

Assessment of Undiscovered Conventional Oil and Gas Resources of the Cooper and Eromanga Basins, Australia, 2016

Using a geology-based assessment methodology, the U.S. Geological Survey estimated mean conventional resources of 68 million barrels of oil and 964 billion cubic feet of gas in the Cooper and Eromanga Basins of Australia.

Introduction

The U.S. Geological Survey quantitatively assessed the potential for undiscovered, technically recoverable conventional oil and gas resources in the Cooper and Eromanga Basins of Australia (fig. 1) as part of an effort to assess priority geologic provinces of the world. By Australian convention, a basin represents an unconformity-bounded set of genetically related strata and can be vertically stacked. Thus, the Warburton (Cambrian–Devonian), Cooper (Permian–Triassic), Eromanga (Jurassic–Cretaceous), and Lake Eyre (Tertiary) Basins are stacked (Menpes and Hill, 2012), with each succeeding basin areally larger than the preceding one. For this U.S. Geological Survey assessment, the Eromanga Basin Province encompasses the Cooper and Eromanga Basins. This study assessed the potential for undiscovered conventional oil and gas resources in the Cooper and Eromanga Basins, in which more than 500 conventional oil and gas fields have been discovered since the 1960s (IHS Energy, 2015). Given the exploration maturity, most undiscovered fields are estimated to be small and in stratigraphic or combination structural-stratigraphic traps (Apak and others, 1997).

For the assessment of conventional resources, the U.S. Geological Survey defined a Cooper-Eromanga Composite Total Petroleum System with Permian and Jurassic coals as the primary source rocks for oil and gas (Boult and others, 1997; Lowe-Young and others, 1997). Five assessment units (AUs) were defined within this composite total petroleum system to encompass oil and gas that were generated largely from coals and migrated and were trapped in Permian through Cretaceous reservoirs. Three AUs were defined within strata of the Cooper Basin and two within the Eromanga Basin. Most of the known gas fields are in the Cooper Basin, whereas most oil fields are in the overlying Eromanga Basin. The assessment input data for the five conventional AUs are shown in table 1.

Undiscovered Resource Summary

The U.S. Geological Survey quantitatively assessed undiscovered, technically recoverable oil and gas resources in five assessment units within the Cooper and Eromanga Basins (table 2). For undiscovered conventional resources, the mean totals are (1) 68 million barrels of oil (MMBO), with an F95 to F5 range from 39 to 108 MMBO; (2) 964 billion cubic feet of gas (BCFG), with an F95 to F5 range from 509 to 1,633 BCFG; and (3) 19 million barrels of natural gas liquids (MMBNGL), with an F95 to F5 range from 9 to 34 MMBNGL.

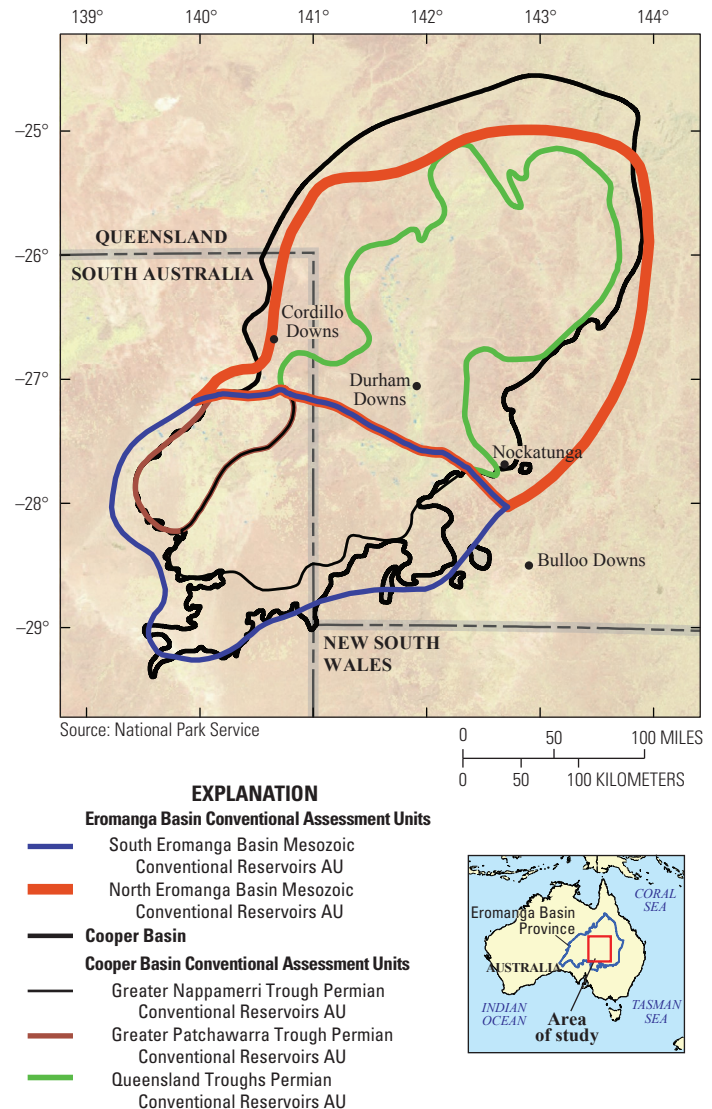


Figure 1. Map showing locations of five conventional assessment units in the Eromanga Basin Province, Australia.

Of the mean total conventional oil resource of 68 MMBO, 48 MMBO (with an F95 to F5 range from 28 to 75 MMBO) are predicted to be in the South Eromanga Basin Mesozoic Conventional Reservoirs AU, and 20 MMBO (with an F95 to F5 range from 11 to 33 MMBO) are in the North Eromanga Basin Mesozoic Conventional Reservoirs AU. About 80 percent of the undiscovered conventional gas resources are predicted to be in the Greater Nappamerri Trough Permian Conventional Reservoirs

AU (mean of 365 BCFG, with an F95 to F5 range from 226 to 540 BCFG), Greater Patchawarra Trough Permian Conventional Reservoirs AU (mean of 112 BCFG, with an F95 to F5 range from 40 to 244 BCFG), and the Queensland Troughs Permian Conventional Reservoirs AU (mean of 290 BCFG, with an F95 to F5 range from 135 to 525 BCFG).

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Table 1. Key assessment input data for conventional assessment units in the Eromanga Basin Province, Australia.

[AU, assessment unit; MMBO, million barrels of oil; BCFG, billion cubic feet of gas. Shading indicates not applicable]

Assessment input data				
South Eromanga Basin Mesozoic Conventional Reservoirs AU	Minimum	Median	Maximum	Calculated mean
Number of oil fields	1	50	120	52
Number of gas fields	1	10	30	10.6
Sizes of oil fields (MMBO)	0.5	0.7	10	0.92
Sizes of gas fields (BCFG)	3	6	10	6.1
AU probability	1.0			
North Eromanga Basin Mesozoic Conventional Reservoirs AU	Minimum	Median	Maximum	Calculated mean
Number of oil fields	1	25	72	26.5
Number of gas fields	1	6	18	6.4
Sizes of oil fields (MMBO)	0.5	0.7	2	0.75
Sizes of gas fields (BCFG)	3	5	8	5.1
AU probability	1.0			
Greater Nappamerri Trough Permian Conventional Reservoirs AU	Minimum	Median	Maximum	Calculated mean
Number of gas fields	1	30	60	30.7
Sizes of gas fields (BCFG)	3	9	100	11.8
AU probability	1.0			
Greater Patchawarra Trough Permian Conventional Reservoirs AU	Minimum	Median	Maximum	Calculated mean
Number of gas fields	1	10	60	11.7
Sizes of gas fields (BCFG)	3	9	25	9.5
AU probability	1.0			
Queensland Troughs Permian Conventional Reservoirs AU	Minimum	Median	Maximum	Calculated mean
Number of gas fields	1	40	144	43.5
Sizes of gas fields (BCFG)	3	6	25	6.7
AU probability	1.0			

Table 2. Assessment results for conventional oil and gas resources in the Eromanga Basin Province, Australia.

[TPS, total petroleum system; AU, assessment unit; MMBO, million barrels of oil; BCFG, billion cubic feet of gas; MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. For gas accumulations, all liquids are included under the NGL (natural gas liquids) 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 (TPS) 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
Cooper-Eromanga Composite TPS														
South Eromanga Basin Mesozoic Conventional Reservoirs AU	1.0	Oil	28	46	75	48	48	82	138	86	0	1	1	1
		Gas					35	61	109	65	1	1	2	1
North Eromanga Basin Mesozoic Conventional Reservoirs AU	1.0	Oil	11	19	33	20	6	12	23	13	0	0	0	0
		Gas					19	31	54	33	0	0	1	1
Greater Nappamerri Trough Permian Conventional Reservoirs AU	1.0	Gas					226	354	540	365	3	5	8	5
Greater Patchawarra Trough Permian Conventional Reservoirs AU	1.0	Gas					40	96	244	112	1	3	7	3
Queensland Troughs Permian Conventional Reservoirs AU	1.0	Gas					135	267	525	290	4	7	15	8
Total undiscovered conventional resources			39	65	108	68	509	903	1,633	964	9	17	34	19

For More Information

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

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