MODERN APPROACH AND PROMISING TECHNOLOGIES WITHIN THE PROJECTS FOR DEVELOPMENT OF OIL-AND-GAS FIELDS AT THE RUSSIAN CONTINENTAL SHELF

UDC 550.8 (470+571)

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Problems and prospects of Russian continental shelf surveying and development in conditions of sanctions and fall in oil prices

For a long time, the Russian shelf has drawn the attention of geologists, who claimed that uncountable mineral riches were found there. I remember, when we were Moscow State University students in the middle of the 1970’s, we heard from our professors that large-scale shelf investigation and development would begin after only a few years. After almost forty years, I spoke the same words to my students just 3–4 years ago. However, nothing like this has ever happened. But why is it so? The resource potential of the Russian shelf is indeed enormous.

During the last two years, active geological exploration operations have resumed in all sea areas. Does it mean that we will see considerable growth of offshore oil and gas production in Russia in the near future? An objective analysis of various factors, some of which will be covered further in the article in relation to one another, allows to give a very cautious answer to this question [1–5].

Stages of Russian shelf investigation

Systematic investigation of shelf subsurface began, probably, in the middle of 1970’s, when the Integrated Marine Arctic Geological and Geophysical Expedition (IMAGE, now MAGE) established in Murmansk began industrial geophysical operations (fig. 1). It is true that expeditions established by various organizations headed off to the sea, but those were episodic studies or field trial operations. The very first marine geophysical investigations in the USSR began in the Caspian Sea already in 1950–1960.

A fresh momentum was given to active shelf (particularly Arctic shelf) investigations by the decision on establishing the Offshore Oil and Gas Administration (“Glavmorneftegaz”) as part of the USSR Ministry for the Oil and Gas Industry. Thanks to the implementation of a comprehensive program of geological exploration operations, tens of offshore fields were discovered in the Barents and Kara seas, as well as on the shelf of the Sakhalin Island, in the 1980’s. These fields have still been the main resource base of the present and future oil and gas production.

In the 1990’s, virtually all the operations were discontinued due to the lack of funding, and most geophysical and drilling vessels not involved in any operations in Russia were sent abroad for foreign contract operations. It should be noted, although, that the Rosshelf company was established in 1992 by the leading Russian state design organizations and large defense enterprises switching to civil products as part of the conversion process. Rosshelf was provided with licenses for the largest discovered fields in the Barents Sea: Shtokman and Prirazlomnoye. Soon after that, an ambitious program for the exploitation of hydrocarbon
reserves on the Russian Arctic sea shelf until 2010 was approved by the Presidential Decree No. 765 dated 23 May 1996. It was assumed that production at a number of Arctic shelf fields, including Shtokman and Prirazlomnoye, would be commenced until that time. However, the program was not implemented. Instead, two large projects Sakhalin-1 and Sakhalin-2 were launched in the Russian Far East at the end of the 1990’s. These projects provided for the exploitation of several fields on the north-eastern shelf of the Sakhalin Island. This became the result of long and difficult negotiations between government authority representatives and foreign investors within the framework of special taxation schemes allowed by the Federal Law No. 225-FZ “On Production Sharing Agreements” dated 30 December 1995. Along with foreign companies, the Russian companies Rosneft and Gazprom became shareholders (with different shares), and ExxonMobil and Shell turned to be the operators of these projects. However, the main activities in this area began later, during the first years of this century. Virtually no shelf investigation works were performed during the 1990’s; technologies and skilled staff were lost, while in the rest of the world technologies were being enhanced and developed.

In the beginning of the 2000’s, investigations of the shelf, including the Arctic shelf, were somewhat revived. By that time, even Russian service companies mainly used foreign equipment. Gazprom was most active on the shelf: design and preparation activities for the Shtokman and Prirazlomnoye fields resumed and geological exploration operations began in the Ob and Taz bays of the Kara Sea. The latter are located close to the traditional gas production areas in the north of Western Siberia, where production at the main onshore fields was declining. Soon, these activities led to the discovery of a number of gas fields in this region, the largest of them being the Kamennomysskoye-Sea and Severo-Kamennomysskoye fields. At the same time, Lukoil successfully explored the Caspian Sea area and discovered the Filanovskiy, Rakushechnoye and Tsentralnoye fields (the latter in partnership with Gazprom and KazMunaiGas), began trial operation of the Caspian Korchagin field. Novatek, in turn, began commercial production from the shore using horizontal wells at the large Yurkharovo field in the Taz Bay, at an average water depth of 4 m.

Finally, a number of significant events have occurred on the shelf during the last years. Oil production was commenced at the Prirazlomnoye field with a more than 10-years delay from the first planned time frame. The production rate is still very low at the present time. The large Yuzhno-Kirinskoye field was discovered on the Sakhalin shelf, and production commencement was announced at the nearby Kirinskoye

![Fig. 1. Main stages of Russian shelf investigation](image_url)

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gas-condensate field, although there have been no actual product deliveries and a lot of technical problems have yet to be solved.

During the entire time of Russian shelf exploration over 200 offshore wells have been drilled, but the shelf is still extremely underexplored: in particular, the exploration degree is about twenty times lower than that of the shelf of Norway and 10 times lower than that of the American part of the Chukchee Sea. However, during the last two years, geological exploration operations have been very active in Russia due to the handing over of many licenses to two largest Russian companies – Gazprom and Rosneft. The Universitetskaya-1 well on the Novaya Zemlya shelf of the Kara Sea has just been drilled, which resulted in the discovery of the large oil field the Pobeda. Additional exploratory wells are being drilled at the recently discovered Yuzhno-Kirinskoye field. The scope of logging operations multiplied. Thus, a total of 20 thousand km² of 3D seismic survey operations and over 30 thousand km of 2D seismic survey operations have been planned for 2015–2016. Many plans will not, however, be implemented.

**Shelf license issuing**

Until 2011, many Russian shelf areas were in the open acreage. Gazprom had a number of licenses, predominantly in the Barents and Kara seas, and Rosneft had some licensed areas in the Far Eastern shelf. These two companies with foreign partners have licensed areas in the framework of the existing production projects Sakhalin-1 and Sakhalin-2, as well as several other areas on the Sakhalin shelf, where production has not begun yet (Sakhalin-3, Sakhalin-5, etc.). Lukoil had a number of licensed areas in the northern Caspian Sea. Single licenses in various seas were held by Novatek, Sintezneftegaz, Priazovneft, and other companies. However, the situation has changed dramatically since 2012. In order to obtain a license for a shelf area, a company must primarily meet the two main criteria: have both a minimum of 5 years of shelf operations experience and a government participation in the shareholders’ capital of over 50%. These requirements are met only by two Russian companies, such as Gazprom and Rosneft. Lukoil, which does not meet the second requirement, now only has several licensed areas in the Caspian Sea, which it had before.

It is difficult to explain this decision. First, neither Gazprom, nor Rosneft conduct any logging or drilling operations on the shelf themselves, rather, they hire service companies, Russian or foreign. In this case, the experience of the direct contractors, and not the customer’s own experience (they virtually do not have any) is important. The customer (Gazprom or Rosneft) only organizes operations and provides financing. As far as production assets, rather than exploration assets, are concerned, the operators of all the existing Sakhalin offshore projects are foreign partners. Second, if the issue is about the state control of the most important shelf areas, such control has not disappeared anywhere, since the subsurface belongs exclusively to the state. The state always has the right to interfere with the exploration and production process, or even revoke a license if the license obligations are not fulfilled, technological requirements are not complied with, or environmental damage is done. This decision probably had a different goal: to spare the state budget from the high costs of the open acreage investigation as far as possible in order to prepare the areas for license rounds. Now, this problem has to be solved, from the financial point of view, by the companies themselves. As a result, today Rosneft has 50 licenses and Gazprom about 30 licenses on the shelf (fig. 2). It should be noted that the size of the assumed licensed areas are just gigantic, unprecedented in the world’s practice (fig. 3).

With such an area, reaching the exploration stage and preparing reserves of commercial categories (C1 and above) will require very many years and significant funds. In any case, neither Gazprom, nor Rosneft will be able to meet the time frames provided by the licenses issued for all the areas at the same time, because even the fleet of drilling rig currently available in the world (much less in Russia) and capable of operating in the Arctic, will not be sufficient to achieve this goal.

The issuance of almost all most attractive shelf licenses to the two largest companies, Gazprom and Rosneft, initiated two differently directed processes. On the one hand, the absence of access to the shelf for other Russian and foreign companies should drastically slow down the geological investigation of the shelf. On the other hand, however, the need to fulfill the license obligations compels both Gazprom and Rosneft to carry out geological exploration works (mainly consisting in logging surveys at this stage), according to the license schedule if possible; all the more so that the Ministry of Natural Resources and Environment now promises to keep strict watch on it.
The adopted procedure of shelf license issuance does not allow to use another convenient tool widely utilized in the world – multiclient surveys during logging operations. With this procedure, service companies carry out operations in the sea areas they selected using their own funding and at their own risk; then sell the resulting data many times to all interested companies. Quite recently, only 2 or 3 years ago, the Ministry of Natural Resources and Environment made an attempt at adopting this promising tool on the Russian shelf, but faced a lack of understanding by other government authorities. The Ministry’s stand was actually constructive and useful to the state. For example, the Norwegian company PGS was willing to spend up to 300 million USD of own funds for logging operations in the Russian Arctic. It can definitely be said that other companies were also willing to do this. If such a procedure was adopted, the state represented by the Ministry of Natural Resources and Environment would obtain information about its subsurface free of charge and could use this information when preparing tender packages and oblige bidders to buy this information. Service companies risking their money could earn an income from selling materials as part of tender packages or in other forms widely used in the international practice. Either way, it is now too late to talk about it. The matter has been settled not in the favor of the state.
of the mechanism of subsurface investigation with minimal costs to the state and companies, tested and endorsed throughout the world. It is true that the existing system still has some small opportunities for utilizing this mechanism, but no one uses them for the time being. Rosneft or Gazprom could allow some service companies to conduct multiclient surveys in their areas and then buy these materials, for example, for half the prime cost and sign a joint sales agreement for such materials. It is evident that foreign partners will be involved in most projects. The practice when an alliance of three or four companies develops complex and large fields in order to reduce risks is widely used in the world. When entering a project, the partners should inevitably buy these data in order to estimate reserves and evaluate their own risks. In this case, the main subsurface user would receive partial compensation for its expenses, and the service company would recover its expenses and earned a certain profit. This would be a “win-win” situation.

Another drawback of the shelf licensing strategy adopted in Russia is the absence of an opportunity to study regional laws due to work localization in individual licensed areas. Attaining this goal would require state funding or the use of a mechanism of conducting joint research activities by Russian and foreign companies.

Besides Gazprom and Rosneft, the state is also a customer of shelf logging services, although the amount of such service is minor (in terms of well length, rather than funding). During the last years, such works were associated with the justification of the external continental shelf boundary. The need for such works is driven by the future submitting to the UN of a Russia application for the expansion of its jurisdiction zone at high Arctic latitudes. Nevertheless, the boundary issue is very complex and has been discussed by the scientific community for decades. It is unlikely that it will be solved favorably in the current geopolitical environment.

Thus, all the attractive areas have now been allocated, and the two Russian oil and gas giants are obliged to investigate them. During the next 5 or 7 years, this should cause considerable intensification of logging operations, which has already occurred in 2013–2014. After that, however, when production will have to be started according to licenses, all the works will slow down. It is clear that there will be no production on the shelf on such a scale in the foreseeable future. Only individual production projects will be implemented, and not in the difficult ice conditions of Eastern Arctic, for the sea of which many licenses were issued. For this reason, it can be predicted with a great degree of confidence that the shelf licensing procedure will be reviewed after several years.

**Technological infrastructure and sanctions impact**

In the 1980’s, almost all shelf investigations in the Soviet Union were conducted using Russian equipment, the specifications of which at that time were comparable with the world’s level. Moreover, thanks to the implementation of a large-scale Arctic development program, a fleet of USSR-made drilling vessels (the Shashin, the Muravlenko, a number of self-elevating drilling rigs, etc.), which would also be capable of carrying out exploration operations according to the current extensive shelf exploration program, had been built by the end of the 1980’s in the USSR.

Many years have passed since then, and now virtually all the components of the shelf exploration process are based on foreign equipment and process technologies, even when individual works are carried out by Russian companies. At present, this problem causes particular vulnerability of further shelf subsurface investigations, since the USA, the European Union, Norway, Canada, and Australia have imposed sanctions against Russia. Some of these sanctions directly prohibit works on the Russian shelf. Thus, seismic surveys, offshore drilling, and other services at sea depths of over 152 m (500 feet), as well as practically all operations in Arctic are prohibited; and these limitations have been enforced already. For example, ExxonMobil, a Rosneft partner, even after the recent discovery of a field in the Kara Sea discontinues its participation in Arctic projects and obtains a permission to complete abandonment operations on the Universitetskaya-1 well in an orderly manner, in order to avoid environmental damage etc.

We will try to analyze what are the threats of the further sanctions prolongation for Russia [4, 5]. We begin with the activities preceding prospecting and exploratory drilling, primarily with seismic surveys. Note that MAGE, Sevmorneftegeofizika (SMNG), Dalmorneftegeofizika (DMNG), and other companies have more than ten vessels of their own for conducting 2D seismic surveys with associated shipboard gravity and magnetic
measures; but all these vessels are equipped with foreign-made signal sources and receivers (towed streamers). Many of the vessels are nearly 30 or more years old, and such “old” vessels can be prohibited from being used in Arctic as early as 2015. Note also that 2D seismic survey is only effective at the reconnaissance and prospecting stages, while 3D seismic survey is required during detailed operations preceding the staking of costly offshore wells. Russian companies only have three vessels capable of this, with each vessel being equipped with 4 to 8 towed streamers, while in most tenders even Russian customers require that a minimum of 12 streamers are used. Besides that, the equipment installed on these vessels does not allow to conduct so-called “broadband” 3D seismic surveys, while this is becoming a standard requirement abroad. Thus, the quality of the resulting 3D data can be compared approximately with the 15-year old world level. What makes the situation even more difficult is that seismic surveys cannot be conducted by 3D-capable vessels in ice conditions, since 300–400 t of costly overboard equipment consisting of 12–16 towed streamers can be simply shorn by ice. The American company ION has process technology for towed streamer protection from ice (only for 2D, not 3D surveys), which will leave the market because of the sanctions. It should be noted that this technology has Russian roots: such works, headed by A.A. Gagelgants, were conducted in Russia in the test run mode in the beginning of the 1990’s. However, the priority was lost later on. For this reason, in the present situation, only production 2D seismic survey operations can be carried out in Eastern Arctic during the short ice-free period, which only lasts for a maximum of a month and a half in this region.

Nevertheless, in the seismic survey data processing software area, the substitution of foreign technologies with Russian software is quite possible. The most important condition of successful geological exploration on the shelf is the availability of a process infrastructure and present-day technologies of prospecting and exploratory drilling (and production offshore drilling later on). Russia has a number of its own drilling rigs, for example, the Polyarnoye Siyaniye and Arcticheskaya Zvezda offshore drilling platforms built several years ago in Vyborg. It should be realized although that only the welded metal foundations were made by Russian personnel, while the process part of the platforms was mostly made in South Korea using many US patents; which may lead to service problems in the future. Besides that, the entire small fleet of Russian offshore drilling platforms is not sufficient to meet even a third of Gazprom and Rosneft’s license obligations in offshore licensed areas. It should also be added that there are no tried production technologies for the exploitation of the giant Rusanov and Leningradskoe gas-condensate fields in the Kara Sea, discovered during the times of the USSR, either in Russia or the world. For Eastern Arctic, which is covered with ice for the most part of the year, even projects for the development of such technologies do not exist at this stage. (Concepts do not count.)

It follows from the above that reliance on foreign technologies in the Russian shelf investigation area is close to absolute; and it cannot be instantly avoided. Today, unfortunately, some public figures speak as if victory were already in the bag. (“Thanks, Obama, we will begin making our own equipment.”) However, in high-tech areas, this problem cannot be solved quickly, all the more so as the Russian industry and the machinery building industry, in particular, has considerably lost its potential during the last twenty odd years. In many things, the process has now been reduced to the assembly of simpler machinery and equipment using foreign components, even in the simplest machine-building industries. In order to learn to make our own products, we need a serious, elaborated long-term program for import substitution in the industry in sanctions conditions, which does not exist and is not planned in the near future.

A serious factor making shelf exploitation more difficult is the problems of environmental protection, particularly in Arctic; since at present, there are actually no effective methods for oil spill response in the harsh environment of polar regions, the polar night, and the absence of any industrial infrastructure within thousands kilometers. Oil spills and other adverse human-caused events can have catastrophic consequences for the vulnerable Arctic nature because it is virtually impossible to arrange quick mitigation of such consequences. This fact is also a technical constraint of sorts for large-scale shelf production deployment.

As mentioned above, the last three years have seen an unprecedented campaign for issuing shelf licenses to two Russian giants, Rosneft and Gazprom, and an increase in logging operations in such licensed and other areas. At the same time,
the gigantic shelf fields, Shtokman, Rusanov, and Leningradskoe, discovered over 20 years ago, as well as dozens of other large and medium fields remain unclaimed due to technological and economic reasons. Thus, the beginning of production in the framework of the detailed Shtokman project, which has received a lot of funding during the previous decades, was delayed many times: first to 2007, then to 2012 and 2017. Now, the matter has been delayed for an indefinite, and very long, time (to 2025 and later). The beginning of production at the above-mentioned Rusanov and Leningradskoe fields in the Kara Sea has been delayed to long after 2030. By that time, the energy resource situation on the planet in general can be changed drastically. The beginning of these changes can be seen rather clearly at the present time.

In the new situation, the main “pro et contra” concerning Russian shelf exploitation should be analyzed more thoroughly and objectively and the program should be made more realistic. Does the country in such adverse economic conditions need to make every effort in order to produce very expensive oil and gas at some time in the very distant future? Actually, it seems advisable to concentrate on the very few coastal projects located close to developed infrastructure and within a reasonable vicinity of traditional production areas.

What if we still go the way of fulfilling license obligations in all the areas and raise considerable funds in order to continue with exploration and subsequent exploitation? Will we find consumers of this oil and gas? And if we do find them, how much hydrocarbons will they be willing to buy and at what price? We will try to find at least some answers to these questions.

**Where will Russian shelf oil and gas be supplied in foreseeable future?**

This is a very important question and it should not be ignored if we deal with such large-scale projects. Unfortunately, it is left “behind the scenes” in all the shelf development programs the author is aware about. It is tacitly accepted that as soon as we explore and produce oil and gas, there will immediately be those to whom we can sell that oil and gas at a profit. Meanwhile, one of the main reasons for shutting down the largest Shtokman project was the absence of the sales market, among other reasons. First, it was assumed that some gas will be supplied to Europe over a pipeline, while some other gas, a much larger portion of it, will be liquefied at the Kola Bay coast and supplied to the US market, which seemed as having infinite capabilities at that time. What is the situation now? The USA provide themselves with gas to a large extent, becoming the largest gas producer in the world. Natural gas liquefaction (NGL) plants are being built in the US and Canada, with an aim of exporting gas in the near future, including to Europe, which will expel Russia from the European market. So far, many people hope that this will not happen, since shale gas is very expensive. However, technologies are developed and become less expensive with time. Also, shale gas is not our only competitor: new reserves of usual gas are discovered every year in more favorable environments than on the shelf of Arctic and the Russian Far East.

At present, competition for hydrocarbon material sales markets has become fierce. The situation around Ukraine with its gas transportation system, the European Union’s impediments to the construction of the Southern Stream pipeline, and the active construction of new regasification terminals in Europe also follow the logic described above. The difficult situation in Europe has raised interest in Asian Pacific countries. Gas is high in demand there, and the prices are one and a half times higher than in Europe. Everyone hopes that such a situation will continue in the future. We will try to analyze this situation objectively, all the more so that the Asian Pacific market is close to the largest Russian offshore oil and gas production sites at the fields included in the projects Sakhalin-1 and Sakhalin-2, and production has been commenced at the Kirinskoye field of the Sakhalin-3 project. This is the first and most important producing oil and gas cluster on the Russian shelf. (Production at the Prirazlomnoye field in Arctic is currently in the very beginning, and Novatek’s Yurkharovo field in the Taz Bay cannot exactly be called a shelf field.)

Now, the Sakhalin shelf projects pay over a hundred billion rubles to the Russian budget every year, although in the 1990’s, when the Production Sharing Agreement (PSA) scheme was launched, many deputies and government officials had serious doubts about the validity of such a step. However, the state did not spend almost anything here, because the main expenses within the framework of PSA were borne by foreign companies. Many thousands of Russian engineers got a job and were trained in offshore oil and gas production, and the Sakhalin Region became an advanced technological region.
with developed industrial and social infrastructure, instead of the depressive area it used to be. The most advanced and so far Russia’s only gas liquefaction plant supplies its products to Japan, Korea, and China; and its third train should be commissioned by 2017.

Unlike these projects, the projects in the Barents Sea, absorbing vast amounts of government-provided financing during 30 years, have not yielded any tangible results. This is a sign of extreme inefficiency of the administrative command system, which was implemented there, unlike in Sakhalin, where the PSA was finally adopted in the 1990’s; and this is despite the fact that the Barents Sea reserves are many times higher than on Sakhalin.

Currently, the Asian market could take even many times more oil and gas from the Sakhalin shelf, even at high prices. Let us see, however, what may happen in the near future. It is planned that two more NGL plants will be launched in Russia by 2018, on the Yamal Peninsula and in Vladivostok, and, possibly, on the Baltic Sea and the Pechora river a little later. Even now, it has become clear that there will be delays, including due to sanctions, and these plants will probably not be commissioned until 2020. Besides that, the Far Eastern NGL plant at the first time (in 2018) will also be supplied with Sakhalin’s gas, since sufficient volumes of gas from the Eastern Siberian Chayanda and Kovykta fields will not be available by that time. However, there are currently no new fields prepared for production on Sakhalin, and the Sakhalin – Khabarovsk – Vladivostok gas pipeline that was constructed is loaded by less than a fourth of its capacity. The large Yuzhno-Kirinskoye field recently discovered on the shelf has many specifics that make its development difficult, including the presence of fringe oil accumulation; and cannot be commissioned within such a short time. Exploratory operations are still being conducted there.

What will happen to the Asian market by that time? Currently, the main NGL volume is supplied there from Qatar, which prefers this market to Europe due to high prices. In 2016–2017, large NGL facilities will be launched in Australia, which will triple the liquefied gas production in this country, and it may become a leading gas supplier for some time. Australian gas, like gas from Canada, the USA, and other countries, will also come to the Asian market, occupying the free niches. According to predictions by the Oxford Institute of Energy Studies, the world’s NGL production will triple by 2020 (fig. 4). Initially, the main streams will probably be directed to the premium Asian Pacific market, resulting in a gradual price decrease until the prices will become equal to the mean European prices with regard to the transportation expenses. With such globalization, in the near future the market should virtually equalize all relative prices, although in absolute terms they will vary by regions due to different distances to supply sources. It means that after 2020 the Asian market will not be ready to take Russian gas at the high prices that are used by some economists when predicting the efficiency of projects, including shelf ones. There may also not be any unoccupied niches left at the market by that time.

What about oil, which is also predicted to be found in considerably quantities, although less than gas, on the Russian shelf? Changes here are also evident. According to predictions, the USA should have overhaul Saudi Arabia and become

![Fig. 4. Predicted world’s NGL production according to Oxford Institute of Energy Studies](image-url)
the world’s largest producer in terms of daily oil production by the end of 2014. Thus, if in 2005 the USA met 60% of its own economy demand in oil using import, this is expected to decrease to about 21% in 2015. However, due to a twofold decrease in oil prices by the beginning of 2015, oil imports to the USA still exceeded 25%, since some shale fields become unprofitable at an oil price of 50 USD/barrel (just as Russian onshore fields). The expansion of oil production in the USA also has consequences for the entire world, because the United States is the main oil and gas consumer on the planet. Where will the surplus of hydrocarbons, which the US does not need in such quantities, be supplied? It is evident that it will be supplied to the world’s market and become price decrease drivers. Now, if we remember that there is a lot of oil and gas in such countries as Libya, Iran, and Iraq, which cannot supply them as much as they could due to internal and external problems, we can understand that there is no shortage of hydrocarbons now and there will not be any in the foreseeable future. On the contrary, a surplus of oil and gas, resulting in considerable price decrease, is observed at times. During such times, those whose prime production costs are low will win. The prime production costs of hydrocarbon materials are extremely high in Russia, many times higher than the calculated prime costs for Middle Eastern fields. For this reason, it is highly likely to get into the loss zone if the sale prices of our hydrocarbon drop, even in the context of some traditional production areas, to say nothing of the shelf. The cost-intensive Arctic shelf projects will probably have to wait for a favorable situation for many decades. For this reason, in the existing situation, the shelf investigation and development program must surely be corrected in favor of financing the most promising projects in the coastal and transit zones near production areas with a developed infrastructure. The other zones will undoubtedly need to be studied, but using relatively cheap remote methods, for the time being. The existing ambitious program cannot now be afforded by the state or the two largest state-owned companies, Gazprom and Rosneft, facing hard times.

Thus, the need to fulfil the exploration license obligations established a favorable environment for considerable growth of logging operations on the Russian shelf during the next years, however, the imposed sanctions put the geological exploration operations program into question.

The emergence of significant additional hydrocarbon volumes at the world’s market restrains oil and gas prices, and has currently led to their drastic decrease. It may significantly reduce the profitability of Russian shelf projects, with many of them becoming unprofitable.

On the one hand, the adopted scheme for issuing shelf licenses only to Rosneft and Gazprom can result in excessive exploration of potentially unclaimed hydrocarbon reserves, however, on the other hand, the imposed sanctions can slow down the rate of Russian shelf investigation and development dramatically.

The large-scale development of Arctic offshore fields, except in coastal and transit zones, is unlikely in the foreseeable future due to economic, technological, and environmental reasons.

Without serious enhancements of Russian oil and gas industry administration, including in shelf projects, it will be difficult to meet the newly emerging challenges.

References