

National and Global Petroleum Assessment

# Assessment of Coalbed Gas Resources of the Central and South Sumatra Basin Provinces, Indonesia, 2016

Using a geology-based assessment methodology, the U.S. Geological Survey estimated a mean of 20 trillion cubic feet of undiscovered, technically recoverable coalbed gas resources in the Central and South Sumatra Basin Provinces of Indonesia.

## Introduction

The U.S. Geological Survey (USGS) quantitatively assessed the potential for undiscovered, technically recoverable continuous coalbed gas resources in the Central and South Sumatra Basin Provinces, Indonesia (fig. 1). The USGS defined a Neogene Coal Total Petroleum System (TPS) in each of these basins and the Central Sumatra Neogene Coalbed Gas Assessment Unit (AU) and the South Sumatra Neogene Coalbed Gas AU. Mappable areas of Neogene-age low-rank coal have been mapped in both basins (Adhi and others, 2004), and recent attempts have been made to exploit coalbed gas resources in the South Sumatra Basin (Sosrowidjojo and Saghafi, 2009). Much is known of Neogene coal thickness, petrography, geochemistry, gas content, and thermal maturity in these basins (Amijaya and Littke, 2005; Davis and others, 2006; Sosrowidjojo and Saghafi, 2009). Critical elements of the geologic models for this assessment include (1) the low rank of the coals (less than 0.5 percent vitrinite reflectance), (2) the presence of a biogenic gas system, and (3) the degree of gas saturation of the coals. This assessment does not include the potential for any thermally generated coalbed gas. All published information was leveraged in this study to define coalbed gas assessment units and quantitatively assess the potential for recoverable coalbed gas resources.

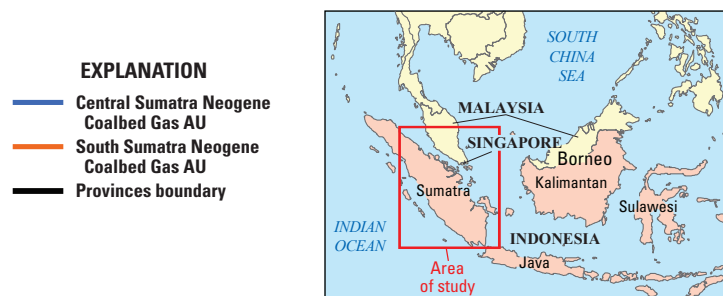
The Central and South Sumatra Basin Provinces represent backarc basins associated with subduction along the Sumatran margin. In the late Paleogene, the formation of the right-lateral Sumatran Fault by oblique convergence of the Australian plate with the Sumatran plate resulted in uplift of the Barisan Mountains. The Barisan Mountains are the source area for the regressive clastic wedge that prograded eastward across the Central and South Sumatra Basin Provinces. The Neogene coals of this study were deposited within this regressive clastic wedge.

## Geologic Model for Assessment

The geologic model for this assessment is similar for continuous coalbed gas accumulations in both the Central and South Sumatra Basin Provinces. Coals of the Neogene regressive clastic wedge were deposited across both basins. Shallow burial left the coals thermally immature (except in proximity to intrusions), and thus of low rank.



Source: U.S. Department of the Interior National Park Service



**Figure 1.** Map showing the location of the Central and South Sumatra Basin Provinces, Indonesia, and the two assessment units (AUs) defined in this study.

Bacterial activity produced biogenic gas in the coal, and measurements indicated that the coals are undersaturated with gas. The presence of liptinite led to coals having hydrogen indices as high as 300 milligrams hydrocarbon per gram organic carbon, which suggests that the coals may be able to produce liquids (Davis and others, 2006). However, we did not assess potential liquids given the low rank of the coals.

The assessment input data are summarized in table 1. Data for drainage areas of wells, success ratios, and estimated ultimate recoveries for coalbed gas wells are taken from geologic analogs in the United States, particularly the biogenic coalbed gas accumulation in the Powder River Basin of Wyoming (Flores, 2004).

## Undiscovered Resources Summary

The USGS quantitatively assessed undiscovered, technically recoverable continuous coalbed gas resources (table 2).

**Table 1.** Key assessment input data for two continuous assessment units in the Central and South Sumatra Basin Provinces, Indonesia.

[AU, assessment unit; %, percent; EUR, estimated ultimate recovery per well; BCFG, billion cubic feet of gas. EUR, well drainage area, and success ratios are from U.S. coalbed gas and shale-gas analogs. The average EUR input is the minimum, median (not the mode), maximum, and calculated mean. Shading indicates not applicable]

Assessment input data—Continuous AUs				
Central Sumatra Neogene Coalbed Gas AU	Minimum	Mode	Maximum	Calculated mean
Potential production area of AU (acres)	1,000	2,569,000	12,844,000	5,137,933
Average drainage area of wells (acres)	40	80	120	80
Success ratio (%)	50	60	70	60
Average EUR (BCFG)	0.08	0.2	0.35	0.206
AU probability	1.0			
South Sumatra Neogene Coalbed Gas AU	Minimum	Mode	Maximum	Calculated mean
Potential production area of AU (acres)	1,000	4,076,000	16,302,000	6,792,833
Average drainage area of wells (acres)	40	80	120	80
Success ratio (%)	50	70	80	66.7
Average EUR (BCFG)	0.08	0.2	0.35	0.206
AU probability	1.0			

The estimated mean total coalbed gas resource is 20,040 billion cubic feet of gas (BCFG), or 20 trillion cubic feet of gas, with an F95–F5 range from 4,869 to 41,989 BCFG. For the Central Sumatra Neogene Coalbed Gas AU, the estimated

mean resource is 8,119 BCFG with an F95–F5 range from 1,880 to 17,160 BCFG. For the South Sumatra Neogene Coalbed Gas AU, the estimated mean resource is 11,921 BCFG with an F95–F5 range from 2,989 to 24,829 BCFG.

**Table 2.** Results for two continuous assessment units in the Central and South Sumatra Basin Provinces, Indonesia.

[BCFG, billion cubic feet of gas; MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. 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							
			Gas (BCFG)				NGL (MMBNGL)			
			F95	F50	F5	Mean	F95	F50	F5	Mean
Neogene Coal Total Petroleum System										
Central Sumatra Neogene Coalbed Gas AU	1.0	Gas	1,880	7,216	17,160	8,119	0	0	0	0
South Sumatra Neogene Coalbed Gas AU	1.0	Gas	2,989	10,677	24,829	11,921	0	0	0	0
<b>Total undiscovered continuous resources</b>			<b>4,869</b>	<b>17,893</b>	<b>41,989</b>	<b>20,040</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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### For More Information

Assessment results are available at the USGS Energy Resources Program Web site at <http://energy.usgs.gov>.