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National and Global Petroleum Assessment

Assessment of Continuous Oil and Gas Resources in the Pannonian Basin Province, Hungary, 2016

Using a geology-based assessment methodology, the U.S. Geological Survey estimated mean undiscovered, technically recoverable continuous resources of 119 million barrels of oil and 944 billion cubic feet of gas in the Hungarian part of the Pannonian Basin Province.

Introduction

The U.S. Geological Survey (USGS) completed an assessment of undiscovered, technically recoverable continuous oil and gas resources within the Hungarian part of the Pannonian Basin Province (fig. 1). The Neogene Pannonian Basin Province is a structurally complex region surrounded by the eastern Alps, west Carpathians, Munții Apuseni, outer Carpathians, south Carpathians, and Dinaric Alps fold belts (Royden, 1988; Dolton, 2006; Tari and Horváth, 2006; Matenco and Radivojević, 2012). Badics and Veto (2012) summarized all of the pertinent geologic and geochemical data on potential continuous (shale oil and shale gas) reservoirs in the Hungarian part of the Pannonian Basin Province. Badics and Veto (2012) concluded that the most viable continuous reservoirs are within the Triassic Kossen Shale, the Lower Jurassic Mecsek Unit, and the lower Oligocene Tard Shale. The purpose of this study is to estimate potential volumes of recoverable continuous oil and gas resources within these three stratigraphic intervals.

Total Petroleum Systems and Assessment Units

For the Pannonian Basin Province, the USGS defined a Triassic Kossen Total Petroleum System (TPS) with the Triassic Kossen Shale Oil Assessment Unit (AU) and the Triassic Kossen Shale Gas AU, a Lower Jurassic TPS with the Lower Jurassic Mecsek Tight Gas AU, and a Lower Oligocene TPS with the Lower Oligocene Tard Shale Oil AU and the Lower Oligocene Tard Shale Gas AU within this TPS (fig. 1). The areas of these AUs reflect the mapping of Badics and Veto (2012).

The geologic model for the Triassic Kossen Shale Oil AU and the Triassic Kossen Shale Gas AU is for some portion of oil and gas generated from organic-rich shales (as much as 19 weight percent total organic carbon; Clayton and Koncz, 1994; Badics and Veto, 2012) to have been retained within the shales. The geologic model for the Lower Jurassic Mecsek Unit is for gas generated from coals and carbonaceous shales to have migrated locally into tight reservoirs, forming a tight-gas accumulation. The geologic model for the Lower Oligocene Tard Shale Oil AU and Lower Oligocene Tard Shale Gas AU is for some portion of the generated oil and gas to have been retained within Tard shales.

Assessment input data for five continuous assessment units are shown in table 1. Well drainage areas, estimated ultimate recoveries, and success ratios are taken from U.S. shale-oil, shale-gas, and tight-gas analogs.

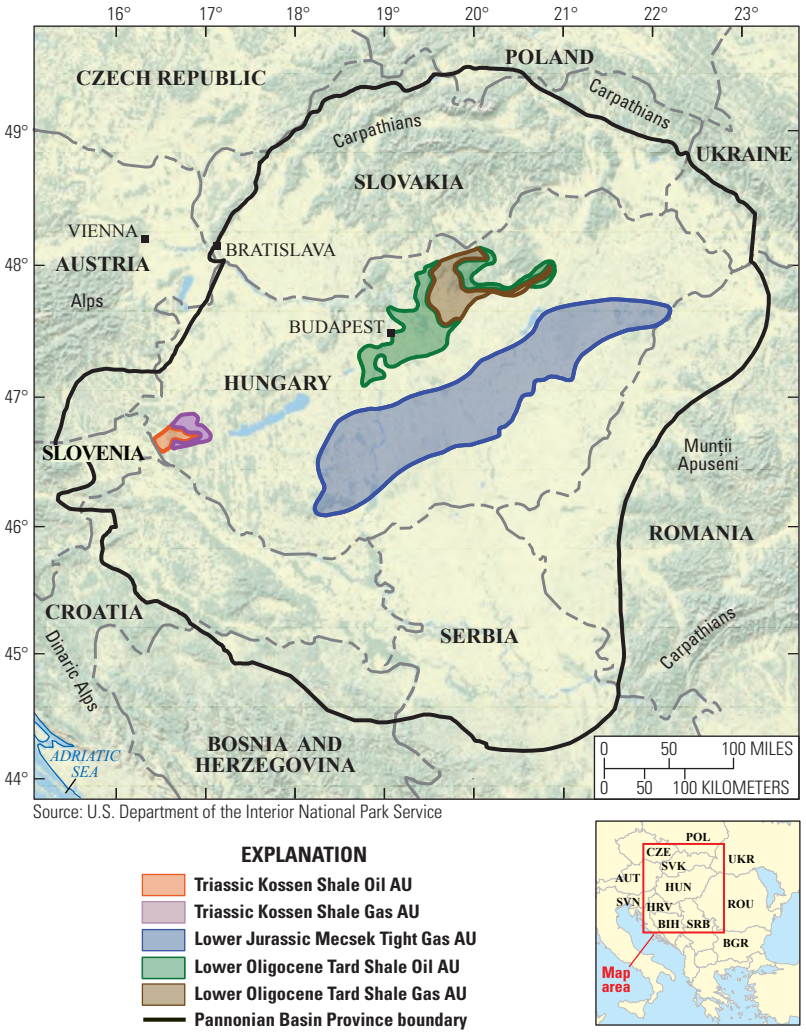

Figure 1. Location of the Pannonian Basin Province and the five continuous assessment units (AUs) defined in this study.

Undiscovered Resources Summary

The USGS quantitatively assessed undiscovered, technically recoverable continuous oil and gas resources within five AUs in the Hungarian part of the Pannonian Basin Province (table 2). The total means for continuous resources are 119 million barrels of oil (MMBO) with an F95–F5 range from 0 to 299 MMBO, 944 billion cubic feet of gas (BCFG) with an F95–F5 range from 0 to 3,239 BCFG, and 13 million barrels of natural gas liquids (MMBNGL) with an F95–F5 range from 0 to 45 MMBNGL.

Table 1. Key assessment input data for five continuous assessment units in the Hungarian part of the Pannonian Basin Province.

[%, percent; EUR, estimated ultimate recovery per well; MMBO, million barrels of oil; BCFG, billion cubic feet of gas. Well drainage areas, EURs, and well success ratios are from U.S. shale-oil, shale-gas, and tight-gas analogs. The average EUR input is the minimum, median, maximum, and calculated mean. Shading indicates not applicable]

Assessment input data—Continuous assessment units (AUs)	Triassic Kossen Shale Oil AU				Triassic Kossen Shale Gas AU			
	Minimum	Mode	Maximum	Calculated mean	Minimum	Mode	Maximum	Calculated mean
Potential production area of AU (acres)	480	60,000	120,000	60,160	480	50,000	100,000	50,160
Average drainage area of wells (acres)	40	80	120	80	80	120	160	120
Success ratios (%)	10	50	90	50	10	50	90	50
Average EUR (MMBO, oil; BCFG, gas)	0.04	0.08	0.2	0.086	0.1	0.3	0.7	0.319
AU probability	0.9				0.9			
Assessment input data—Continuous assessment units (AUs)	**Lower Jurassic Mecsek Tight Gas AU**				**Lower Oligocene Tard Shale Oil AU**			
	Minimum	Mode	Maximum	Calculated mean	Minimum	Mode	Maximum	Calculated mean
Potential production area of AU (acres)	480	1,300,000	4,000,000	1,766,827	480	408,000	816,000	408,160
Average drainage area of wells (acres)	40	80	120	80	40	80	120	80
Success ratios (%)	10	50	90	50	10	50	90	50
Average EUR (BCFG, gas; MMBO, oil)	0.04	0.08	0.4	0.098	0.02	0.04	0.1	0.043
AU probability	0.5				0.8			
Assessment input data—Continuous assessment units (AUs)	**Lower Oligocene Tard Shale Gas AU**							
	Minimum	Mode	Maximum	Calculated mean				
Potential production area of AU (acres)	480	255,000	509,000	254,827				
Average drainage area of wells (acres)	80	120	160	120				
Success ratios (%)	10	50	90	50				
Average EUR (BCFG, gas)	0.04	0.1	0.8	0.138				
AU probability	0.8							

Table 2. Assessment results for five continuous assessment units in the Hungarian part of the Pannonian Basin Province.

[MMBO, million barrels of oil; BCFG, billion cubic feet of gas; NGL, natural gas liquids; MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. For gas accumulations, all liquids are included in the NGL category. F95 represents 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. Shading indicates not applicable]

Total petroleum system and assessment units (AUs)	AU probability	Accumulation type	Total undiscovered resources											
			Oil (MMBO)				Gas (BCFG)				NGL (MMBNGL)			
			F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
Triassic Kossen Total Petroleum System														
Triassic Kossen Shale Oil AU	0.9	Oil	0	26	70	30	0	51	145	59	0	1	3	1
Triassic Kossen Shale Gas AU	0.9	Gas					0	54	140	60	0	1	3	1
Lower Jurassic Total Petroleum System														
Lower Jurassic Mecsek Tight Gas AU	0.5	Gas					0	0	2,112	533	0	0	22	5
Lower Oligocene Total Petroleum System														
Lower Oligocene Tard Shale Oil AU	0.8	Oil	0	79	229	89	0	152	476	178	0	3	10	4
Lower Oligocene Tard Shale Gas AU	0.8	Gas					0	79	366	114	0	2	7	2
Total undiscovered continuous resources			**0**	**105**	**299**	**119**	**0**	**336**	**3,239**	**944**	**0**	**7**	**45**	**13**

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For More Information

Assessment results also are available at the USGS Energy Resources Program website at https://energy.usgs.gov.

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