Algorithm for implementing the import substitution strategy when exploiting hydrocarbons on the Arctic shelf of the Russian Federation

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Abstract. The development of an algorithm for implementing the import substitution strategy related to the exploitation of oil and gas fields on the Arctic shelf of the Russian Federation requires full-scale state regulation aimed at reducing dependence on technologies and the corresponding equipment of the global oil and gas business. Dependence on imported technologies in recent years has contributed to the lag and slowdown in the creation of domestic innovative technologies and related equipment as well as the loss of competitive advantages. The work formulates the principles for the formation of the import substitution strategy when exploiting oil and gas fields on the Arctic shelf which encompass the problems of scientific justification, legal regulation, systemic character, adaptability, innovative development, efficiency, economy, maintenance and growth of product quality, the need for process informatization and active use of workforce as well as environmental safety. An exemplary algorithm for implementing the strategy of import substitution when exploiting hydrocarbons on the Arctic shelf is presented and its stages are considered. The proposed algorithm for implementing the strategy of import substitution when exploiting hydrocarbons on the Arctic shelf will increase the number of factors of the Russian Arctic development and is an important basis for involvement of industrial enterprises, exploration and research organizations to production of innovative goods and services. As a result it will serve as an incentive for industrial, infrastructural and socio-economic development of the Arctic territory.

1. Introduction

In the Russian Arctic 90 percent of the recoverable hydrocarbon resources of the continental shelf of the Russian Federation are concentrated including about 70% on the shelf of the Kara and Barents Seas. According to experts by 2030 oil production on the Arctic shelf will increase by 3.6 times and will be about 2.2 million barrels of oil equivalent per day what will be half of the hydrocarbons exploited in the Arctic [1].

The industrial complex of the Russian Federation is largely ensured by the exploitation of hydrocarbon deposits and forms a significant share of the country's foreign exchange earnings and accordingly the consolidated budget, the revenue dynamics of the Arctic territorial infrastructure and the population employment.
Arctic deposits are the most important reserves of hydrocarbon resources. The exploitation of oil and gas resources increases the economic potential of the Arctic regions and contributes to infrastructure development.

Despite significant prospects the exploitation of the Arctic continental shelf is associated with serious challenges and problems primarily related to technological and technical re-equipment of the industry, improvement of the qualitative and quantitative indicators of raw material extraction, development and implementation of innovative technologies and related equipment.

For the implementation of strategic government objectives it is necessary to create a systematic and reasonable strategy for the Arctic shelf development taking into account the implementation of import substitution policy.

2. Modern history of import substitution development in the Russian oil and gas industry
Since 2014 Russia has faced a number of unprecedented challenges with regard to oil exploitation in the Arctic associated with both falling oil prices and sectoral sanctions imposed against the Russian Federation by the United States and a number of European countries. The sanctions were intended to stop implementation of current and promising projects on the Arctic shelf, which according to the unanimous opinion of most experts in the near future acts as a guarantor of energy security of not only Russia but also of many foreign countries.

For the formation of the import substitution policy a number of legal acts were adopted [2, 3]. “Prirazlomnoye” project as well as projects at the geological exploration stage that are able to become new points of growth of oil extraction in the medium and long term and owned by the PJSC “Gazprom Neft” and PJSC “Rosneft” were selected as the object of sectoral restrictions for oil extraction on the Arctic shelf of the Russian Federation.

Exploitation of the Arctic shelf is a new direction for activities of the Russian oil and gas industry. Despite the accumulated significant experience in exploiting onshore oil fields, laying tens of thousands kilometers of gas and oil pipelines, exploiting shelf hydrocarbon fields in the Arctic is an unprecedentedly new work direction in the technical, technological and organizational terms. Until August 2014 more than 90% of the equipment used for the shelf exploitation was imported primarily from the USA and Europe. Russian components accounted for only a small part of equipment that is not classified as high-tech.

The imposed sanctions were designed to “freeze” existing projects on the Arctic shelf by strictly prohibiting supply of technological equipment for exploration and exploitation of hydrocarbons on the Arctic shelf. It should be noted that the sanctions from western countries seriously affected the economic interests of a number of energy companies: American “ExxonMobil”, Italian “Eni”, and Norwegian “Statoil”, which had signed agreements on the development of promising areas in the Russian zone of the Arctic shelf. The existing agreements were terminated despite the obvious success in joint work on the Russian shelf: for example the joint work on construction of a search and appraisal well by the Russian oil company “Rosneft” and American “ExxonMobil” in the Kara Sea at the “Universitetskaya” structure have led to opening of a large oil field received the name “Pobeda”.

Foreign equipment suppliers are strictly prohibited from supplying equipment to Russian Arctic projects under the threat of sanctions from the governments of the states up to bankruptcy of companies and criminal prosecution of managers. It also affected the possibility of supplying equipment through the “third” countries if it was detected that the ultimate beneficiary are companies related to the implementation of Russian projects in the Arctic. Actively developing until 2014 international cooperation in exploitation of hydrocarbons in cold climates was stopped. In addition, some Russian energy companies were denied access to the foreign capital market resulting in loss of the possibility of companies to attract loans and place debt securities with a maturity of more than 30 days. The situation was aggravated by the Russia’s lack of technology, appropriate equipment and materials, technical means for carrying out work on the shelf and their support, drilling rigs for exploration and mining, support vessels, helicopters for staff rotation delivery as well as vehicles of underwater remote control and monitoring.
Obviously the imposed sectoral restrictions have affected Russian projects of exploration and extraction of hydrocarbons in the Arctic — some of the exploration projects that were actively developing until 2014 were stopped. It should be noted that the sanctions did not have a critical impact on the implementation of “Prirazlomnoye” project owned by PJSC “Gazprom Neft” for oil extraction in industrial volumes. In December 2013 “Prirazlomnoye” oil field was put into commercial operation and in April 2014 the first batch of oil was shipped from the platform. “Prirazlomnoye” is the only active oil field on the Russian Arctic shelf. The field's oil was named Arctic Oil (ARCO) and has high bitumen content and a low coke residue. Also due to the low paraffin content heavy arctic oil is well transported and contains a large number of fractions used for the production of oils. The oil is well suited to refineries in northwestern Europe. Currently 120 oil tankers have been shipped including shipments in harsh ice conditions. For shipment specially designed for such conditions ice-class tankers “Mikhail Ulyanov” and “Kirill Lavrov” were used.

Since the introduction of sanctions energy companies have begun a large-scale work to find new suppliers and “having opened the doors” of the Russian shelf for Eastern companies that had not previously participated in Russian projects. It made it possible to preserve the possibility of implementing programs for the development of shelf projects at a high technological level and to reduce to a minimum the adjustment of license obligations of Russian state companies.

Development of the Russian national service market of suppliers became the most important event in conditions of sectoral restrictions. In each of the Russian energy companies import substitution programs that aimed at interacting with the domestic industry were formed.

It should be noted that despite the skepticism from critics the import substitution programs implemented by the Government and Russian energy companies have reached tangible success. For example “Gazprom Neft” has identified key directions to support and expand the domestic production base. Within these directions domestic producers from the company and the state receive comprehensive support in the development of new types of products and technologies. In addition there is a consideration of a model for creating joint ventures as well as localization of production capacities of leading foreign manufacturers in Russia. Within such directions the following ones should be noted: catalysts for petrochemistry and oil refining, compressors and pumps, necessary equipment for seismic exploration and maintenance of horizontal and directional drilling.

The state actively supports stimulation of the innovative goods production: a legislative base is being formed, action plans have been developed together with energy companies and ministries to replace equipment imports and critical components. PJSC “Gazprom Neft” proposed a unique mechanism “Buy Russian” consisting in state subsidizing the buyer for price differences and risk charges when purchasing pilot batches of new products manufactured in the Russian Federation. This mechanism works as follows: the state compensates up to 20% of the production cost to the buyer of domestic developments in case if the product is more expensive than import or its application involves a number of technological risks.

In 2016 the Ministry of Industry and Trade of the Russian Federation announced contests for a number of research and development works (R&D). According to the results the following companies were the winners:
- R&D «Gelen-filled Spit» —JSC Concern Okeanpribor;
- R&D «Location» and «Seismo Spit» are developed by the JSC N. N. Andreyev Acoustics Institute;
- R&D «Selection» is developed by the Shirshov Institute of Oceanology of RAS;
- R&D «Seismotomography» is developed by the JSC Scientific Production Enterprise “Aviation and Marine Electronics”.

According to the results of the implementation of the first two institutions a recording complex and a spit control mechanism for seismic vessels have been created. In October 2017 the tests were carried out on the seismic vessel "MAGE".
It should be noted that the task of state regulation is not only the development and implementation of Russian innovative technologies for the exploitation of hydrocarbons on the Arctic shelf but also the formation of import substitution policy [4].

3. Principles of import substitution strategy formation during the exploitation of oil and gas fields of the Arctic shelf
The proposed principles the import substitution strategy should be based on are:
1). The principle of legal regulation for complex planning of field exploitation.

As an example it can be noted that creation of PJSC “Gazprom Neft” Department of technological partnerships and import substitution in order to interact with various organizations engaged in the development of innovative technologies and equipment supply.

2). The principle of development and implementation of scientifically based tools taking into account the study of the achievements of foreign and domestic experience.

3). The principle of consistency showing that the exploitation of hydrocarbon resources is a complex economic system. During the process of implementing the strategy it is necessary to take into account the systemic nature of the functioning and development of the oil and gas industry as well as the full range of legal, economic, industrial and informational relations in economic activities of the Arctic [5].

There is a systemic interdependence of the exploitation of the Arctic hydrocarbon fields with the development of the Arctic transport system, the development of the icebreaker fleet, the extent of the spread of the Arctic Ocean ice fields and accounting for iceberg hazard [6].

4). The principle of purposefulness involving the setting of goals for the federal and regional authorities. At the same time the goal should be real and achievable by active actions and a rational management system. The goals should contain specification and detailing.

5). The principle of innovation that aimed at replacing imported technologies with domestic ones what is possible if there are certain scientific, technical, organizational and social conditions [7, 8].

To ensure the effectiveness of the Arctic shelf exploitation it is necessary to activate research and development. Thus the oil extraction coefficient when exploiting “Prirazlomnoye” shelf field does not exceed 30%. At the same time in Norway when developing such deposits by the use of innovative technologies the extraction coefficient is more than 70%.

The extraction of hydrocarbon resources on the Arctic shelf will require widespread introduction of industrial outsourcing and the development of industrial services. Due to the high level of technological equipment and the specialized type of work small and medium innovative enterprises can contribute to the modernization of production, the use of new materials and innovative technologies and to the acceleration of scientific and technological progress [9, 10].

6). The principle of efficiency and economy which envisages the development of the most rational way of implementing the import substitution strategy.

7). The principle aimed at improving the quality and competitiveness of products for the exploitation of shelf fields. For example, there is a production by a number of enterprises of poor-quality pipeline fittings for the oil and gas industry.

8). The principle of informativeness providing modern information when exploiting hydrocarbon fields on the Arctic shelf.

9). The principle of focusing on highly qualified human resources.

It is necessary to create a staffing system [11].

10). The principle of environmental and technological safety providing above all preservation of a vulnerable ecosystem and prevention of potential oil spills.

4. Algorithm for implementing the import substitution strategy when exploiting hydrocarbons on the Arctic shelf
An algorithm for implementing the import substitution strategy when exploiting hydrocarbons on the Arctic shelf was proposed. It involves the following steps.
1). Monitoring of the dynamics and analysis of the import structure, formation of a list of goods and technologies subject to import substitution. To understand the breadth of the possibilities of import substitution and their structuring it is necessary to develop a system of classification features [12, 13]

2). Ranking of import substituting projects by degree of readiness for implementation and by degree of priority.

3). Organization of work with the hydrocarbon extraction companies to include in their technical specifications for the purchase requirements of the preferential inclusion of materials, equipment and technologies of Russian production if there is an availability of relevant Russian analogues.

4). Joint development of action plans for the creation of import substituting products by Russian manufacturers, energy companies and government sector agencies which allow to coordinate the stages of creating new types of products.

In this regard it should be noted the experience of PJSC “Gazprom Neft”, which in order to optimize interaction with technology partners has defined and widely distributed its List of technologies and equipment which the company is ready to acquire from domestic manufacturers.

5). Assistance to organizations that produce or plan to produce import-substituting products and technologies in the form of state financing of tripartite contracts concluded between Russian producers, energy companies and government industry departments (on example of PJSC “Gazprom Neft” such tripartite contracts were funded in 2016-2017 for the amount exceeding 2 billion rubles.) [14].

6). Creation of a modern information base and knowledge about the fundamental possibility of creation of import-substituting products.

7). Preparation of proposals for improving staffing and aimed at increasing the flexibility of the Arctic system of secondary vocational education, ensuring rapid response to changes in the labor market demand and reducing the need for employees of a certain level and specialization.

8). Questionnaire of suppliers and consumers of import substituting products and making suggestions for the development of additional support measures for manufacturers of import substituting products and technologies. Development of recommendations for improving the strategy of import substitution when exploiting hydrocarbons on the Arctic shelf.

5. Conclusion
The proposed algorithm for implementing the import substitution strategy when exploiting hydrocarbons on the Arctic shelf will increase the number of development factors of the Russian Arctic and is an important basis for the involvement of industrial enterprises, exploration and research organizations to production of innovative goods and services. In result it will serve as an incentive for industrial, infrastructural and socio-economic development of the Arctic territory.

Implementation of projects for the exploitation of the shelf fields is capable of connecting key industries to the development of necessary goods. Their accelerated development will serve as a locomotive for related industries resulting in increase of domestic demand for products, which is a reliable engine of socio-economic development.

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