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National and Global Petroleum Assessment

Assessment of Undiscovered Conventional Oil and Gas Resources of the Grand Erg/Ahnet Province, Algeria, 2018

Using a geology-based assessment methodology, the U.S. Geological Survey estimated undiscovered, technically recoverable mean resources of 378 million barrels of oil and 7 trillion cubic feet of gas in the Grand Erg/Ahnet Province of Algeria.

Introduction

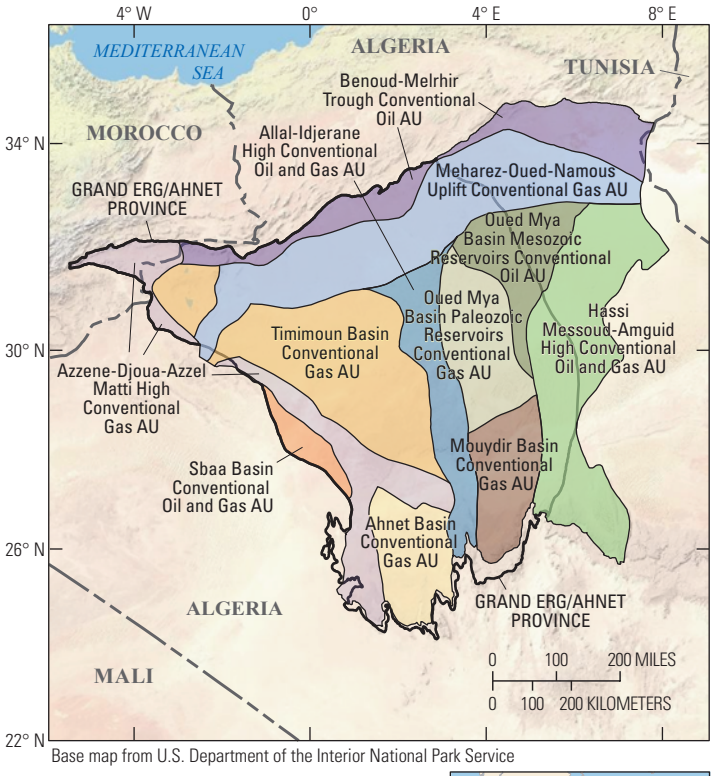
The U.S. Geological Survey (USGS) quantitatively assessed the potential for undiscovered, technically recoverable conventional oil and gas resources in the Grand Erg/Ahnet Province (Klett, 2000) of Algeria (fig. 1). North Africa was a north-facing passive continental margin until Late Carboniferous–Permian Hercynian compression reactivated regional fault systems that segmented the passive margin into a mosaic of basins and uplifts (Klett, 2000; Coward and Ries, 2003; Badalini and others, 2009; Eschard and others, 2010). The Timimoun, Sbaa, Ahnet, Oued Mya, Benoud-Melrhir, and Mouydir Basins and the intervening uplifts are within the USGS-defined Grand Erg/Ahnet Province (fig. 1). Silurian and Devonian source rocks deposited during the passive-margin phase are preserved in the basins but were largely eroded from the uplifts during Hercynian compression (Eschard and others, 2010). Variations in the magnitude of subsidence, uplift, and erosion among the basins led to temporal and spatial variations in thermal maturation of the source rocks. In some basins, gas is interpreted to have been generated prior to or during Hercynian compression, whereas in other basins, the source rocks reached the thermal window for oil or gas generation in the Mesozoic (Makhous and others, 1997; Boote and others, 1998; Logan and Duddy, 1998; Makhous and Galushkin, 2003; Eschard and others, 2010; Kaced and Arab, 2012; Jaeger and others, 2017).

Total Petroleum System and Assessment Units

The USGS defined a Paleozoic Composite Total Petroleum System (TPS) and 11 assessment units (AUs) within this TPS, and 10 of these AUs were quantitatively assessed (table 1; Allal-Idjerane High Conventional Oil and Gas AU was not assessed). The main source rocks for this composite system are the organic-rich lower Silurian Tanezzuft Formation (and equivalent shales; Boote and others, 1998) and Upper Devonian (Frasnian Stage) shales (Lüning and others, 2004). The hydrocarbons generated from these shales were combined into a composite TPS. The geologic model for the Paleozoic Composite TPS is for oil and gas to have been generated from Silurian and Devonian organic-rich shales, with generation possibly ranging from Carboniferous through the Mesozoic. Oil and gas migrated into conventional reservoirs within stratigraphic and structural traps in the basins and migrated updip from the source rocks into conventional reservoirs along the flanks and crests of the uplifts. The uplifts are in a mature stage of exploration, whereas the basins are less mature for conventional resources exploration. Assessment input data are summarized in table 1.

Undiscovered Resources Summary

The USGS quantitatively assessed conventional oil and gas resources in 10 of the 11 defined AUs (table 2) in the Grand Erg/Ahnet Province of Algeria (Allal-Idjerane High Conventional Oil and Gas AU was not assessed). For undiscovered, technically recoverable conventional oil and gas resources, the mean totals are 378 million barrels of oil (MMBO) with an F95–F5 fractile range from 143 to 801 MMBO; 7,032 billion cubic feet of gas (BCFG), or 7 trillion cubic feet of gas, with an F95–F5 fractile range from 2,896 to 13,572 BCFG; and 46 million barrels of natural gas liquids (MMBNGL) with an F95–F5 fractile range from 19 to 90 MMBNGL.



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

Figure 1. Map showing the 11 conventional assessment units (AUs) in the Grand Erg/Ahnet Province of Algeria. The Allal-Idjerane High Conventional Oil and Gas AU was not assessed.

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Table 1. Key input data for 10 conventional assessment units in the Grand Erg/Ahnet Province of Algeria.

[AU, assessment unit; BCFG, billion cubic feet of gas; MMBO, million barrels of oil. The Allal-Idjerane High Conventional Oil and Gas AU was not assessed. Shading indicates not applicable]

Assessment input data—Conventional AUs	Timimoun Basin Conventional Gas AU				Azzene-Djoua-Azzel Matti High Conventional Gas AU			
	Minimum	Median	Maximum	Calculated mean	Minimum	Median	Maximum	Calculated mean
Number of gas fields	1	25	100	27.6	1	15	45	16.0
Size of gas fields (BCFG)	30	60	1,000	85.1	30	40	200	45.0
AU probability	1.0				1.0			
Assessment input data—Conventional AUs	**Sbaa Basin Conventional Oil and Gas AU**				**Ahnet Basin Conventional Gas AU**			
	Minimum	Median	Maximum	Calculated mean	Minimum	Median	Maximum	Calculated mean
Number of oil fields	1	3	6	3.1				
Number of gas fields	1	3	6	3.1	1	10	35	10.8
Size of oil fields (MMBO)	5	8	40	9.1				
Size of gas fields (BCFG)	30	48	100	49.7	30	50	200	55.2
AU probability	1.0				1.0			
Assessment input data—Conventional AUs	**Meharez-Oued-Namous Uplift Conventional Gas AU**				**Oued Mya Basin Paleozoic Reservoirs Conventional Gas AU**			
	Minimum	Median	Maximum	Calculated mean	Minimum	Median	Maximum	Calculated mean
Number of gas fields	1	10	30	10.6	1	15	60	16.6
Size of gas fields (BCFG)	30	60	500	74.0	30	60	2,000	102.0
AU probability	1.0				1.0			
Assessment input data—Conventional AUs	**Oued Mya Basin Mesozoic Reservoirs Conventional Oil AU**				**Mouydir Basin Conventional Gas AU**			
	Minimum	Median	Maximum	Calculated mean	Minimum	Median	Maximum	Calculated mean
Number of oil fields	1	10	30	10.6				
Number of gas fields					1	5	20	5.5
Size of oil fields (MMBO)	5	7	50	8.3				
Size of gas fields (BCFG)					30	60	200	65.0
AU probability	1.0				0.5			
Assessment input data—Conventional AUs	**Hassi Messoud-Amguid High Conventional Oil and Gas AU**				**Benoud-Melrhir Trough Conventional Oil AU**			
	Minimum	Median	Maximum	Calculated mean	Minimum	Median	Maximum	Calculated mean
Number of oil fields	1	10	30	10.6	1	5	20	5.5
Number of gas fields	1	5	15	5.3				
Size of oil fields (MMBO)	5	8	600	16.9	5	10	200	14.8
Size of gas fields (BCFG)	30	40	150	43.7				
AU probability	1.0				1.0			

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For More Information

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

Table 2. Results for 10 conventional assessment units in the Grand Erg/Ahnet Province of Algeria.

[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. 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
Paleozoic Composite Total Petroleum System														
Timimoun Basin Conventional Gas AU	1.0	Gas					939	2,123	4,557	2,351	3	7	17	8
Azzene-Djoua-Azzel Matti High Conventional Gas AU	1.0	Gas					375	673	1,213	717	2	4	8	4
Sbaa Basin Conventional Oil and Gas AU	1.0	Oil	15	27	45	28	44	80	139	84	0	0	1	0
		Gas					92	149	221	154	2	3	5	3
Ahnet Basin Conventional Gas AU	1.0	Gas					285	553	1,071	599	1	2	4	2
Meharez-Oued-Namous Uplift Conventional Gas AU	1.0	Gas					380	735	1,376	787	7	14	29	16
Oued Mya Basin Paleozoic Reservoirs Conventional Gas AU	1.0	Gas					576	1,483	3,513	1,690	2	5	13	6
Oued Mya Basin Mesozoic Reservoirs Conventional Oil AU	1.0	Oil	44	83	152	88	39	81	162	88	1	2	3	2
Mouydir Basin Conventional Gas AU	0.5	Gas					0	0	570	179	0	0	2	1
Hassi Messoud-Amguid High Conventional Oil and Gas AU	1.0	Oil	57	146	424	180	38	101	303	126	1	2	6	3
		Gas					121	218	391	232	0	1	2	1
Benoud-Melrhir Trough Conventional Oil AU	1.0	Oil	27	70	180	82	7	21	56	25	0	0	0	0
Allal-Idjerane High Conventional Oil and Gas AU		Oil	Not quantitatively assessed											
		Gas												
Total undiscovered conventional resources			**143**	**326**	**801**	**378**	**2,896**	**6,217**	**13,572**	**7,032**	**19**	**40**	**90**	**46**

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