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National and Global Petroleum Assessment

Assessment of Undiscovered Oil and Gas Resources in the Cuyo Basin Province, Argentina, 2017

*U*sing a geology-based assessment methodology, the U.S. Geological Survey estimated mean undiscovered, technically recoverable resources of 236 million barrels of oil and 112 billion cubic feet of associated gas in the Cuyo Basin Province, Argentina.

Introduction

The U.S. Geological Survey (USGS) completed an assessment of undiscovered, technically recoverable continuous (unconventional) and conventional oil and gas resources within the Cuyo Basin (or Cuyana Basin) Province of Argentina (fig. 1). The Cuyo Basin Province encompasses a group of Triassic extensional subbasins that formed in a transtensional environment as South America began to separate from Africa (Uliana and others, 1989; Milani and Fihlo, 2000; Barredo, 2012; Barredo and others, 2012). The lithologies of the Triassic synrift to early postrift sediments of these basins range from volcanics to fluvial-lacustrine sandstones and shales. Organic-rich lacustrine shales of the late synrift to early postrift Middle Triassic Cacheuta Formation are the petroleum source rocks in the Cuyo Basin Province (Lopez-Gamundi, 2010; Legarreta and Villar, 2011). Andean compression in the Miocene served to invert many of the Triassic extensional structures (Dellape and Hegedus, 1995), and the resulting foreland orogenic clastic wedge buried the lacustrine shales of the Cacheuta subbasin into the oil generation window in late Miocene to Pliocene time.

Total Petroleum System and Assessment Units

For the Cuyo Basin Province, the USGS defined the Triassic Cacheuta Lacustrine Total Petroleum System based on the presence and thermal maturation of organic-rich lacustrine shales of the Middle Triassic Cacheuta Formation. Organic-rich lacustrine shales of the Cacheuta Formation are as much as 400 meters thick, are predominantly Type I organic matter, and contain total organic carbon contents up to as much as 10 weight percent (Legarreta and Villar, 2011). Shales of the Cacheuta Formation are thermally mature with respect to oil generation in the Cacheuta subbasin, and nearly all conventional oil fields are located in this subbasin.

For this assessment, the USGS defined a Cacheuta Subbasin Lacustrine Shale Oil Assessment Unit (AU), an Alvear Subbasin Lacustrine Shale Oil AU, and a Cacheuta Subbasin Conventional Oil AU within the total petroleum system (fig. 1). The geologic model for the Cacheuta Subbasin Lacustrine Shale Oil AU is for some portion of recoverable oil to have been retained within the Cacheuta Formation lacustrine shales following oil migration into conventional traps. The Alvear Subbasin Lacustrine Shale Oil AU encompasses the area of the Alvear subbasin (fig. 1).

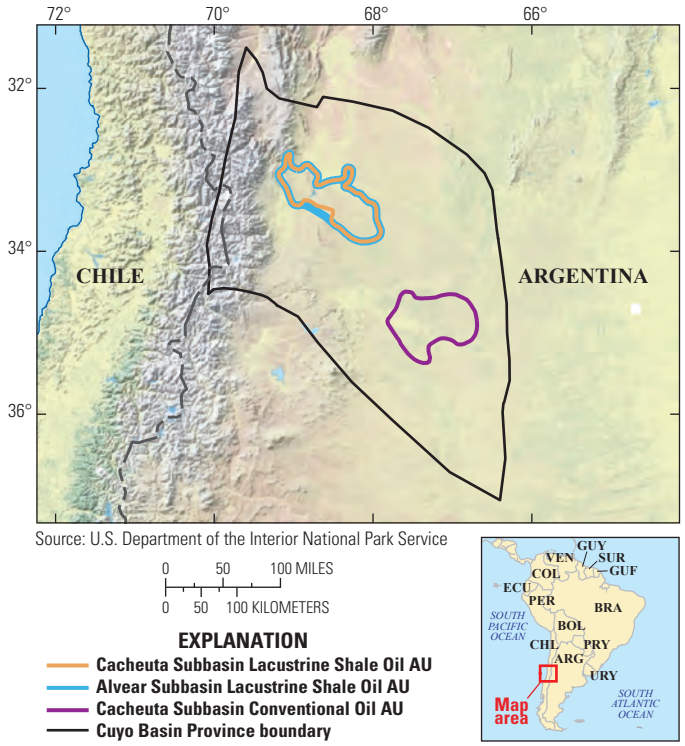

Figure 1. Locations of the Cuyo Basin Province, Argentina, and the three assessment units (AUs) defined in this study. The Alvear Subbasin Lacustrine Shale Oil AU was not quantitatively assessed.

Lacustrine shales in this subbasin are generally considered to be thermally immature with respect to oil generation (Pucci, 2013). However, given the uncertainty with the level of thermal maturation, the Alvear Subbasin Lacustrine Shale Oil AU was not quantitatively assessed. The Cacheuta Subbasin Conventional Oil AU was defined to include oil in conventional reservoirs and traps that was sourced by lacustrine shales of the Cacheuta Formation. The geologic model for this AU is for oil to have migrated from lacustrine shales into synrift fluvial and lacustrine sandstones and into fluvial sandstones of the overlying Rio Blanco Formation within inverted Triassic extensional structures.

Assessment input data for two AUs are shown in table 1. For the Cacheuta Subbasin Lacustrine Shale Oil AU, well drainage areas, estimated ultimate recoveries, and success ratios were guided by U.S. shale-oil analogs.

Undiscovered Resources Summary

The USGS quantitatively assessed technically recoverable, undiscovered conventional and continuous oil and associated gas resources within the Cuyo Basin Province of Argentina (table 2). For total resources, the estimated means are 236 million barrels of oil (MMBO) with an F95–F5 range from 55 to 537 MMBO; 112 billion cubic feet of gas (BCFG) with an F95–F5 range from 23 to 266 BCFG; and 1 million barrels of natural gas liquids (MMBNGL) with an F95–F5 range from 0 to 2 MMBNGL.

Table 1. Key assessment input data for two assessment units (AUs) in the Cuyo Basin Province, Argentina. The Alvear Subbasin Lacustrine Shale Oil AU was not quantitatively assessed.

[%, percent; EUR, estimated ultimate recovery per well; MMBO, million barrels of oil. The average EUR input is the minimum, median, maximum, and calculated mean. Shading indicates not applicable]

Assessment input data—Continuous AU	Cacheuta Subbasin Lacustrine Shale Oil AU			
	Minimum	Mode	Maximum	Calculated mean
Potential production area of AU (acres)	1,600	742,000	1,494,000	745,867
Average drainage area of wells (acres)	80	160	240	160
Success ratio (%)	10	50	90	50
Average EUR (MMBO)	0.04	0.08	0.3	0.092
AU probability	1.0			
Assessment input data—Conventional AU	**Cacheuta Subbasin Conventional Oil AU**			
	Minimum	**Median**	**Maximum**	**Calculated mean**
Number of oil fields	1	12	24	12.3
Sizes of oil fields (MMBO)	0.5	1.0	35	1.7
AU probability	1.0			

Table 2. Assessment results for two assessment units in the Cuyo Basin Province, Argentina.

[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 Cacheuta Lacustrine Total Petroleum System														
Cacheuta Subbasin Lacustrine Shale Oil AU	1.0	Oil	45	182	498	215	21	89	258	108	0	1	2	1
Alvear Subbasin Lacustrine Shale Oil AU	Not quantitatively assessed													
Total continuous resources			**45**	**182**	**498**	**215**	**21**	**89**	**258**	**108**	**0**	**1**	**2**	**1**
Cacheuta Subbasin Conventional Oil AU	1.0	Oil	10	19	39	21	2	4	8	4	0	0	0	0
Total conventional resources			**10**	**19**	**39**	**21**	**2**	**4**	**8**	**4**	**0**	**0**	**0**	**0**
Total undiscovered resources			**55**	**201**	**537**	**236**	**23**	**93**	**266**	**112**	**0**	**1**	**2**	**1**

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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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