

Assessment of Undiscovered Oil and Gas Resources of the West Siberian Basin Province, Russia, 2008

Using a geology-based assessment methodology, the U.S. Geological Survey (USGS) estimated means of 3.7 billion barrels of undiscovered oil and 651 trillion cubic feet of natural gas north of the Arctic Circle in the West Siberian Basin Province.

Introduction

The U.S. Geological Survey (USGS) recently assessed the undiscovered oil and gas potential of the West Siberian Basin Province in Russia as part of the USGS Circum-Arctic Resource Appraisal program. This province is the largest petroleum basin in the world and has an areal extent of about 2.2 million square kilometers (fig. 1). It is a large rift-sag feature (fig. 2) bounded to the west by the Ural fold belt; to the north by the Novaya Zemlya fold belt and North Siberian Sill, to the south by the Turgay Depression and Altay-Sayan fold belt, and to the east by the Yenisey Ridge, Turukhan-Igarka uplift, Yenisey-Khatanga Basin, and Taimyr High (fig. 1). The West Siberian Basin Province has a total discovered oil and gas volume of more than 360 billion barrels of oil equivalent (Ulmishek, 2003). Exploration has led to the discovery of tens of giant oil and gas fields, including the Urengoy gas field with more than 350 trillion cubic feet of gas reserves and Samotlar oil field with reserves of nearly 28 billion barrels of oil (Ulmishek, 2003). This report summarizes the results of a reassessment of the undiscovered oil and gas potential of that part of the province north of the Arctic Circle; a previous assessment that included the entire province was completed in 2000 (Ulmishek, 2000). The total petroleum system (TPS) and assessment units (AU) defined by the USGS for the assessments in 2000 were adopted for this assessment. However, only those parts of the AUs lying wholly or partially north of the Arctic Circle were reassessed for this study.

Geologic Definition of Assessment Units

Ulmishek (2000) defined the Northern West Siberian Mesozoic Composite TPS in the northern part of the West Siberian Basin Province (fig. 1). More than 70 fields have been discovered in this TPS, most of which are gas fields. Several rock units might be potential source rocks, including strata of Jurassic and Cretaceous age. However, the true source of the gas resources remains unknown (Ulmishek, 2003).

Two AUs encompass the northern part of the province (fig. 1). The Northern West Siberian Onshore Gas AU includes primarily Cretaceous sandstone reservoirs in structural traps. The South Kara Sea Offshore AU, considered to be the offshore geologic extension of the Northern

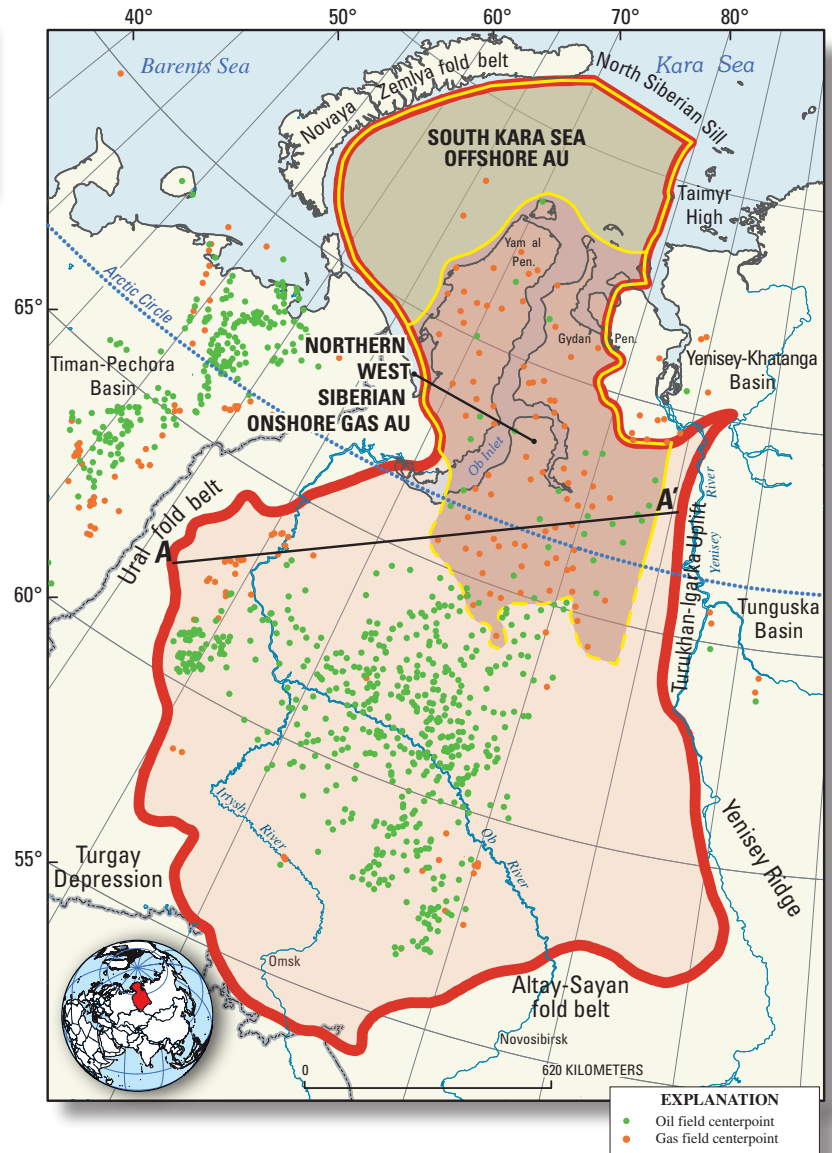


Figure 1. West Siberian Basin Province (red line). Two assessment units (AU) (yellow lines) were defined in this study: Northern West Siberian Onshore Gas AU and South Kara Sea Offshore AU. Dashed yellow lines represent the part of the Northern West Siberian Onshore Gas AU that extends south of the Arctic Circle. Outermost yellow line bounds the Northern West Siberian Mesozoic Composite TPS.

West Siberia Onshore Gas AU, includes similar traps and reservoirs. Each AU was evaluated in its entirety for undiscovered, technically recoverable, oil and gas resources, but the assessment results reported here are only for those parts that are north of the Arctic Circle. About 75 percent of the Northern West Siberian Onshore Gas AU is north of the Arctic Circle, and the South Kara Sea Offshore AU lies wholly within the Arctic Circle (fig. 1).

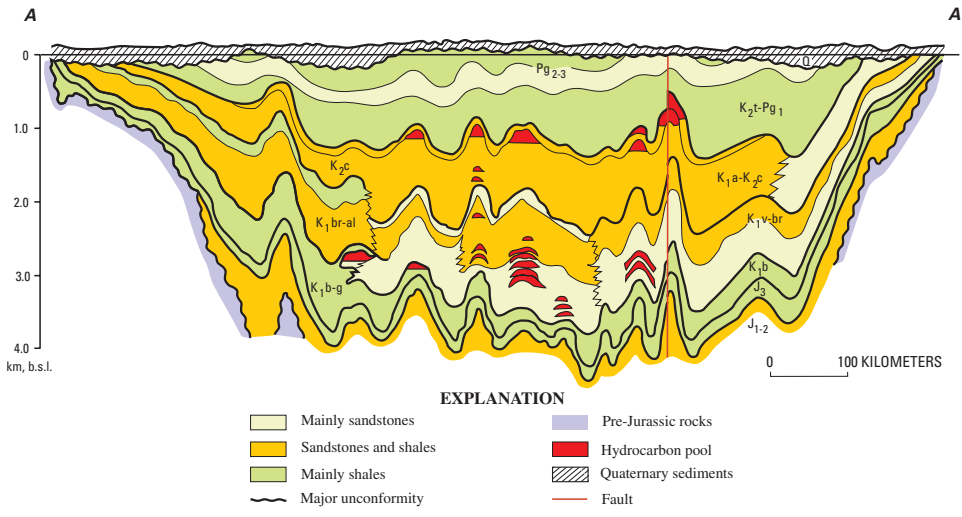


Figure 2. Line of cross section A-A' in the West Siberian Basin Province; location of section shown in figure 1. J, Jurassic; K₁b, Berrasian; K₁v, Valanginian; K₁g, Hauterivian; K₁br, Barremian; K₁a, Aptian; K₁al, Albian; K₂c, Cenomanian; K₂t, Turonian; Pg₁, Paleogene; Pg₂₋₃, Eocene-Oligocene; Q, Quaternary. b.s.l., below sea level. From Ulmishek (2000).

Resource Summary

The results of the quantitative assessment of undiscovered, technically recoverable, conventional oil and gas resources in that part of the Northern West Siberian Mesozoic Composite TPS north of the Arctic Circle are given in table 1. The total estimated means for undiscovered conventional oil and gas resources are 3,659 million barrels of oil (MMBO), 651,499 billion cubic feet of natural gas (BCFG), and 20,329 million barrels of natural-gas liquids (MMBNGL). Of these volumes, the Northern West Siberian Onshore Gas AU accounts for 1,152 MMBO, 29,277 BCFG, and 850 MMBNGL, and the South Kara Sea Offshore AU accounts for 2,507 MMBO, 622,222 BCFG, and 19,479 MMBNGL. The estimate for undiscovered gas in the South Kara Sea AU reflects the exploration immaturity compared to the Northern West Siberian Onshore Gas AU.

References

- Ulmishek, G., 2003, Petroleum geology and resources of the West Siberian Basin, Russia: U.S. Geological Survey Bulletin 2201-G, 49 p.
- Ulmishek, G., 2000, West Siberia Basin—Geologic Province 1174, in U.S. Geological Survey World Energy Assessment Team, U.S. Geological Survey World Petroleum Assessment 2000—description and results: U.S. Geological Survey Digital Data Series DDS-60, four CD-ROM set, Disk 2.

For Further Information

Assessment results are available at the USGS Energy Program Web site, <http://energy.usgs.gov/arctic>, or by contacting Donald L. Gautier, Task Leader for the USGS Circum-Arctic Oil and Gas Resource Appraisal (gautier@usgs.gov).

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Table 1. West Siberian Basin Province assessment results, north of the Arctic Circle.

[MMBO, million barrels of oil. BCFG, billion cubic feet of gas; MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. For gas accumulations, all liquids are included as NGL (natural gas liquids). Undiscovered gas resources are the sum of nonassociated and associated gas. F95 represents a 95-percent chance of at least the amount tabulated; other fractiles are defined similarly. AU probability is the chance of at least one accumulation of minimum size within the AU. Largest expected oil field size in MMBO; largest expected gas field size in BCFG. TPS, total petroleum system; AU, assessment unit. Gray shading indicates not applicable; oil field sizes in MMBO; gas field sizes in BCFG]

Total Petroleum Systems (TPS) and Assessment Units (AU)	AU Probability	Field Type	Largest Expected Oil Field Size	Total Undiscovered Resources											
				Oil (MMBO)				Gas (BCFG)				NGL (MMBNGL)			
				F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
Northern West Siberian Mesozoic Composite TPS															
Northern West Siberian Onshore Gas AU	1.00	Oil	431	223	901	2,930	1,152	1,241	5,304	17,744	6,859	25	109	369	142
		Gas	5,560					6,242	18,831	50,642	22,418	194	594	1,613	708
South Kara Sea Offshore AU	1.00	Oil	712	572	2,053	6,023	2,507	3,183	12,064	36,779	14,933	64	248	763	308
		Gas	189,354					154,681	513,304	1,372,510	607,289	4,799	16,000	44,090	19,171
Total Conventional Resources						3,659					651,499				20,329