

Assessment of Coalbed Gas Resources in the Kutei and Barito Basin Provinces, Indonesia, 2018

Using a geology-based assessment methodology, the U.S. Geological Survey estimated undiscovered, technically recoverable mean resources of 10.7 trillion cubic feet of potential coalbed gas resources in the Kutei and Barito Basin Provinces of Indonesia.

Introduction

The U.S. Geological Survey (USGS) quantitatively assessed the potential for undiscovered, technically recoverable continuous (unconventional) coalbed gas resources in the Kutei and Barito Basin Provinces of Indonesia (fig. 1). Miocene coals in the Kutei and Barito Basin Provinces form part of a regressive clastic wedge sourced from uplifted areas in western Borneo (Moss and Chambers, 1999; Witts and others, 2011). Clastic sediments of this wedge prograded to the east and southeast within fluvial-deltaic and marginal marine environments with extensive coals (Paterson and others, 1997; Davis and others, 2007; Widodo and others, 2010). The extent, thickness, and thermal maturation of coals have been documented in both basins (Adhi and others, 2004; Sapiie and others, 2014; Friederich and others, 2016; Putra and others, 2016). Drilling and testing for coalbed gas has occurred in the Barito Basin Province, where coals of the Miocene Warukin Formation are the primary exploration target (De Man and others, 2012; Putra and others, 2016). The primary coalbed gas reservoirs in the Kutei Basin are coals of the Miocene Balikpapan Formation (Satyana and others, 1999; Pramudhita and others, 2009), which have not been drilled or tested to the extent of Warukin coals in the Barito Basin.

Total Petroleum Systems and Assessment Units

For potential coalbed gas resources in the Kutei Basin Province, the USGS defined a Kutei Neogene Coal Total Petroleum System (TPS) and Kutei Neogene Coalbed Gas Assessment Unit (AU) within this TPS. The Barito Neogene Coal TPS was defined in the Barito Basin Province with a Barito Neogene Coalbed Gas AU. Shallow Neogene coals in both basins are generally thermally immature with vitrinite reflectance of less than 0.5 percent (Haris and others, 2010), contain Type III kerogen, have hydrogen index values of as much as 260 milligrams of hydrocarbon per gram of organic carbon, and have net coal thickness of as much as 60 meters (Davis and others, 2007). The geologic model for this assessment is similar for coalbed gas accumulations in both the Kutei and Barito Basin Provinces. Coals of the Neogene regressive clastic wedge were deposited across large areas of both basins. Shallow burial generally left the coals thermally immature with respect to gas generation. However, bacterial activity acting on shallow coals produced biogenic gas, which was adsorbed and retained within the coal cleat systems (De Man and others, 2012). The geologic model for both TPSs includes the possibility that some thermogenic gas is present within the deeper, more thermally mature Neogene coals (Haris and others, 2010). Vertical wells were used in the modeling of potential coalbed gas resources.

Assessment input data are summarized in table 1. Input data for drainage areas, success ratios, and estimated ultimate recoveries are taken from geologic analogs in the United States, particularly the coals in the Powder River Basin (Flores, 2004).

Undiscovered Resources Summary

The USGS quantitatively assessed coalbed gas resources in two assessment units (table 2) in the Kutei and Barito Basin Provinces of Indonesia. For undiscovered, technically recoverable coalbed gas resources, the mean totals are 10,738 billion cubic feet of gas (BCFG), or 10.7 trillion cubic feet of gas, with an F95–F5 fractile range from 2,525 to 22,759 BCFG. Of the mean total of 10,738 BCFG (coalbed), 6,753 BCFG, or 63 percent, is estimated to be in the Kutei Neogene Coalbed Gas AU, and 3,985 BCFG (coalbed), or 37 percent, is estimated to be in the Barito Neogene Coalbed Gas AU.



Base map from U.S. Department of the Interior National Park Service

EXPLANATION

- Kutei Neogene Coalbed Gas AU
- Barito Neogene Coalbed Gas AU
- Province boundary



Figure 1. Map showing the two coalbed gas assessment units (AUs) in the Kutei and Barito Basin Provinces of Indonesia. Province boundaries are from Klett and others, 1997.

Table 1. Key input data for two coalbed gas assessment units (AUs) in the Kutei and Barito Basin Provinces of Indonesia.

[%, percent; EUR, estimated ultimate recovery per well; BCFG, billion cubic feet of gas. Well drainage area, success ratio, and EUR are defined partly using U.S. coalbed gas analogs. Shading indicates not applicable]

Assessment input data—Continuous AU	Kutei Neogene Coalbed Gas AU			
	Minimum	Mode	Maximum	Calculated mean
Potential production area of AU (acres)	800	5,121,000	10,242,000	5,121,267
Average drainage area of wells (acres)	40	80	120	80
Success ratio (%)	10	50	90	50
Average EUR (BCFG)	0.08	0.2	0.35	0.206
AU probability	1.0			
Assessment input data—Continuous AU	Barito Neogene Coalbed Gas AU			
	Minimum	Mode	Maximum	Calculated mean
Potential production area of AU (acres)	800	3,032,500	6,065,000	3,032,767
Average drainage area of wells (acres)	40	80	120	80
Success ratio (%)	10	50	90	50
Average EUR (BCFG)	0.08	0.2	0.35	0.206
AU probability	1.0			

Table 2. Results for two coalbed gas assessment units (AUs) in the Kutei and Barito Basin Provinces of Indonesia.

[BCFG, billion cubic feet of gas; NGL, natural gas liquids; 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 systems and assessment units (AUs)	AU probability	Accumulation type	Total undiscovered resources							
			Gas (BCFG)				NGL (MMBNGL)			
			F95	F50	F5	Mean	F95	F50	F5	Mean
Kutei Neogene Coal Total Petroleum System										
Kutei Neogene Coalbed Gas AU	1.0	Coalbed gas	1,596	6,049	14,323	6,753	0	0	0	0
Barito Neogene Coal Total Petroleum System										
Barito Neogene Coalbed Gas AU	1.0	Coalbed gas	929	3,573	8,436	3,985	0	0	0	0
Total undiscovered continuous resources			2,525	9,622	22,759	10,738	0	0	0	0

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For More Information

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