are surprisingly accompanied by a greater uncertainty, as non-market mechanism are often applied to this industry on a global scale. If this problem is to be solved, innovative development in this industry becomes a must, which implies large-scale investments in the development of Russian-made equipment and technologies, the development of unconventional, residual, and hard-to-recover hydrocarbon reserves from the earlier developed areas. The Arctic shelf must be developed further. At the same time, emphasis has to be made on the socio-economic development of the Arctic**.

Keywords— oil and gas complex, Russia, unpredictable development, price volatility, sanctions, innovations

I. INTRODUCTION

In recent years, especially since Q3 2017, the oil and gas complex has been showing considerable uncertainty with respect to development. Over the last year, the world has seen profound changes in the hydrocarbon market: the oil and gas industry is transforming, and so is power engineering in general. Non-market approaches and the industry's volatility have caused numerous problems. This is primarily due to sanctions and various constraints that are imposed to create competitive advantage in the real economy sectors. This applies not only to Russia, but also to a number of other countries rich in oil and gas. As of mid-2018, about a third of the world's oil reserves are subjected to unilateral sanctions [1].

In the context of ever greater uncertainty in this industry, which affects Russia's economic development and budget, we have to analyze the problems of the oil and gas complex, to find ways out of this situation.

This paper reviews the results obtained by Russian scientists and practitioners studying how primary industries affect Russian economy and budget, the developmental issues facing Russia's oil and gas complex in the context of the depleted conventional reserves, sanctions, the volatility of oil prices, and the possible ways out.

II. RESULTS

A. *Is Russian economy becoming more or less dependent on the oil and gas revenues*

Oil and gas have always been crucial for the country's economy, and this is not going to change anytime soon. This is evidenced by the share of oil and gas money in Russia's budget, which for many years exceeded 50%. When the share of oil and gas revenues in the country's budget began decreasing in 2015, general public assumed Russia's economic dependency on oil and gas was coming to an end.

Indeed, oil and gas revenues used to make up for 50% of the federal budget during the so-called "fat years"; that figure dropped to 36% in 2016 and then rose again to 40% in 2017, which correlated well with the oil prices in the world market. The effect of lower prices was mitigated by the Russian ruble's weakening against the U.S. dollar, which was why the share of oil and gas revenues in the budget revenue did not drop considerably. However, this is not the complete picture of what kind of role the oil and gas complex has to play in the country's budget, as it generates much higher revenues that are not limited to fossil extraction taxes and export duties alone. Beside direct budget revenue, there are indirect revenues as well: income tax for natural and legal persons, excise duties, insurance premiums, etc; when combined, the actual sums that oil and gas bring to the budget are much more significant [2].

Since 2015, oil and gas revenues have changed breakdown-wise. This is the product of the so-called "tax maneuver", a six-year reform targeted at substituting the export duties with increased taxes on the extraction of fossils. This reform is expected to encourage companies to sell more oil and petroleum products in the domestic market rather than exporting them. The tax maneuver is expected to bring an additional 1.3 to 1.6 trillion rubles to the budget over six years [3].

The intention is that this measure shall increase the budget revenues; however, such revenues are by and large extremely unstable, as this bill makes an emphasis on additional tax

benefits and excise duty refunds with respect to the extraction of fossils.

B. Uncertainty is the landmark of oil and gas industry in Russia and worldwide

In recent years, Russia's oil and gas industry has been facing numerous problems, mostly due to uncertainty: sanctions, high oil-price volatility, ever more challenging competition against alternative energy are no favorable factors. Speaking of competition, most scientists and practitioners believe hydrocarbons will remain the main type of fuel despite renewable energy being on the rise [4,5,6].

High uncertainty in oil and gas industries is observed not only in Russia, but also on a global scale. For example, while in 2016 the world market was still characterized by oversupply, in 2017 the market saw undersupply for the first time since 2013. 2017 was a year of lesser volatility yet still uncertain price dynamics [7].

One of the factors of uncertainty in the development of the oil and gas complex is sanctions and various kinds of restrictions. This concerns not only our country, but also a number of other countries with a rich oil and gas potential. As a result of the sanctions connected with the US withdrawal from the multilateral agreement on the Iranian nuclear program, as well as sanctions against Venezuela, which possesses the world's largest oil reserves, and already implemented sectoral sanctions against Russian oil and gas companies, the total amount of stocks exposed to unilateral restrictions makes up about a third of all world oil. Thus, because of the US sanctions against Iran, French company Total was forced to withdraw from one of the largest gas projects in the world — the South Pars project, having lost billions of dollars of investments. Total's exit from this project and its possible freezing makes room for more expensive American LNG. The policy of using sanctions and various ultimatums concerning the hydrocarbon market may cause a permanent *sanction premium* in the price.

Uncertainty will also be seen in oil prices. Prices will be chaotic: periods of price increase will be replaced by a fall. The main reasons for the recent increase in oil prices are the following: purposefully pursued policies primarily of American shale companies, which need a high level of oil prices to maintain the profitability of its production; accelerating of global economic growth; Most OPEC countries now need a price of $ 70-80 per barrel to balance their budgets.

The negative effects of sanctions and lower oil and gas prices were not too significant for Russia, as the country has come to a sustainable industrial model over many years. Besides, most of Russia's oil fields feature an extremely low production price of 5 to 10 U.S. dollars per barrel, while Rosneft produces oil for 2.1 USD per barrel [8].

At the same time, Russia's and the world's oil industry is experiencing a slowdown due to the depletion of oil reserves and the reduction in investments over the past quarter-century. Some experts believe this might increase the probability of a global oil-supply crisis from 2018 onwards [9].

In 2016, Russia's oil production volume (including gas condensate) rose by 2.5% to a new high of 547.5 million tons. According to British Petroleum, Russia produced 12.6% of the world's oil in 2016, second only to Saudi Arabia (13.4%). The 2016 increase far exceeded the forecasts thanks to the skyrocketing production in October 2016, which kind of prepared Russia's oil industry to the OPEC+ agreement on production reduction, as the reduction under the agreement would be calculated against October 2016. As a result of this maneuver, Russia's production level of 2017 was only a 0.1% decrease. Despite this, Russia did fulfill its obligations under the reduction agreement and actually exceeded those in 2017.

In 2017, thanks to the OPEC+ transaction and other factors, among which the most significant is the unprecedented decline in oil production in Venezuela, the world oil market has approached a decrease in excess of oversupply and oil reserves, which in 2018 should be finally eliminated. The fulfillment of the obligations of the OPEC + transaction for Russia went almost unnoticed, and the subsequent rise in oil prices led to an increase of export earnings and budget revenues.

The gas industry does have its own, well-known development problems. This is mainly due to the transportation of gas, increased competition in the global shale gas markets (see [10] for details). At the same time, Gazprom notably increased its sales to non-CIS countries by nearly 12% in 2016 [11]. Currently the share of gas in the global fuel and energy balance is about 22%, i.e. gas is inferior to both oil and coal, moreover it is assumed that by 2035 the share of gas in the global fuel and energy balance will be equal to the share of oil. The competitiveness of gas is explained by a number of advantages over other sources of energy: gas is the cleanest fossil fuel, its reserves are large and accessible to mankind, currently the technologies for gas production, transportation and storage are highly developed.

The main consumers of Russian gas are the markets of Europe and China, and the European market shows growth in demand - 5% annually. In Europe, there is interest in Russian gas. This is determined by both a decrease in own production volumes and an increase in consumption. Over the past ten years, European gas production volumes have decreased by 37%, in Germany - by 71%. Due to its own resources, Germany currently covers only 7% of its gas consumption. According to calculations, by 2035 own production in Europe will be reduced approximately in two times, and additional opportunities for gas supplies will be about 200 billion m^3. The demand of Russian gas by European countries was greatly influenced by the production of shale gas in the United States. The increased use of shale gas in the US economy led to the release of large volumes of coal, resulting an increase of exports of low-cost coal to European countries, in turn, European markets began to replace Russian gas with cheaper coal.

The Chinese market in 2017 showed an increase of gas demand by more than 15%, which is the largest performance in recent years. The growth of gas imports increased by almost 30%, and gas consumption in 2017 amounted up to 237 billion m^3. At the same time, China has begun to address acute

environmental problems. By 2020, the goals that China sets itself will be absolutely realistic: gas consumption will be 360 billion m^3, its share in China's energy balance will increase from 7% to 10%.

Russia is making efforts to find new gas markets. In July 2018 regular deliveries of liquefied natural gas to China began. The first supply of liquefied gas via the North Sea Route was made without icebreaker escort in record time - 19 days. Gas supplies to China are scheduled on December 20, 2019 via the Power of Siberia gas pipeline, the construction of the first section of the offshore segment of the Turkish Stream project is completed, and we are ready to begin construction of the Nord Stream-2 gas pipeline. But it is not so simple.

For the construction of the Nord Stream-2 gas pipeline permits from a number of countries are required for the construction works in the waters of the Baltic Sea. They have already been given by Germany, Russia and Finland, the territorial waters of which "Nord Stream - 2" cannot even go round geographically. Recently the project was approved by Sweden, because Stockholm did not see the legal reasons for refusal. The government of the Kingdom of Sweden has fully agreed on the laying of a gas pipeline in the Swedish economic zone in the Baltic Sea. All that remains is to get permission from Denmark. There are difficulties here, because the influence of the United States, opposing the Nord Stream 2, is strong. Moreover, the Danish parliament passed a law under which the Head of The Ministry of Foreign Affairs of the country has the right to prohibit any construction by his decision, and to do so for ~~–s~~ecurity reasons". However, according to experts, the territorial waters of Denmark can easily be bypassed by a gas pipeline, which can only lead to an insignificant increase in the cost of laying work. For Europe, the construction of Nord Stream-2 and the additional production of Russian gas is very important, because, as already mentioned, firstly, consumption grows, and secondly, gas production rates are decreasing. In the Netherlands, production peaked in 2007–2008. The rapid decline in gas production at the largest Slochteren gas deposit will lead to the situation where in 15 years the country will become an importer of blue fuel. The UK has been consuming more natural gas since 2005 than it can produce. In parallel with the decline in its own production volumes, England will withdraw coal-fired thermal power stations that are the most polluting to the environment, which will provide an additional incentive for gas imports. Prices for American liquefied gas, which it actively offers to European countries, are significantly higher than the Russian pipeline gas.

Russia is looking for new gas markets; however, Europe will remain Russia's priority market despite the fact that Asia-Pacific countries being interested in Russia's energy resources, boast a well-developed gas market, yet have no gas transport system similar to that of Europe.

C. State of the art and possible development in oil and gas industry

In recent years, sanctions against Russian companies, high price volatility, and the depletion of conventional-field resources have been the main factors affecting Russia's oil and gas industry as well as its development. Sanctions forced Shell to stop its operations, Total to transfer its share in the Bazhenov formation to LUKOIL and the share in Shtokman to Gazprom, etc. The recent growth in oil prices is not expected to last long, as was stated at SPIEF–2018. Oil price dynamics will be chaotic, alternating between growth and drops. While ruble revenues do not affect the industry, lower dollar revenues mean less investments in exploration and in the fuel-energy complex.

A serious problem of the modern development of the industry is the state of the resource base of Russian companies, since most of the deposits are in a stage of falling production.

In Western Siberia, the main oil-producing region of Russia, in recent years there has been a progressive decline in oil production, due to the fact that here they produce the development of highly worn out deposits with falling production of easily extracted oil. The increase in oil production is constrained by the technologies used. So, for example, equipment and technologies used in Western Siberia today do not allow raising of oil recovery rates, as well as commercially extracting oil from deeper horizons (hard and heavy oil that is difficult to extract, shale oil of the Bazhenov formation).

It was assumed that the extraction of reserves of this kind of oil (for example, from the Bazhenov Formation) should compensate for the decrease in oil volumes at the deposits that are at the stage of declining production. Undoubtedly, Eastern Siberia could become one of the main areas of oil production. However, due to the lack of knowledge and underdeveloped transport infrastructure, the development of the region is slow. In addition, the current economic conditions in the country constrain the intensive development of the resource base. In such conditions, one of the strategic directions for the development of the oil and gas industry is the development of hard-to-recover and shale reserves in traditional areas of hydrocarbon development.

In Russia, the Bazhenov Formation is considered to be the largest source of unconventional reserves, which is located in the central part of Western Siberia at depths of 2–3 thousand meters [12], i.e. on the territory which is quite developed in contrast to Eastern Siberia. The distribution area is about 1 million km^2 and has an average thickness of about 40 m. According to geologists, oil resources in the layers of the Bazhenov formation only in Western Siberia can reach 100-170 billion tons. At the same time, the quality of oil is high, it is light and low-sulfur, which facilitates its processing. However, after the introduction of sanctions prohibiting the supply to Russian companies the equipment and technologies that can be used to extract oil from deep horizons, subsoil users operating in Western Siberia have announced the suspension of the implementation of long-term projects at such fields. The lack of domestic technologies, the use of which would make oil production from deep horizons profitable, makes users of the subsoil refuse to implement these projects at all.

In this regard, there are encouraging news. In September 2017, Gazprom Neft and the Government of the KhMAO-

Yugra signed an agreement on the establishment of the Bazhen Technology Center in the region. On this industry platform, which unites the efforts of oil and gas and oilfield services companies, the scientific community, investors and the state, will be focused the advanced technologies and equipment needed to create cost-effective methods for developing the Bazhenov Formation. The created complex of technologies will allow to reach the target mark for the extraction of hydrocarbons from the deposits of the Bazhenov Formation, which, according to the company's plans, by 2025 will amount to 2.5 million tons per year. Successful implementation of the project will create a new oil province in Western Siberia, which is very important, because in this region production and transport infrastructure already exists. As we can see, this is a national scale task [13].

The offshore sector, which accounts for almost a third of oil production, and which is an essential component of future supply in the world, has been particularly hard hit by the slowdown in the industry. In 2016, only 13% of all resources taken for development were located on the shelf, compared with more than 40% on average from 2000 to 2015. Russia owns the world's largest continental shelf. However, due to the fall in oil prices and sanctions, the development of offshore hydrocarbon deposits in our country is likely to go at the wrong pace as previously thought. However, despite these difficulties in the development of hydrocarbons, the work continues on the Russian Arctic shelf.

One serious problem facing this industry lies in the reserves available to Russian companies, as most fields are approaching depletion. More efficient development necessitates innovative approach to the industry and can be achieved by implementing cutting-edge drilling technology and achieving higher oil recovery factors. Eastern Siberia is rather underdeveloped, meaning that it is of strategic importance to develop hard-to-recover and tight-oil reserves in the conventional fields.

The Bazhenov formation in the center of Western Siberia, located 2 to 3 thousand meters deep, is Russia's largest unconventional reserve [12]. In 2016, Gazpromneft successfully carried out the fully cycle of developing the Bazhenov formation in one fields in KhMAO and prove efficient the basic technology adapted to the specifics this formation [13].

The offshore sector, which accounts for nearly a third of the world's oil production, was affected by most by the industry's slowdown [14]. The world's largest continental shelf belongs to Russia. Innovative approach to developing the remote fields in the Arctic necessitates the use of new technologies that Russia currently doesn't have.

D. Is Russian economy becoming more or less dependent on the oil and gas revenues

The current crisis associated with sanctions and the fall in oil prices has had a negative impact on the Russian economy. However, most of all it affected oil and gas companies and regions in which the development of hydrocarbon deposits is carried out, since the formation of the revenue side of regional budgets and the state of the social sphere largely depend on the success of the oil and gas complex.

The oil and gas industry in the Russian economy has always played and will play a significant role in the foreseeable future. This is evidenced by the share of oil and gas revenues in the federal budget of Russia, which for many years exceeded 50%. When the share of the oil and gas complex in the country's budget began to decline starting from 2015, it was perceived by society as a departure of the Russian economy from oil and gas dependence.

Indeed, the share of oil and gas revenues in the federal budget decreased from 50%, which was observed in the so-called ―fat years" to 36% in 2016 and then increased again to 40% in 2017, which corresponds to the change in the price of oil, the price of which decreased from $ 108 per barrel in 2013 to $ 42 per barrel in 2016 and rose to $ 53 per barrel in 2017. The drop in the share of oil and gas revenues in the budget compared to the fall in oil prices is not so significant, this is explained by the fact that the fall in hydrocarbon prices was partially offset by the weakening of the ruble against the dollar.

However, this does not give a complete picture of the role of the raw materials sector in the country's budget. Revenues from the oil and gas industry are much higher and do not consist solely of the mineral extraction tax and export customs duty. In addition to direct sources of budget replenishment, there are quite a few indirect sources. Therefore, assessing the degree of dependence of the budget system on oil and gas revenues, it is also necessary to take into account tax budget revenues from other taxes and payments from enterprises of the industry (income tax, personal income tax, excise taxes, insurance premiums, etc.), as a result their share in the federal budget will be even greater. Thus, the rates and shares of excises and taxes transferred to the federal budget related to the oil and gas sector, but not formally considered as oil and gas revenues, are growing.

Since 2015, the structure of oil and gas revenues has significantly changed, remaining stable in the period 2013–2014. This was the result of the implementation of the ―tax maneuver", according to which there was an increase in the tax rates for the extraction of mineral resources on oil and gas condensate, while simultaneously reducing export duties on oil and oil products. Thus, in general, the reform will stimulate companies to sell more oil and oil products on the domestic market than abroad.

It can be stated that with the adoption of two bills by the State Duma in July 2018, the tax maneuver in the oil industry was completed, which lasted for several years. According to the legislation, it is proposed to reduce the export duty on oil to zero and to increase the rate of the mineral extraction tax by the amount of the reduction of the export duty. Thus, the export duty within six years will be completely replaced by the growth of the mineral extraction tax. At the same time, the draft law provides for the preservation of existing benefits for the mineral extraction tax: a lower tax rate on production at new offshore fields; gas condensate for the production of liquefied natural gas; for deposits of the Yamalo-Nenets

Autonomous District; for fields with difficult conditions (high depletion, oil fields with hard-to-recover oil, etc.)

Due to the tax maneuver, it is estimated to receive 1.3–1.6 trillion rubles of additional income over 6 years. According to the plan, budget revenues should increase as a result of the tax maneuver, but they can fluctuate significantly over the years, since the bill provides a lot of space for the use of additional benefits for the mineral extraction tax and for the return of excise taxes.

III. Conclusions

Below is the summary of the above. The oil and gas industry will remain crucial for Russia's economy and budget. The now-popular thesis that Russia's budget becomes less dependent on the external economic environment has no ground.

In the today's situation with its high uncertainty, sanctions, and considerable oil-price volatility, Russia's oil and gas complex needs the following.

- Innovative development. Solving this problem requires: large investment in developing state-of-the-art Russian-made equipment and technology; using cutting-edge technology to increase oil recovery;
- Development of unconventional reserves in the long-developed regions, as it means less exploration costs;
- Development of residual and hard-to-recover oil reserives in the long-developed regions;
- Further development of the Arctic shelf. At the same time, emphasis must be made on the comprehensive socio-economic development of the Arctic, as envisaged in Russia's Development Strategy of the Arctic Zone.

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