

Offshore hydrocarbon fields technical and process development priorities for PJSC Gazprom

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Russian Arctic and Far East seas are presently the main strategic regions to build and provide the new centers of gas extraction with resources. Quantitative assessment [1] found that the Russia's Arctic sea shelves contain the recoverable hydrocarbon resources of more than 124 bln. tons of fuel oil equivalent (Figure 1). Gas makes more than 77% of hydrocarbon resources.

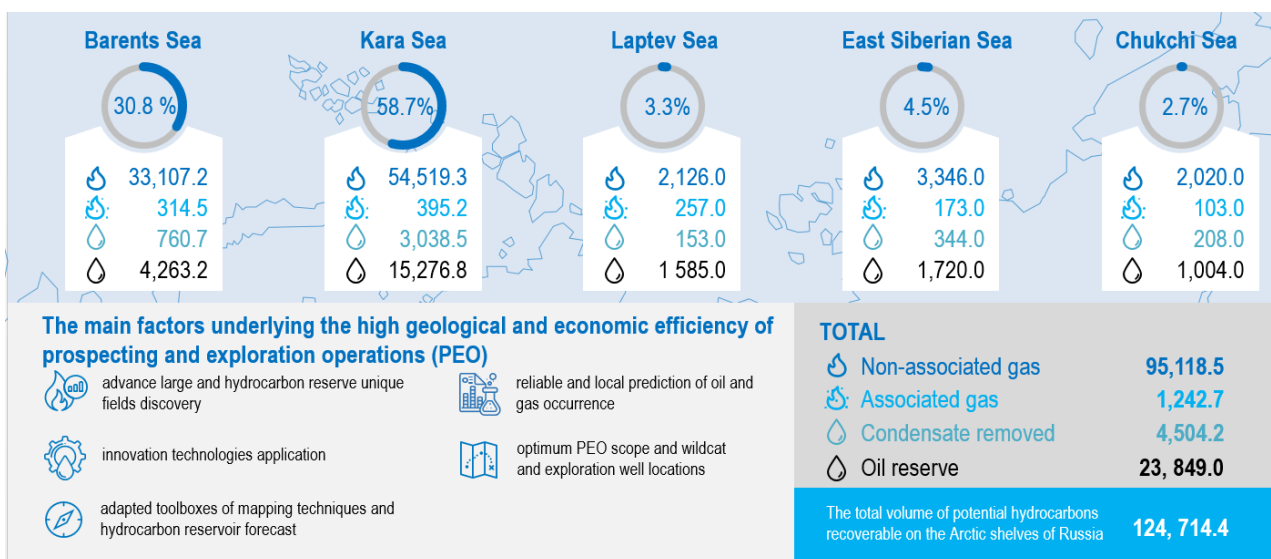


Fig. 1 – Hydrocarbon total initial resources on the Russia's Arctic sea shelves [1]

PJSC Gazprom and its subsidiaries hold 31 licenses including the transit sections in the entire water zone of the Arctic and Far East seas. 16 fields and 16 perspective zones have been discovered over here. According to the data of State Register of Reserves for January 1, 2020, PJSC Gazprom gas reserves in A+B1+B2+C1+C2 categories make more than 47 trillion m³.

The share of offshore reserves is 26%. Of these, more than 90 % of non-associated gas fields are located within the Arctic shelf - in A+B+C1 categories about 7.9 trillion m³ (Figure 2) [2]. The unexplored gas deposits resource potential for these zones is estimated at 17.4 trillion m³.

About 90% of initial ultimately recoverable hydrocarbon resources in total are located on exploration targets of the Kara Sea and the Barents Sea shelf. These are the seas where

advance large and unique hydrocarbon, primarily gas, reserve fields are discovered thus providing for high geological and economical efficiency of the entire process of gas extraction in the Russian Arctic seas. The gas production resource base needs to be further prepared in the waters of the Kara Sea and the Barents Sea in the short and medium term.

So far only 10.5% of total initial hydrocarbon resources are accounted for by the Eastern Arctic seas. But there are vast license areas resolved and dozens of local gas and oil perspective zones identified in this region.

The major reservoirs on the Barents sea, the Kara sea and the sea of Okhotsk shelf where PJSC Gazprom intends to extract gas are: the Shtokmanovskoye, the Leningradskoye, the Dinkov, the Rusanovskoye, the 75 Years of Victory (Skuratovskoye), the Nyarmeyskoye, the Kruzenshternskoye, the Kirinskoye and Yuzhno-Kirinskoye fields. The Kamennomyskoye-Sea and Severo-Kamennomyskoye fields are located in the Ob Bay.

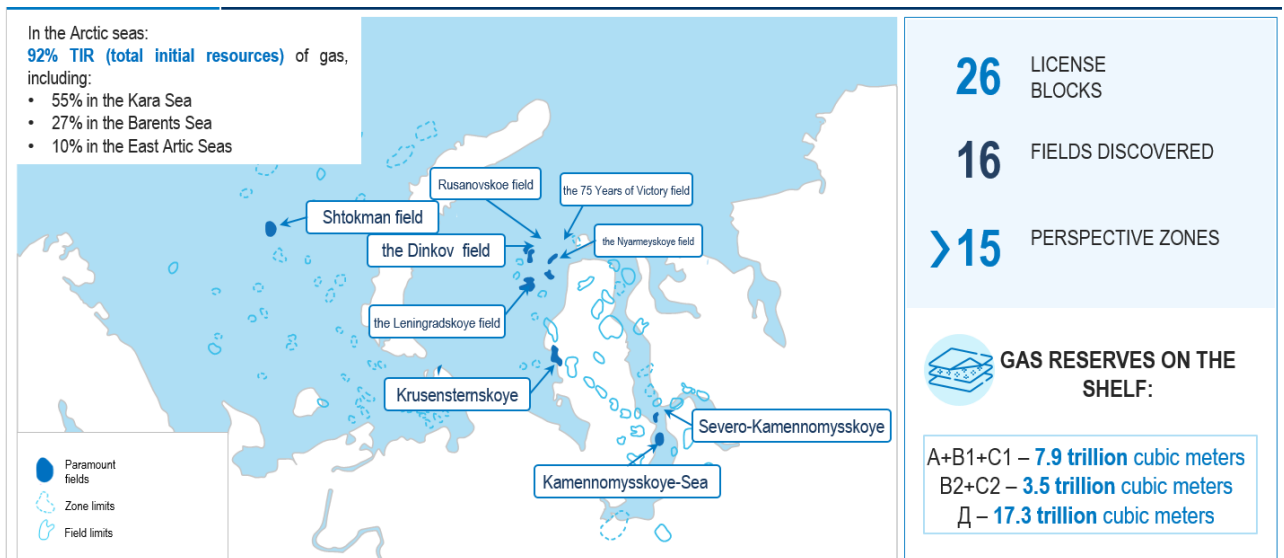


Fig. 2 – PJSC Gazprom total initial hydrocarbon resources on the Russian West-Arctic seas shelf [2]

Three largest fields, the Shtokmanovskoye, Ledovoye and Ludlovskoye fields, have been discovered on 7 license blocks owned by PJSC Gazprom in the Barents Sea. Geological and geophysical knowledge has uneven nature. However, 3D seismic surveys have been completed at all LBs and 13 prospecting and exploration wells have been drilled at 4 blocks. The Jurassic and Triassic deposits are prospective ones. Total gas reserves are estimated at 4.6 trillion cubic meters, resources - 1.9 trillion cubic meters.

PJSC Gazprom owns two transit areas and eleven areas located in deep-water and offshore conditions on the on the Yamal shelf. Within the deep-sea areas 10 prospecting and exploratory wells were drilled and 5 fields were discovered with total

reserves of 3.4 trillion cubic meters of gas. The resource potential of perspective zones and deep-seated deposits is 11.4 trillion cubic meters of gas.

Another area of planned gas production in the Kara Sea is in the Ob and Taz Bays. Six fields (Kamennomyssskoye-Sea, Severo-Kamennomyssskoye, Obskoe, Chugoryakhinskoye, Antipayutinskoye, Tota-Yakhinskoye) were discovered here within 6 LB; 18 wells were drilled in the water area. The total gas reserves are estimated at almost 1.4 trillion cubic meters, 96% of which are classified as B1+C1 categories.

In the Sea of Okhotsk, Gazprom owns five license blocks: four on the northeastern shelf of Sakhalin Island (the Kirinskoye field, the Kirinsky prospective, the Vostochno-Odoptinsky, the Tsentralno-Pogranichny) and one on the West Kamchatka shelf.

Four fields - the Kirinskoye, the Yuzhno-Kirinskoye, the Yuzhno-Lunskoye and the Mynginskoye - were discovered in two areas of the Sakhalin shelf. The total gas reserves of these fields are about 1 trillion cubic meters. The gas resource potential of the perspective zones in the five license blocks is 1,350 billion cubic meters.

Due to the bulk of hydrocarbon reserves in the Arctic and Far East seas, a whole set of technical and process problems must be solved.

Offshore hydrocarbon fields technical and process development tasks for Gazprom PJSC are:

- development and introduction of technologies and technical equipment necessary for the development of PJSC Gazprom's offshore license blocks in accordance with the peculiarities of the hydrocarbon production region,
- development of activities for interaction between organizations involved in the full cycle of offshore field development (prospecting and exploration, drilling, development, construction and operation of offshore fields),
- building of digital three-dimensional geological and hydrodynamic models of offshore fields,
- development of technologies and technical equipment for monitoring, maintenance and repair of offshore facilities,
- development of technical and process solutions for emergency and rescue support of offshore fields, including hydrocarbon spills response,
- development and improvement of the corporate regulatory and technical base in the field of exploration, development, construction and operation of offshore fields, emergency and rescue operations and environmental protection,
- designing, building, retrofitting and expansion of the fleet of special marine equipment and vessels (offshore platforms, drilling rigs, supply vessels, etc.).

In order to ensure timely and effective technical and technological development in the development of offshore hydrocarbon fields Gazprom PJSC requires the involvement and integration of companies in various areas of the oil and gas complex, including research and development centers, experimental design bureau, as well as production and financial organizations.

Gazprom VNIIGAZ, the leading research institute of PJSC Gazprom is clearly a single integrator of such a scientific and production process.

Gradual depletion of onshore oil and gas resources the offshore hydrocarbon reserves will be of great importance. Offshore reserves play a vital role in being energy independent for certain regions of the Arctic and the Far East and the country as a whole.

To develop PJSC Gazprom's offshore fields in the current sanction conditions the domestic industrial enterprises are required to extend the range and increase production of highly efficient technical means and technologies.

Figure 3 shows the major priorities for PJSC Gazprom offshore hydrocarbon fields technical and process development.

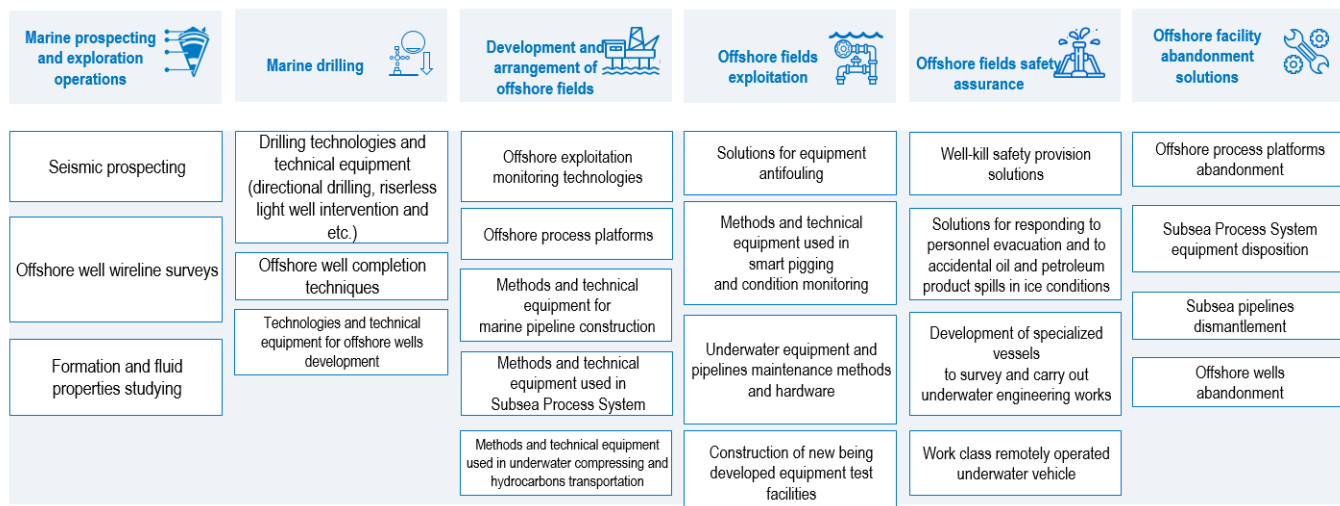


Fig.3 - Offshore hydrocarbon fields technical and process development priorities for PJSC Gazprom

Figure 4 shows the basic trends in technological development, including the most urgent and promising technologies and technical means required for the development of PJSC Gazprom's offshore fields.

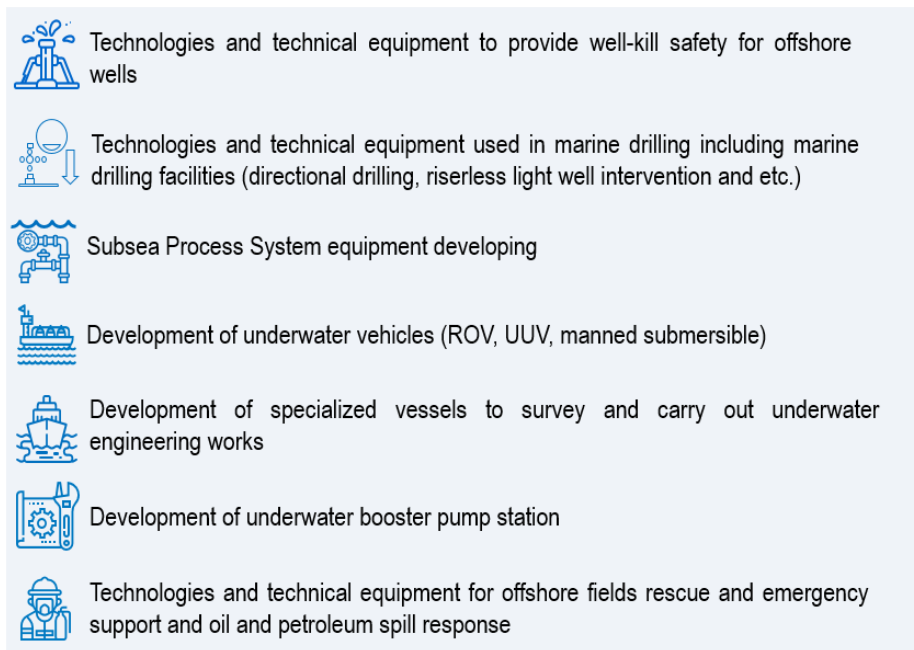


Fig. 4 – The most urgent and promising technologies and technical means required for the development of PJSC Gazprom's offshore fields

Thus, PJSC Gazprom and its subsidiaries are faced with the tasks of not only replenishing the mineral resource base but also technical and technological development at all stages of the offshore field development life cycle.

For these purposes the Corporate Research and Engineering Center (CREC) for Oil and Gas Resources developing was established at Gazprom VNIIGAZ LLC in 2014. The Center is responsible for strategic planning in terms of preparation and development of hydrocarbon resources on the shelf of the Russian Federation and the open acreage.

The solutions under developing in CREC are: technical and process design solutions for construction of underwater booster pump station, engineering solutions on amphibious vehicles use for rescue and emergency support of offshore fields, as well as engineering proposals on manufacturing of equipment for the purposes of well-kill safety on offshore wells.

Gazprom VNIIGAZ LLC as part of the CREC for Offshore Oil and Gas Resources Development and other specialized centers, provides scientific and engineering support for investment projects at all stages of Gazprom's offshore hydrocarbon field development: exploration works, designing, construction and installation works, operation and dismantlement of offshore facilities and structures.

List of References:

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