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World Assessment of Oil and Gas Fact Sheet

Assessment of Undiscovered Petroleum Resources of the Laptev Sea Shelf Province, Russian Federation

The Laptev Sea Shelf Province was assessed for undiscovered crude oil, natural gas, and natural gas liquids/condensates resources (collectively referred to as petroleum) as part of the U.S. Geological Survey's Circum-Arctic Oil and Gas Resource Appraisal. Using a geology-based methodology, the USGS estimates the mean undiscovered, conventional petroleum resources in the province to be approximately 9,300 million barrels of oil equivalent, including approximately 3,069 million barrels of crude oil, 32,252 billion cubic feet of natural gas, and 861 million barrels of natural gas liquids.

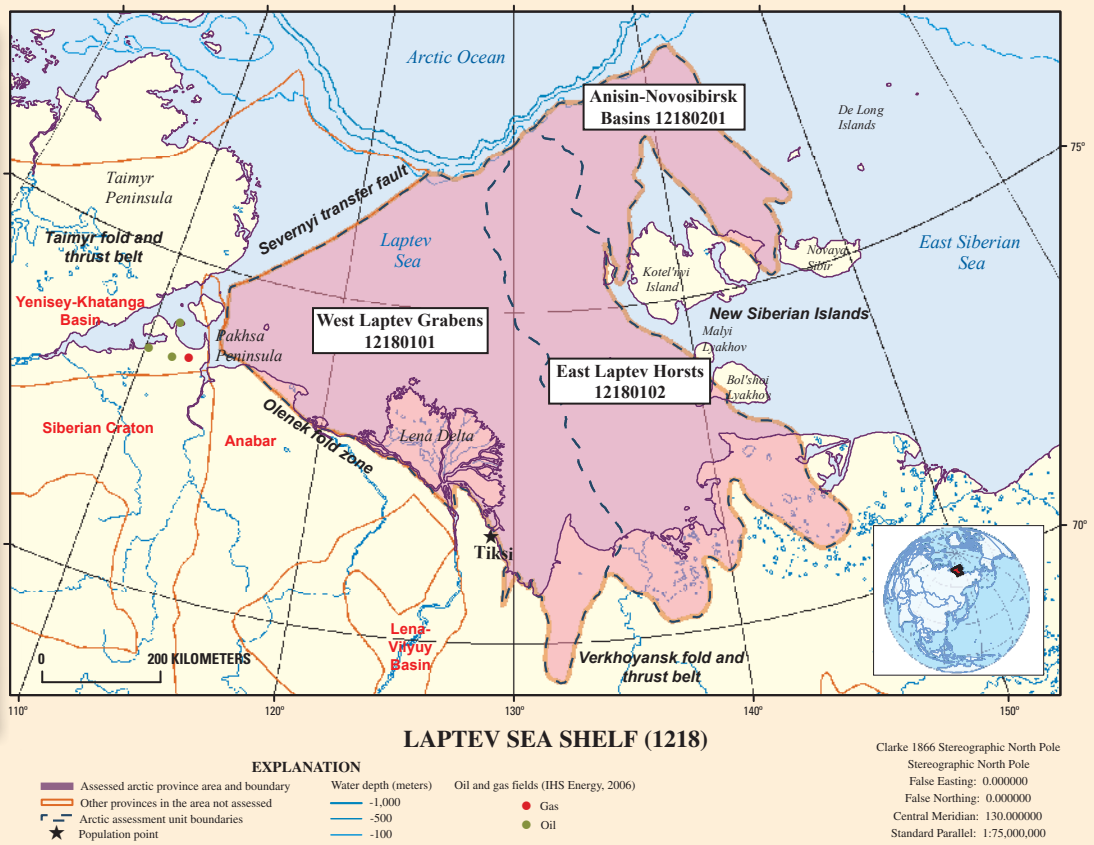

Figure 1. Map showing location of the Laptev Sea Shelf Province and assessment units.

Introduction

In 2007, the U.S. Geological Survey (USGS) completed an assessment of potential undiscovered, technically recoverable (assuming the absence of sea ice) crude oil, natural gas, and natural gas liquids (collectively referred to as petroleum) resources in the Laptev Sea Shelf Province of the Russian Federation. As with other areas assessed in the USGS Circum-Arctic Oil and Gas Resource Appraisal (CARA), this area shares important characteristics with many Arctic basins, including sparse data, significant petroleum-resource potential, geologic uncertainty, and technical barriers that impede exploration and development. As defined for CARA, the province includes an area of approximately 500,000 km^2, most of which underlies less than 500 m of water offshore of northern Russia between long. 110° and 150° E. and between lat. 70° and 80° N.

Assessment Units

The Laptev Sea Shelf Province contains a composite sedimentary basin, in which sediments were deformed by compression during Early Cretaceous time; later, in Paleogene and Neogene time, a superimposed rift/sag system developed in the area. The province was subdivided into three geologically distinctive assessment units based on structural style—the West Laptev Grabens, East Laptev Horsts, and Anisin-Novosibirsk Basins assessment units (AUs) (fig. 1). The West Laptev Grabens AU was evaluated using two different geological scenarios (table 1) because geologic models for petroleum occurrence considered for this AU are mutually exclusive. The differences between the two scenarios are so extreme that the populations of undiscovered accumulations cannot be statistically combined into a single distribution. The Anisin-Novosibirsk Basins AU was also assessed. The East Laptev Horsts AU, although defined, was not quantitatively assessed because of the extremely low assessment-unit probability for the existence of an undiscovered accumulation exceeding the defined minimum size of 50 million barrels of oil equivalent.

Petroleum System Elements

Onshore field work and interpretation of geophysical data gathered from offshore areas by geologists from several countries and organizations indicate that two or more total petroleum systems might exist in the study area. Because of possible mixing of petroleum, the Jurassic-Cretaceous-Paleogene Composite Total Petroleum System (TPS) was identified for the West Laptev Grabens AU. Geologic

Table 1. Laptev Sea Shelf province assessment results (discovered reserves not included).

[MMB, million barrels; BCF, billion cubic feet. Results shown are fully risked estimates. For gas fields, all liquids are included under the natural gas liquids (NGL) category. F95 denotes a 95-percent chance of at least the amount tabulated. Other fractiles are defined similarly. Fractiles are additive under the assumption of perfect positive correlation. TPS, total petroleum system; AU, assessment unit. Gray shading indicates not applicable]

Total Petroleum Systems and *Assessment Units*	AU Probability	Field Type	Total Undiscovered Resources Oil (MMB) F95	Oil (MMB) F50	Oil (MMB) F5	Oil (MMB) Mean	Gas (BCF) F95	Gas (BCF) F50	Gas (BCF) F5	Gas (BCF) Mean	NGL (MMB) F95	NGL (MMB) F50	NGL (MMB) F5	NGL (MMB) Mean
LAPTEV SEA SHELF PROVINCE (1218)														
Jurassic-Cretaceous-Paleogene Composite TPS (121801)														
West Laptev Grabens AU (12180101) Scenario 1, 0.1% probability	1.00	Oil	3,344	12,790	38,691	15,861	4,221	17,699	62,602	23,545	111	470	1,694	633
		Gas					18,947	76,933	245,801	97,337	493	2,028	6,624	2,593
West Laptev Grabens AU (12180101) Scenario 2, 0.9% probability	0.49	Oil	0	0	4,251	1,127	0	0	6,587	1,660	0	0	177	45
		Gas					0	0	59,147	16,886	0	0	1,583	450
West Laptev Grabens AU (12180101) Aggregate *		Oil				2,600				3,849				104
		Gas								24,931				664
East Laptev Horsts AU (12180102)	0.03	Not quantitatively assessed												
Total undiscovered petroleum resources, TPS 121801						2,600				28,780				768
Paleogene TPS (121802)														
Anisin-Novosibirsk Basins AU (12180201)	0.43	Oil	0	0	1,837	469	0	0	2,901	693	0	0	79	19
		Gas					0	0	10,694	2,779	0	0	286	74
Total undiscovered petroleum resources, TPS 121802			0	0	1,837	469	0	0	13,595	3,472	0	0	365	93
Total undiscovered petroleum resources, Laptev Sea Shelf						3,069				32,252				861

* Aggregate means for the entire assessment unit equal the means times the scenario probability of each scenario.

scenarios evaluated for the assessment were based on the existence and distribution of source rocks of these ages. The Paleogene TPS was identified for the Anisin-Novosibirsk Basins AU. The greatest geologic uncertainty for the assessment of both assessment units is with respect to the petroleum charge.

Analyses of natural gas collected from bottom sediments and near-bottom waters of the Laptev Sea Shelf indicate the presence of mature oil-prone marine source rocks, presumably of Paleogene age. Upper Jurassic (Volgian) organic-rich mudstone might also be an important petroleum source rock in the study area, as are synrift Lower Cretaceous and Paleogene carbonaceous and coaly rocks. Major synrift reservoir rocks are likely to be shelf and slope siliciclastic sediments deposited by deltas of the paleo- and present-day Lena River. Whether prerift reservoir rocks are present is uncertain. Traps for petroleum accumulation could include extensional structures and stratigraphic traps associated with shelf sediments.

Resource Summary

The U.S. Geological Survey assessed undiscovered conventional, technically recoverable petroleum (discovered reserves not included) resulting in the estimated mean volumes of a probability distribution of approximately 3,069 million barrels (419 million metric tons) of crude oil, 32,252 billion cubic feet (913 billion cubic meters) of natural gas, and 861 million barrels (117 million metric tons) of natural gas liquids (table 1). The greatest volume of undiscovered petroleum is estimated to be in the West Laptev Grabens AU.

References

IHS Energy, 2006, [includes data current through December, 2005], International petroleum exploration and production database: IHS Energy; database available from IHS Energy, 15 Inverness Way East, Englewood, Colorado 80112 USA.

For Further Information

Assessment results are available at the USGS Central Energy Team website, *http://energy.usgs.gov/arctic*, or contact Donald L. Gautier, Task Leader for the USGS Circum-Arctic Oil and Gas Resource Appraisal (gautier@usgs.gov).

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