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National and Global Petroleum Assessment

Assessment of Unconventional Tight-Gas Resources of the Magallanes Basin Province, Chile, 2015

Using a geology-based assessment methodology, the U.S. Geological Survey assessed a technically recoverable mean resource of 8.3 trillion cubic feet of unconventional tight gas in the Zona Glauconitica of the Magallanes Basin Province, Chile.

Introduction

The U.S. Geological Survey assesses the potential for technically recoverable unconventional shale-oil, shale-gas, tight-oil, tight-gas, and coalbed-gas resources in priority geologic provinces worldwide. This report summarizes the geologic model and assessment of unconventional tight-gas resources within the informally defined Zona Glauconitica of the Magallanes Basin Province, Chile (fig. 1). The Zona Glauconitica is a 50- to 150-meter thick transgressive unit consisting of low-permeability sandstone and siltstone with significant percentages of glauconite (Zurita and others, 2013). Sediments were sourced from the Andean orogen to the west (Biddle and others, 1986). The Magallanes Basin Province contains a Lower Cretaceous Total Petroleum System made up of several source rock intervals containing marine Type II organics with as much as 6 weight percent total organic matter (Pittion and Arbe, 1997). Parts of the oil and gas, generated from Lower Cretaceous source rocks, (1) migrated vertically into the Zona Glauconitica; (2) remained in the Lower Cretaceous source rocks; and (3) migrated into the underlying Springhill Sandstone, which forms the major conventional reservoir for more than 200 oil and gas fields in the eastern part of the Magallanes Basin Province. This study focuses on estimating the potential for technically recoverable resources of tight gas in the Zona Glauconitica.

Geologic Model for Assessment

The geologic model used in the assessment of the Zona Glauconitica Tight Gas AU (fig. 1) assumes oil and gas were generated within the underlying Lower Cretaceous organic rich shales and migrated upward into low-permeability transgressive siltstones and sandstones of the Zona Glauconitica AU. The main phase of migration was oil, which was subsequently cracked to condensate and gas in the low-permeability reservoir possibly because of elevated heat flow on the Springhill Platform. More than 10 wells have tested and produced gas and condensate from the Zona Glauconitica AU, providing evidence of a viable unconventional accumulation. Key assessment input data are summarized in table 1. Data for estimated ultimate recovery, well drainage areas, and success ratios were derived from comparisons to U.S. analogs for tight-gas reservoirs.

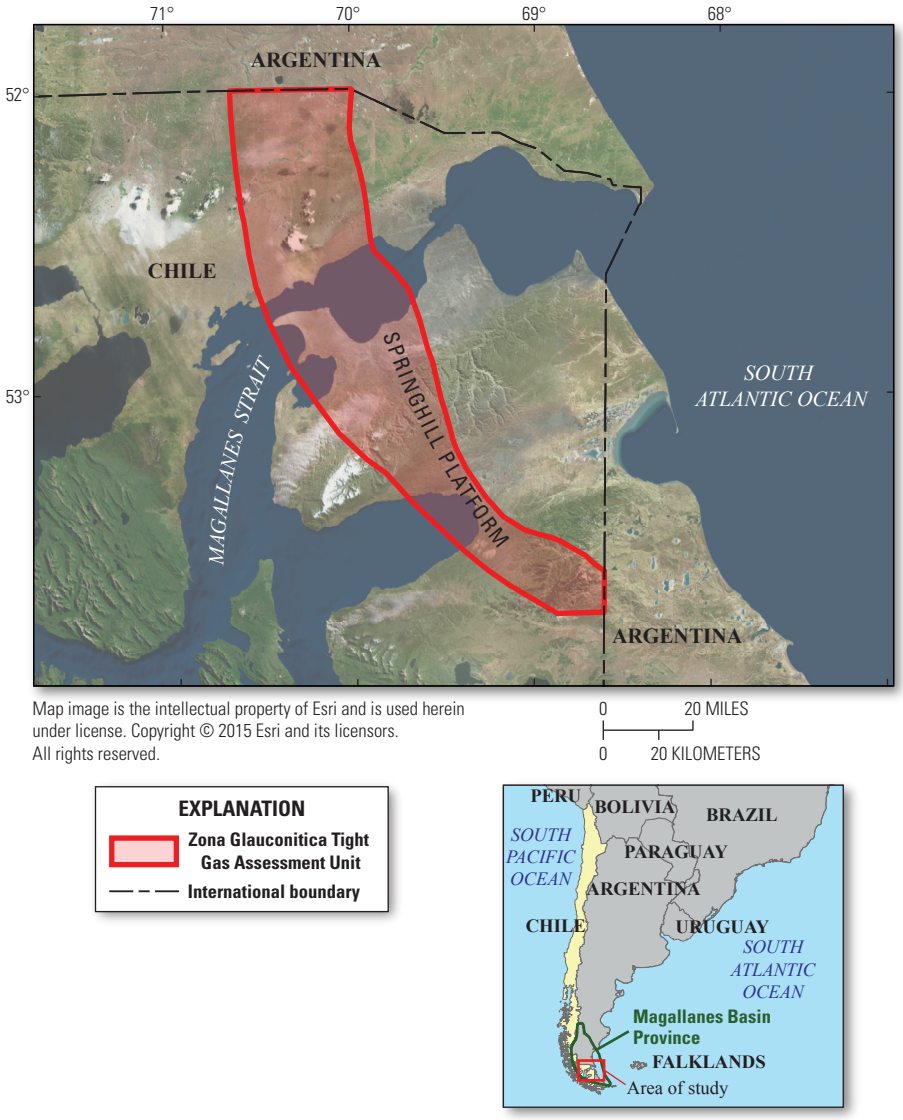

Figure 1. Location of the Magallanes Basin Province in southern Chile and the Zona Glauconitica Tight Gas Assessment Unit.

Unconventional Resource Summary

Total estimated mean tight-gas resource in the Zona Glauconitica AU (fig. 1) is 8,271 billion cubic feet of gas and 83 million barrels of liquids (table 2). The F95–F5 range of resource estimates (2,458 to 16,290 billion cubic feet of gas; 23 to 172 million barrels of liquids) reflects considerable geologic uncertainty, particularly with respect to the geologic boundaries of the Zona Glauconitica AU.

Other unconventional oil and gas accumulations might be present in the Magallanes Basin Province, including shale gas and shale oil in Lower Cretaceous source rocks and tight gas in deepwater sandstones coeval to the Zona Glauconitica, but these potential accumulations were not quantitatively assessed at this time.

Table 1. Key assessment input data for the Zona Glauconitica Tight Gas Assessment Unit of the Magallanes Basin Province, Chile.

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

Assessment input data	Zona Glauconitica Tight Gas			
	Minimum	Mode	Maximum	Calculated mean
Potential production area of AU (acres)	50,000	750,000	2,300,000	1,033,333
Average drainage area of wells (acres)	60	80	180	107
Success ratios (%)	70	80	90	80
Average EUR (BCFG)	0.6	1.0	1.6	1.025
AU probability	1.0			

Table 2. Assessment results for tight-gas resources of the Zona Glauconitica Tight Gas Assessment Unit of the Magallanes Basin Province, Chile.

[AU, assessment unit; 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 under the NGL category. F95 represents a 95 percent chance of at least the amount tabulated. Other fractiles are defined similarly. Fractiles are additive under assumption of perfect positive correlation. Shading indicates not applicable]

Total petroleum system and AU	AU probability	Accumulation type	Total undiscovered resources							
			Gas (BCFG)				NGL (MMBNGL)			
			F95	F50	F5	Mean	F95	F50	F5	Mean
Lower Cretaceous Total Petroleum System										
Zona Glauconitica Tight Gas AU	1.0	Gas	2,458	7,595	16,290	8,271	23	74	172	83
Total undiscovered unconventional resources			2,458	7,595	16,290	8,271	23	74	172	83

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For Further Information

Assessment results also are available at the U.S. Geological Survey Energy Resources Program Web site at http://energy.usgs.gov.

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