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World Petroleum Resources Assessment Fact Sheet

Assessment of Undiscovered Petroleum Resources of the Barents Sea Shelf

Four geologic provinces of the Barents Sea Shelf were assessed for undiscovered crude oil, natural gas, and natural gas liquid or condensate resources as part of the U.S. Geological Survey's Circum-Arctic Oil and Gas Resource Appraisal. Using a geology-based methodology, the mean undiscovered, conventional, technically recoverable petroleum resources in the Barents Sea Shelf are estimated to be more than 76 billion barrels of oil equivalent, which includes approximately 11 billion barrels of crude oil, 380 trillion cubic feet of natural gas, and 2 billion barrels of natural gas liquids.

Introduction

In 2008, the U.S. Geological Survey (USGS) completed an assessment of potential undiscovered, technically recoverable crude oil, natural gas, and natural gas liquid resources in the Barents Sea Shelf. These resources are assumed to be recoverable regardless of the presence of sea ice or depth of water. As with other areas assessed in the USGS Circum-Arctic Oil and Gas Resource Appraisal, this area shares important characteristics with many Arctic basins, such as sparse data, high geologic uncertainty, substantial petroleum-resource potential, and technical barriers that impede exploration and development. The Barents Sea Shelf, which lies entirely north of the Arctic Circle, contains an area of approximately 1,760,000 square kilometers between longs 0º and 80ºE. Most of this area offshore northern Norway and the Russian Federation lies under less than 500 meters of water.

Assessment Units

The Barents Sea Shelf contains several sedimentary basins separated by structural arches in the eastern part and a broad structural platform in the western part. The shelf was divided into four geologic provinces based on structural style—East Barents Basins Province, Novaya Zemlya Basins and Admiralty Arch Province, Barents Platform Province, and Norwegian Margin Province (fig. 1). The provinces were subdivided into eight geologically distinctive assessment units (AUs)—the Kolguyev Terrace, South Barents Basin and Ludlov Saddle, North Barents Basin, Novaya Zemlya Basins and Admiralty Arch, Barents Platform North, Barents Platform South, Western Barents Margin, and Arctic Norwegian Sea AUs (fig. 1). The Novaya Zemlya Basins and Admiralty Arch AU, although defined, was not quantitatively assessed because of a less than 10 percent probability of the existence of one undiscovered accumulation exceeding the defined minimum size of 50 million barrels of oil equivalent.

Petroleum System Elements

Analyses of petroleum and rocks from wells indicate sources of petroleum in Middle Triassic and Upper Jurassic mudstones, with possible contributions from underlying Paleozoic and other Mesozoic rocks. Because of possible mixing of petroleum, a single Paleozoic-Mesozoic Composite Total Petroleum System (TPS) was identified for the East Barents Basins, Novaya Zemlya Basins and Admiralty Arch, and Barents Platform Provinces. Along the west margin of the shelf, source rocks include Jurassic, Cretaceous, and possibly Paleogene mudstones, so a single Mesozoic-Cenozoic Composite TPS was identified for the Norwegian Margin Province.

Known reservoir rocks include Carboniferous to Permian, Triassic, Middle and Upper Jurassic, and Cretaceous and Paleogene sandstones, as well as Upper Permian spiculite. Potential reservoirs include upper Paleozoic carbonate rocks.

Known and inferred traps include structural highs with closures, fault-related structures, drapes over structures, stratigraphic onlaps and pinchouts along basin margins, carbonate-shelf and reef-associated deposits, stratigraphic traps (for example, submarine fans and channels), and salt structures. Traps formed before and during petroleum generation.

Resource Summary

The USGS assessed undiscovered conventional, technically recoverable petroleum (discovered reserves not included), resulting in the estimated mean volumes of a probability distribution of approximately 11 billion barrels (1,750 million cubic meters, equivalent to 1,500 million metric tons) of crude oil, 380 trillion cubic feet (11 trillion cubic meters) of natural gas, and 2 billion barrels (320 million cubic meters, equivalent to 270 million metric tons) of natural gas liquids (table 1). Most undiscovered petroleum is estimated to be in the East Barents Basins Province.

U.S. Department of the Interior
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Fact Sheet 2009–3037
June 2009

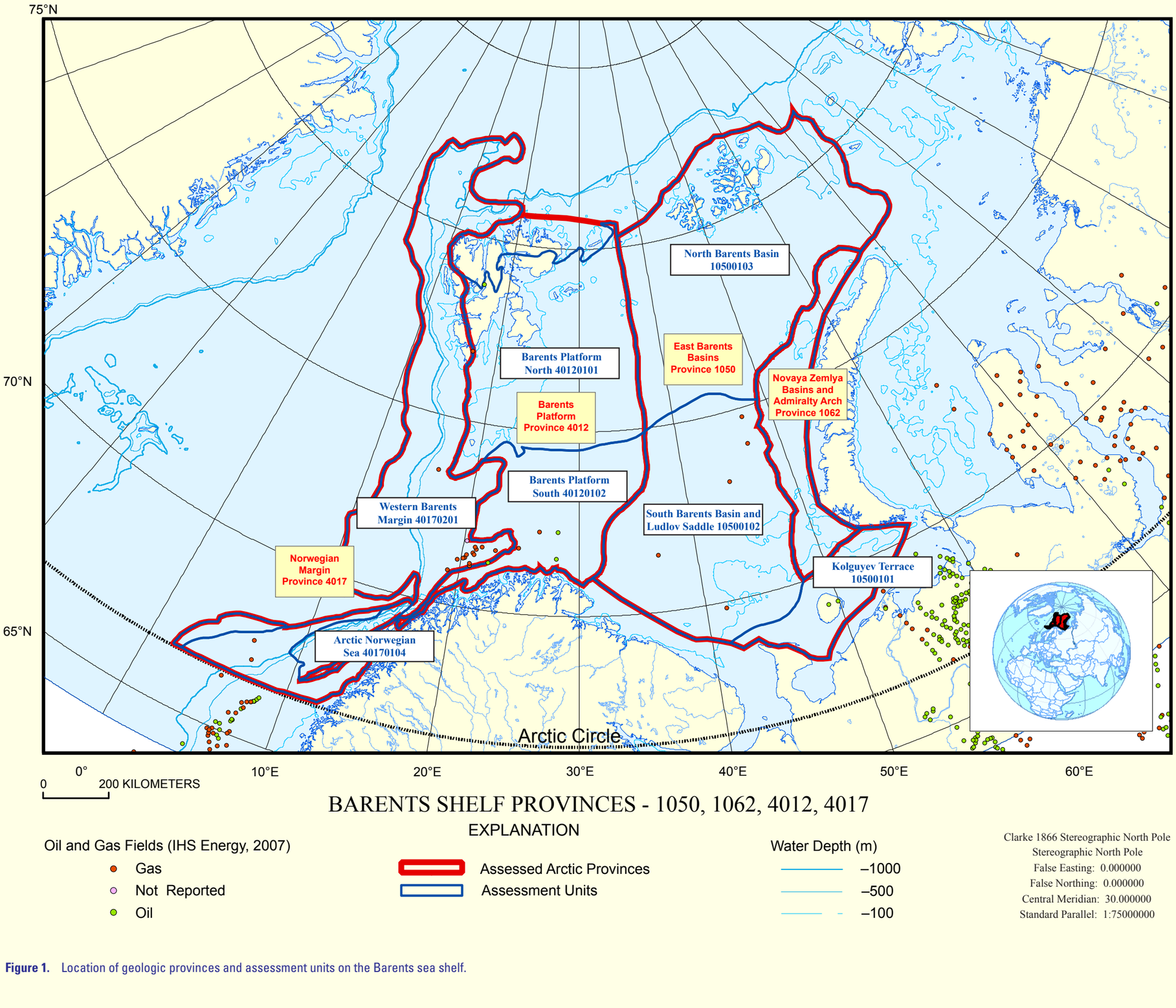

Figure 1. Location of geologic provinces and assessment units on the Barents sea shelf.

References

IHS Energy, 2007, International petroleum exploration and production database [current through December 2007]: 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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Acknowledgments

Information and data for the Barents Platform Province and Norwegian Margin were provided by the Norwegian Petroleum Directorate. Geographic information system analysis was performed by Feliks Persits.

Table 1. Assessment results of the East Barents Basins, Novaya Zemlya Basins and Admirality Arch, Barents Platform Provinces, and Western Barents Margin (conventional undiscovered resources).

[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. Numbers do not exactly add to the totals because totals were calculated by statistical aggregation]

Total Petroleum Systems and *Assessment Units*	AU Probability	Field Type	Total Undiscovered Resources Oil (MMB)				Gas (BCF)				NGL (MMB)			
			F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
EAST BARENTS BASINS PROVINCE (1050)														
Paleozoic-Mesozoic Composite TPS (105001)														
Kolguyev Terrace AU (10500101)	1.000	Oil	0	110	398	145	0	155	973	275	0	2	14	4
		Gas					973	2,039	4,605	2,313	22	54	129	62
South Barents Basin and Ludlov Saddle AU (10500102)	1.000	Oil	241	1,300	5,901	1,939	312	2,175	11,900	3,669	3	27	163	50
		Gas					44,854	142,293	472,507	183,689	126	460	2,080	714
North Barents Basin AU (10500103)	0.504	Oil	0	1,197	21,424	5,322	0	1,748	41,460	10,145	0	20	557	137
		Gas					0	36,814	450,041	117,467	0	98	1,808	456
Total undiscovered petroleum resources, Province 1050			389	4,543	24,119	7,453	56,952	259,635	796,922	321,323	211	1,016	4,153	1,453
NOVAYA ZEMLYA BASINS AND ADMIRALTY ARCH PROVINCE (1062)														
Paleozoic-Mesozoic Composite TPS (106201)														
Novaya Zemlya Basins and Admiralty Arch AU (10620101)	0.090	Not quantitatively assessed												
BARENTS PLATFORM PROVINCE (4012)														
Paleozoic-Mesozoic Composite TPS (401201)														
Barents Platform North AU (40120101)	0.360	Oil	0	0	1,669	369	0	0	5,031	1,067	0	0	113	24
		Gas					0	0	20,709	5,005	0	0	159	36
Barents Platform South AU (40120102)	1.000	Oil	649	1,519	3,308	1,687	1,635	4,345	10,120	4,905	34	95	230	108
		Gas					6,246	13,789	29,431	15,241	37	98	227	110
Total undiscovered petroleum resources, Province 4012			630	1,765	4,486	2,033	7,980	22,043	58,576	26,064	77	234	628	277
NORWEGIAN MARGIN PROVINCE (4017)														
Mesozoic Composite TPS (401701)														
Arctic Norwegian Sea AU (40170104)	1.000	Oil	290	1,000	2,971	1,227	1,360	5,089	15,964	6,409	34	136	442	173
		Gas					8,523	18,901	39,094	20,646	96	226	497	252
Mesozoic-Cenozoic Composite TPS (401702)														
Western Barents Margin AU (40170201)	0.490	Oil	0	0	970	210	0	0	5,241	1,095	0	0	143	30
		Gas					0	0	15,908	4,131	0	0	200	50
Total undiscovered petroleum resources, Province 4017			311	1,128	3,654	1,444	10,875	27,672	69,981	32,399	147	419	1,155	507
Total undiscovered petroleum resources, Barents Sea Shelf						10,930				379786				2,237