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Foreign experience of hydrocarbon resources development at the Arctic continental shelf

The article examines the experience of hydrocarbon resources of the Arctic zone of the world's leading oil and gas powers in order to identify effective socio-economic approaches to the development of hydrocarbon deposits in the public interest and possible future use in modern Russian conditions. A comparative analysis of natural resources development models by different states and conclusions about their effectiveness are given.

The authors discuss aspects of an effective industrial policy in the upstream oil and gas sector in the region, taking into account a wide range of socio-economic problems in various stages of deposits development. The article also addresses the problems of relationships between the state and the oil and gas business, formation of an effective strategy for managing the development of hydrocarbon resources.

Oil and gas industry, industrial policy, the Arctic shelf hydrocarbon resources, socio-economic effects.

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Oil and gas complex is an essential link in the economic structure of Russia, forming a significant part of federal budget's tax revenue. Extraction and processing of hydrocarbons controls the economic potential of some regions of the Russian Federation.

Reproduction of hydrocarbon resource base is currently the main and most important challenge of the Russian oil and gas industry, as in the past 20 years it has been developing mainly at the expense of stocks explored in 60es-70es of the last century. This solution may be mainly due to conduct of exploration for oil and gas in new regions and assessment of the prospects of deep horizons of the sedimentary cover. Waters of the continental shelf have huge potential in this regard; the largest component of marine reserves is related to the Arctic waters.

Involvement of marine oil and gas resources of Russia in the industrial revolution is an alternative direction of development of oil and gas industry. Existing estimates of marine hydrocarbon potential resources are higher than those estimates for the largest oil and gas basins in the world.

Search and efficient development of offshore oil and gas fields is not possible without the use of experience and knowledge of previous generations, as well as the transfer of foreign technology, organizational and economic experience and innovation for the effective development of shelf deposits for the public interest.

In recent years, issues of development and exploitation of hydrocarbons in the high northern latitudes (mainland and continental shelf situated above latitude 60 – 64°) were the focus of the most diverse groups of the world community – politicians, national and regional levels, representatives of social movements and environmental organizations, as well as directly oil and gas business.

Significant resource potential of the northern territories gives rise to a lot of discussions on issues of search and exploration, and the subsequent development of hydrocarbons located in the high northern latitudes, maintained almost simultaneously in several countries of the world. Even at relatively low volumes of exploration, which are held the world in the northern areas there have been already identified unique fields, such as the Shtokmanovskoye, natural gas reserves in the Ob and Taz gulfs (Russia), Hybernia (Canada), Snovit and Ormen Lange (Norway). In addition, oil and gas potential of other, less studied areas of the Arctic shelf have been confirmed.

Among the main causes of attention to the Arctic hydrocarbons there are the following:

- the trends towards exhaustion of oil and natural gas in the main traditional areas of the leading oil and gas world companies;
- technical and technological innovations that made possible the development of hydrocarbon resources in extreme climatic conditions with an acceptable cost-effectiveness;
- strengthening the role of factors and conditions that underlie the political and energy security and stability of the leading industrialized countries (primarily in the US).

The latter circumstance appears as one of the dominant reasons of general interest to the northern territories. North Seas and the territories having a large hydrocarbon potential, are within the jurisdiction of such countries as Canada, Norway, USA, UK, Denmark, Russia and therefore represent as regions with very high political stability, from which we can implement sustainable supply of hydrocarbons to the world's major market outlets.

High competitive positions of Russia in a globalized economy are largely determined by the availability of strategic stocks of natural minerals of the North, which will ensure economic stability, both now and in the future. According to experts, there are more attractive to long-term investment sites in northern Russia than in any other state.

One of the most important distinguishing features of the development of hydrocarbon resources in the Far North of foreign countries is the dominance of state involvement at all stages of formulation and adoption of major decisions. It is necessary to take into account the interests of provinces, some municipalities,

as well as indigenous nationalities and ethnic groups living in areas of oil and gas resources development. This conclusion comes from the study and analysis of the experience of natural resources exploitation in various northern regions of the world, unconditional leadership among which belongs to Norway.

For instance, 40 years ago Norway began the development of offshore hydrocarbon deposits with attraction of foreign companies and the conversion of whaling ships in rigs. Over four decades, a powerful industrial base created in the country was able to provide oil and gas sector with the most modern equipment to build the world's largest offshore drilling rig, to master the production of gas with the use of underwater mining complexes, to build the world's northernmost gas liquefaction plant, as well as pave the underwater pipes at depths of the sea more than a thousand meters.

Exploratory drilling of oil on the Norwegian continental shelf began in 1966 after there was done demarcation and the relevant agreements on the division of bottom areas of the North Sea to Denmark and the UK were signed. The first large deposit "Ekofisk" was discovered in 1969 by American company "Philips". In just four decades on the shelf of Norway there have been drilled 2992 production wells, more than 60 fields were opened [1].

To achieve the main goal – to improve the social value of national hydrocarbon resources – Norway, which has no experience of exploration and development of oil and gas fields and the necessary financial resources, had to face a huge challenge: on the one hand, to develop effective public policies for the integrated management of oil and gas resources and, on the other – to attract private capital which is able to realize the entire process of their development on a high technical, technological and social level [8].

Norway began to produce more oil than was required for its own needs in 1975 already. This circumstance determined the specificity of the Norwegian approach to the development of oil resources. Moreover, this specificity was also reflected in the further development of fields in the north of the Norwegian and Barents Seas.

The basic principle underlying the use of oil and gas resources in Norway is that hydrocarbons are irreplaceable national resource. Therefore, according to the Norwegian government, the exploitation of hydrocarbon resources must be conducted in such a way as to maximize the value of these resources and ensure the highest share of revenues from oil and gas for the country as a whole, also taking into account the needs of future generations. Among the main objectives of public policy in the field of oil and gas resources in Norway may be noted the following [9]:

a) establishment of the maximum possible economic efficiency of exploration, development and production of hydrocarbons, as well as ensuring a stable level of welfare and employment;

b) creation of conditions for the internationalization of the Norwegian oil and gas industry in order to ensure the development of this sector of the economy in the period of depletion of major stocks;

c) a combination of the role of one of the leading energy producers with the role of one of the leading countries in achieving the performance indicators that meet environmental requirements, including reduction of greenhouse gas emissions.

In the current global financial crisis the thoughtful strategic and tactical actions of the Government of Norway based on the instruments of financial support to companies engaged in the real economy and provision of interest-free loans arouse respect. The country's oil and gas companies pay the state 80-percent tax while progressing even in a crisis.

Norway has become main supplier of oil and gas to Europe together with Russia and Algeria, taking 10th place in the world by everyday oil production. Providing domestic demand for energy from hydro and wind power, Norway exports 95% of hydrocarbons, providing 68% of the volume of foreign trade, gaining significant funds from this (over 500 billion kroner a year),

which are to improve the welfare of the population, industrial development and replenishment of the pension fund ensuring stable development of the state for many years.

Borrowing from the experience of American companies, Norwegian companies have become leaders in the global market of underwater and drilling equipment, floating oil production systems, storage, shipment and service maintenance. Norway has established a unique model of cooperation between partners of oil and gas industry, united in the organization "INTSOK", and research institutions.

Norway's success in ensuring a high level of hydrocarbon resources in the public interest is largely determined by government policy which encourages partnerships between foreign and Norwegian companies. Thus, the Norwegian Government has made mandatory research programs for foreign companies, which allowed oil and gas technologies, developed and implemented in Norway to be among the best. Since 1970, the state recognized the importance of promoting competition in the oil and gas industry and at the same time the need to stimulate the development of domestic oil and gas industry. Thus, the preferential use of local goods and services in oil and gas projects have been explicitly defined by law: in the period 1972 – 1974, Norway's share of shipments reached 90%.

Establishment of the Norwegian state company "Statoil" in 1972, and the participation in the offshore development of two private Norwegian companies "Norsk Hydro" and "Saga Petroleum" was aimed at the formation of the key role of Norwegian companies in the petroleum sector.

International and foreign companies have been given the important role of technology support in collaborative alliances with Norwegian companies, as well as the role of "catalyst" in the transformation of Norwegian companies in full-scale operators of shelf development.

Joint ventures in the service sector were also created on the basis of principles, which resulted in the Norwegian engineering companies to gain access to advanced technologies. The Norwegian experience shows that the procedure for access of foreign companies to develop oil fields can be effectively used as a tool for solving a wide range of technological, economic and social problems. For example, the realized public value of development of "Ekofisk" field (the largest deposit in the North Sea shelf) as at the end of 2004 was as follows: in the total value of extracted resources the cost of goods and services (procured for the project) amounted to 36%, about 50% were usual taxes and rent charges, approximately 4% was salary of employed in the project and the owners of subsoil using companies got about 10%.

The main objective of Norway was to strengthen its position by expanding domestic presence – involvement in the project and improving management of oil and gas industry in general.

The Norwegian Government is constantly adjusting economic policies in oil and gas industry to ensure long-term socio-economic benefits from the development of resources for the country as a whole. One such example is the adoption of the new Oil Act of 1996, which aims to increase efficiency and reduce costs in the oil and gas industry. The adopted act is an upgrade of the existing regulatory documents in oil and gas industry and involves greater management flexibility in different directions, for example, managing assignments of oil and gas shelf parts.

Hydrocarbon resources of the Norwegian continental shelf are the most important sources of well-being of the country's economy. Oil and gas sector offers great opportunities for the development of regional industry, creating jobs and raise living standards, because it is the driving force for progress of innovations, development of new technologies and business processes in other sectors of Norwegian industry. Very close relationships between the oil and gas industry and the industry of information technology, shipping, finance, insurance and other sectors of the Norwegian economy are formed. Indirect economic effects of oil and gas industry, causing employment and produc-

tion in other sectors of Norwegian industry are significant. Currently, the oil sector indirectly provides employment to approximately 220,000 people throughout Norway [3].

One of the most important factors in the development of new deposits is ensuring the sustainable development of the mining region, in which the field is developed. For example, one of the world leaders in the development of offshore fields, Norwegian company "Statoil", since its inception has been actively involving local businesses in the implementation of large-scale projects to develop oil and gas fields off the coast of Norway. This has contributed significantly to accelerate socio-economic development, within which "Statoil" company acted [6].

The Norwegian Government intends to promote further development of oil and gas sector at the expense of maintaining a high level of business activity within it, paying more attention to the development of new technologies, as well as by encouraging the process of internationalization of the sector. The Norwegian government believes oil and gas industry is a very effective sphere of economic activity with significant potential for development in the long term throughout the Norwegian continental shelf (NCS), including the high latitudes.

Expected residual oil reserves in NCS exceed 10.6 billion m^3 of oil equivalent [3]. Over the past 30 years only 3.3 billion m^3 of oil equivalent were produced, representing about a quarter of all resources. The remaining resources of NCS become increasingly difficult to extract from the technological and commercial point of view.

It is obvious that the future of oil and gas industry in Norway is largely dependent on its ability to compete globally. The internationalization of the oil and gas industry opens up opportunities for development in other countries. Examples of areas where Norwegian companies are at the cutting edge are underwater technology, seismic and reservoir studies. In addition to direct effects on the Norwegian economy, such as export earnings and employment, internationalization is important from the standpoint of long-term competitiveness and ensuring companies' dynamics. International competition is important for learning, innovation and development and is a prerequisite for permanent increase of oil and gas industry.

Norway seeks to implement these general provisions by means of specific examples – first of all in the northern part of the North Sea and the Barents Sea. Pioneering high-latitude projects are development and production of "Snohvit" and "Ormen Lange" deposits.

In these projects, a single approach implemented – in terms of consideration of a coherent chain of added value creation – from the reservoir to the terminal. A distinctive feature of the projects is the lack of surface platforms and other surface marine structures – all operations are controlled remotely from the land – from the remote management of the plant for natural gas liquefying. In this many new technical solutions are used for the first time, such as for example the laying of submarine fiber optic cables. In "Snohvit" deposit the carbon dioxide is released in the terminal for gas receiving on land and transported back to the deposit on special pipeline for injection.

To implement the project "Snohvit" the local business community has formed a special Association of suppliers of oil and gas industry "Petro Arctic" (previously it was called "Snohvit"). Currently, the Association of "Petro Arctic" includes more than 400 vendors, covering a wide range of goods and services. The Association offers its services not only in design and construction stages, but also during subsequent operations. A similar network of suppliers has been formed for the project "Ormen Lange".

Within the "Snohvit" project it is also implemented the use natural gas fields not only as an energy source but also as a source of running out cooling water from the gas liquefaction plant in the amount of 36,000 m^3 of seawater per hour, heated to 12 – 15° which is ideal conditions for fish breeding.

Operating mining companies receive significant government support. The project ("Snohvit") is a pioneer one in a new, poorly developed area so it is fraught with huge initial costs. In the spring of 2002 the Norwegian Government has proposed several changes in the tax system related to the development of the field "Snohvit". Levels of depreciation for the project were established at 33.3% for three years, while depreciation under the regular system of oil taxation is 16.7%. The geographic scope of depreciation rules data is severely restricted by the province of Finnmark and the four municipalities in the northern part of the province of Tromso [3].

The Norwegian experience in the development of Arctic resources is noteworthy, especially for the integration of "northern" component in the overall oil and gas politics of the country. In this case, there is not only the continuity of policy in moving from south to north, but the state presence in all key stages – from the definition of sites and areas of activity to forms of direct participation in oil and gas operations.

We can confidently assert that the strategic goal of transforming the unexpectedly discovered oil wealth in the technological superiority has been successfully solved in Norway. It is important to note that this result was not predetermined in advance. Thus, *the British model* of development of the same stocks as in Norway, the North Sea shelf, made a bid of oilfield services to major international corporations with their advanced technology. As a result, there are two opposite results. If Norway currently has prevailing high-tech oil and gas industry, competitive on the international market, the UK did not work it out [5]. It is no coincidence that Norway's experience is copied by other states. Currently, Chinese oil and gas service market is acting under this scenario [7].

The experience of the first project on *the Canadian shelf – Hibernia* is also useful for implementing projects in Arctic in Russia. This is the first large deposit mined in the coastal waters of the Canadian province of Newfoundland [4].

This project is unique due to technical, political and financial reasons. The Northern Coastal Region conditions require the use of advanced technologies, thanks to the introduction of which Canada expects to be among the leading countries in the world in the field of offshore oil production. The investment capacity of the project is 7.3 billion dollars in reserves of 400 million tons Hibernia deposit, located on the east coast of Canada, was opened in 1979. It took over 10 years to the Government of Canada and Newfoundland to have entered into agreements with oil companies to proceed towards development.

In 1985 federal and provincial governments signed a master agreement providing for joint management of marine oil and gas reserves. The Canadian government partly financing the project, in the long term, will not only return all spent money, but also reduce budget spending, as there will be no need for subsidies to the province of Newfoundland. Many Canadian experts believe that from the standpoint of public policy Hibernia serves the purposes of regional development in the first place, and purpose of oil production in the second.

It is significantly that the State in the formulation of approaches to implement this pioneering project has played and continues to play the role of arbiter and guarantor of property rights, and also provides compensation for the increased risks associated with this project. In order to reduce risks and improve investment attractiveness of the state is directly involved in the financial support of the project. The main forms of such support are as follows:

a) reimbursement of 25% of the cost of preparing for operation to the project operating companies, which is the sum of 1.05 billion doll.;

b) guarantee loans amounting to 40% of the cost of preparing for operation of up to 1.68 billion doll.; if companies do not return the loans, it would be made by the government and oil companies will give it the respective share in the project in this case;

c) interest-free loan of up to 300 million doll. To facilitate the payment of interest

(the loan is granted in the event that oil prices plunge below 19 doll. per barrel);

d) additional loan guarantees of up to 175 million doll. to pay 40% of the cost of preparing for operation, if the cost of this phase exceeds 5.2 billion doll.

While supporting the project, the federal and provincial governments aimed at raising the maximum level of employment of Canadians and improving their skills. In general, 66% of jobs have been allocated to Canadians and the share of Canadian contractors in the total work was 60%.

Unlike Russia, the requirements on the use of local labor force and local contractors are more "weighty" as they are accompanied by appropriate financial support from the state. Total project costs are as follows: 5.8 billion dollars are invested by the companies and 1.5 billion dollars by the government.

Taking into account the pioneering nature of the project a special "Law on the Development of Hibernia" was developed and adopted, whereby the charge of the project and its coordination with federal agencies is the Minister of Natural Resources of Canada.

Canadian authorities had complicated negotiations on financing activities and income distribution. At the same time for an early implementation of the project, the federal and regional governments had to compromise on the issue of jurisdiction over coastal waters, and adopted a set of measures of state support for financing the project. Political will and benefits brought the project among the largest in the world.

An example of this project also illustrates the pragmatic approach at the state level very eloquently as there are no disputes about the ownership of hydrocarbon resources in the shelf. Shelf in Canada (as well as in Russia) is under the jurisdiction of the federation. Nevertheless, an agreement was concluded between the Federation and Newfoundland, as the combined efforts of the authorities at various levels may be of mutual benefit. Thus, solving the problems of the shelf deposits development is a part of cooperative federalism. The federal government right from the start of the project on the shelf was focused on reaching agreements with the provinces – Newfoundland and Nova Scotia (Western Canada) – to co-manage resources on the shelf.

Norwegian, Canadian and British experience in the development of oil and gas deposits will be extremely useful for Russia. Moreover, at present the domestic business has no experience, as well as practical approaches to implementation of new large, complex projects in undeveloped areas. This raises the crucial, complex and urgent task to create practical approaches to implementing such projects. The principal feature of the new projects – higher costs in the development of the region – the creation of regional infrastructure, which significantly affects the economy of the project. Another important feature of projects in new areas is the need for a coordination of procedures and approaches to harmonize the interests of various companies – holders of licenses for subsoil use, as well as the need to create the conditions and prerequisites for long-term socio-economic development of new areas.

Equally important is the principal feature of projects in new areas – the impossibility of solving the problem exclusively through the approaches focused on pure commercial viability of projects on development of hydrocarbon fields.

Analysis of state of affairs with the formation of approaches to the implementation of new oil projects in other northern regions of the world – Norway, Greenland, Newfoundland (Canada), north-west and north-east Alaska (USA), the Northwest Territories and Yukon (Canada) – shows that *none of these projects is reviewed and does not operate in isolation from the solution of socio-economic problems of the territory*. Thus, largely thanks to the regional argument start of the project of the "Snohvit" deposit development in the Norwegian sector of the Barents Sea took place.

All the above features (if they are viewed in the aggregate) involve the use of procedures and approaches based on policy principles, as well as active participation of the state (at both

the federal and regional levels) in the implementation of new projects in undeveloped areas. Therefore, in the case of the shelf of northern seas of Russia in general, we should go about creating a precedent for a new project in the new area on the new principles and approaches.

The implementation of such projects should be based on the following principles:

a) a single program of prospecting, development and exploration of a single project (which involves the creation of a common infrastructure);

b) a concerted technological scheme of development and exploitation of closely spaced objects;

c) synchronization of all works on exploration and development with the decision of socio-economic problems of the functioning of the economy of territory affected by the development in such a way as to ensure sustainability of the area's economy in the long term.

In addition to the program elements this also requires the establishment of institutional structures ensuring implementation of the project, operating companies, as well as the establishment of public monitoring of the implementation of such projects.

In the Russian Federation strengthening the role of the state is required, first in the issue of regulation of natural resources. In accordance with the law the subsoil in Russia are state owned, but in practice the past 15 years shows that the growth in living standards and the budget replenishment are weakly defined by efficiency of oil and gas industry of the country.

The balance of interests and minimizing conflicts between the state, oil and gas companies and the local population are largely determined by the steady and balanced economic development of the mining region. Ignoring or infringement of the interests of any of these subjects will inevitably lead to a significant reduction of the so-called synergistic result, based on mutual cooperation.

Fostering productive infrastructure in mining areas deserves special attention in the state's economic policies and is a prerequisite for sustainable and effective development of oil and gas industry as a basic component of regional economic specialization. Oil and gas production structure of the region is characterized by the fact that it provides tangible and intangible production services, which are auxiliary in nature. Oil and gas industry has specific requirements for the production of services of industrial infrastructure in the region, largely determining the economic activities of all enterprises and organizations in the region, and indirectly, the standard of living.

The development of the service (production) sector at the regional level, not only creates the conditions for increasing the value added during the development of hydrocarbon fields and contributes to increase of qualification requirements for personnel, but also removes the risks associated with the problems of employment in service companies from the oil and gas companies. The service sector is one of the most high-tech elements in the structure of oil and gas sector, so its formation and development should be one of the most important objects of management at the regional level. Such regulation reasonably relates the full support of small and medium businesses, restrictions on use of equipment with a high degree of wear.

With the right strategy for managing oil and gas complex of the state oil and gas projects can revitalize the general economic conjuncture of most industries, especially heavy industry, as in this case the problem of economic and social situation in the country can be solved. It is important to emphasize that competent management strategy for oil and gas sector does not deny the benefits of international integration and cooperation, the possibility of transferring technological expertise of invaluable exploration of hydrocarbon deposits to foreign partners.

Implementation of oil and gas projects in Northern Russia is able to involve key industries that are related to inter-industry production chains, accelerating the development of which

will be a driving force for the related industries, i.e., it will stimulate the development of their suppliers, etc. The main method of involving industry in the implementation of oil and gas sector can and should become policy and practice of the organization of orders on the basis of tenders. It is through the tendering and selection of socially responsible suppliers of high-tech equipment and services that the state should have a decisive impact on the improvement of industrial and economic sectors with the subsequent growth of multiplicative effects. The processes of production incentives, both directly and indirectly associated with the implementation of large-scale project to develop oil and gas resources, will develop investment demand and revive the domestic market.

The general approach of industrial policy in the development of hydrocarbon deposits is a maximum load capacity and increase production. This will allow the bulk of enterprises to restore the economic situation fully, establish financial management, settle with creditors, and most importantly – to increase investment opportunities due to depreciation charges, as well as by increasing its own profits for investment, which in turn will allow the modernization of fixed assets and their maintenance in operational condition.

To achieve maximum levels of oil and gas production on the Arctic shelf of Russia is problematical not due to its limited resource base, but the present state of technological capabilities of domestic economy and the highly uncertain environment in which its research and development is to take place. Therefore, to consolidate the interests of subsoil users and the state it is necessary to accumulate the scientific and technical production and investment capabilities with the ability to attract foreign partners.

Russia needs the active use of international positive experience in the development of hydrocarbon deposits. In this case, effective modernization of the country's oil and gas industry with the solution of a wide range of socio-economic problems can be successfully carried out.

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