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National Assessment of Oil and Gas Fact Sheet

Assessment of Undiscovered Oil and Gas Resources of the Permian Basin Province of West Texas and Southeast New Mexico, 2007

Using a geology-based assessment methodology, the U.S. Geological Survey estimated a mean of 41 trillion cubic feet of undiscovered natural gas and a mean of 1.3 billion barrels of undiscovered oil in the Permian Basin Province.

Introduction

The U.S. Geological Survey (USGS) recently assessed the undiscovered oil and gas potential of the Permian Basin Province of west Texas and southeast New Mexico (figs. 1, 2). The assessment was geology based and used the total petroleum system (TPS) concept. The geologic elements of a total petroleum system are petroleum source rocks (quality, source rock maturation, generation, and migration), reservoir rocks (sequence stratigraphy, petrophysical properties), and traps (trap formation and timing). Using this geologic framework, the USGS defined a Paleozoic Composite Total Petroleum System and 31 assessment units (AU) within the system, and it quantitatively estimated the undiscovered oil and gas resources within 30 of the assessment units (table 1). This study assessed potential for technically recoverable resources in new field discoveries only; field growth (or reserve growth) of conventional oil and gas fields was not included.

Each of the 26 conventional oil and gas assessment units in this study is geologically comparable to one or more oil and gas plays that were defined in the Permian Basin Province by the Bureau of Economic Geology, Texas, and the New Mexico Bureau of Geology and Mineral Resources (Broadhead, 1993; Dutton and others, 2005). Some oil and gas plays were combined to form a single assessment unit.

For the first time, the USGS defined continuous (unconventional) assessment units in the Permian Basin Province. These units were the (1) Spraberry Continuous Oil AU; (2) Woodford–Barnett Continuous Gas AU; (3) Delaware–Pecos Basins Woodford Continuous Shale Gas AU; (4) Delaware–Pecos Basins Barnett Continuous Gas Shale AU; and (5) Delaware Basin Wolfcamp Shale AU.

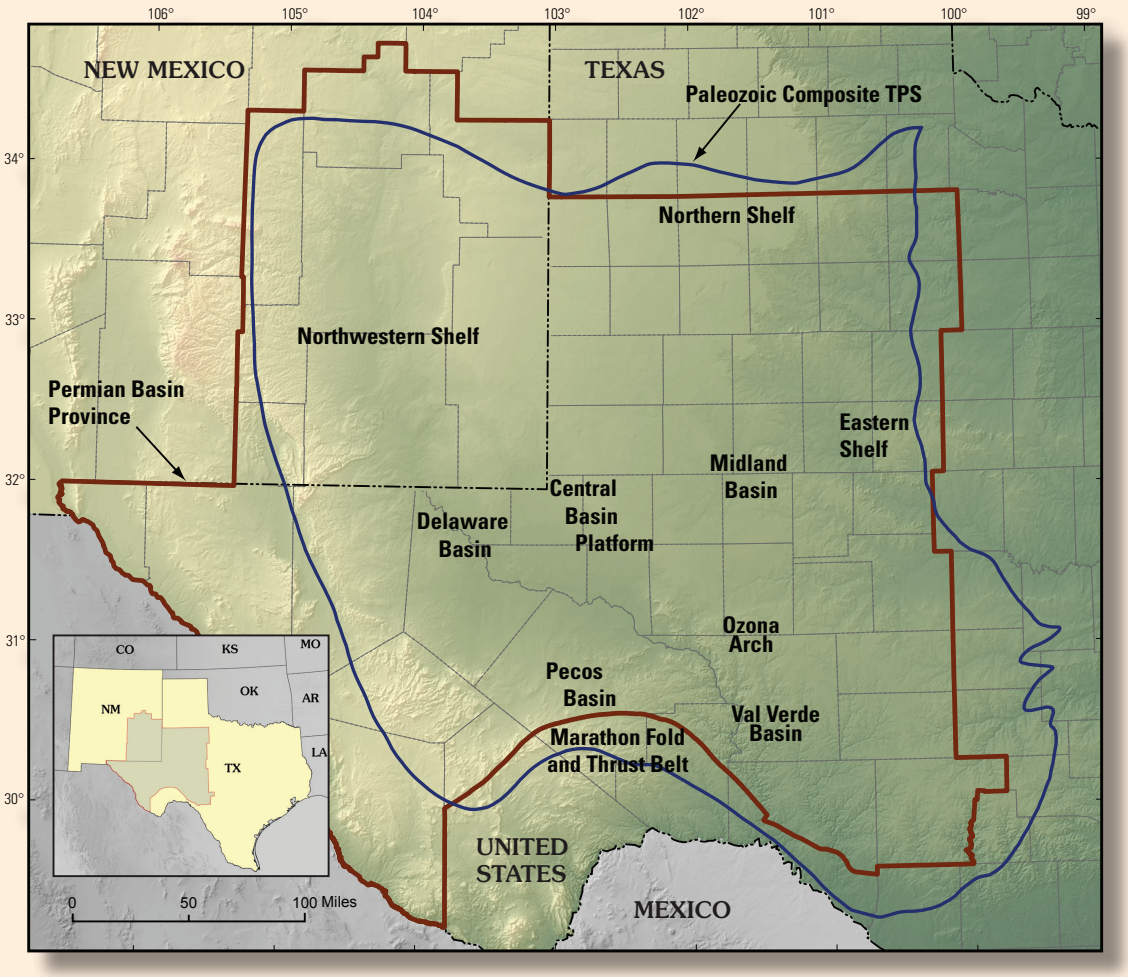

Figure 1. *Permian Basin Province in west Texas and southeastern New Mexico. The Permian Basin Province contains the Midland Basin, Delaware Basin, Pecos Basin, Central Basin Platform, Val Verde Basin, Ozona Arch, and the Northwestern, Northern, and Eastern Shelves.*

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Figure 2. *Photograph of the Guadalupe Mountains in west Texas illustrating the massive El Capitan carbonate fore-reef facies and the underlying slope-forming Delaware Mountain Group sandstones and mudstones.*

Resource Summary

The USGS assessed undiscovered conventional oil and gas resources and continuous (unconventional) oil and gas resources in 30 assessment units (table 1). For conventional resources, the estimated means were 747 million barrels of oil (MMBO), 5.2 trillion cubic feet of gas (TCFG), and 236 million barrels of natural gas liquids (MMBNGL) in 26 assessment units.

For continuous gas resources, the USGS estimated a total mean resource of 34.8 TCFG in three assessment units, which comprises a mean of 2.8 TCFG in the Woodford–Barnett Continuous Gas AU of the Midland Basin, a mean of 15 TCFG in the Delaware–Pecos Basins Woodford Continuous Shale Gas AU, and a mean of 17 TCFG in the Delaware–Pecos Basins Barnett Continuous Gas Shale AU in the Delaware Basin. The Delaware Basin Wolfcamp Shale AU was not assessed. For continuous oil resources the estimated mean was 510 MMBO in the Spraberry Continuous Oil AU in the Midland Basin.

The assessment indicates that the majority of undiscovered natural gas in the Permian Basin Province is estimated to be in three continuous assessment units of the Delaware and Midland Basins. Of the total mean of 41 TCFG in the province, about 35 TCFG is estimated to be in these three assessment units. Given that few wells have produced from these assessment units, there is significant geologic uncertainty in these estimates, which is reflected in the range of estimates for natural gas (table 1).

For Further Information

Supporting geologic studies of the composite total petroleum system and assessment units and the methodology used in the Permian Basin Province assessment are in progress. Assessment results are available at the USGS Central Energy Team website, *http://energy.cr.usgs.gov/oilgas/noga*.

Table 1. *Permian Basin Province assessment results.*

[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 as NGL (natural gas liquids). F95 represents a 95 percent chance of at least the amount tabulated; other fractiles are defined similarly. TPS, total petroleum system; AU, assessment unit. Gray shading indicates not applicable]

Total Petroleum System (TPS) and Assessment Unit (AU)	Field Type	*Total Undiscovered Resources*											
		Oil (MMBO)				*Gas (BCFG)*				*NGL (MMBNGL)*			
		F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
Conventional Oil and Gas Resources													
Paleozoic Composite TPS													
Ellenberger Group Karst and Dolomite AU	*Oil*	12	40	83	43	12	40	90	44	1	3	8	4
	Gas					147	475	924	498	3	11	24	12
Simpson Group Sandstones AU	*Oil*	1	3	6	3	2	6	14	7	0	0	1	0
	Gas					22	63	123	66	1	2	5	2
Pre-Pennsylvanian Ramp and Platform Carbonates AU	*Oil*	15	48	95	51	17	56	122	61	1	4	10	5
	Gas					91	323	664	343	3	12	28	14
Devonian Thirtyone Formation Chert and Carbonate AU	*Oil*	7	22	45	24	23	79	178	87	2	8	19	9
	Gas					91	321	665	344	5	17	38	19
Lower Pennsylvanian (Morrow/Atoka) Shelf Sandstone and Carbonate AU	*Oil*	0	0	0	0	0	0	0	0	0	0	0	0
	Gas					238	780	1,485	812	3	9	19	10
Pennsylvanian–Lower Permian (Wolfcamp) Northwest Shelf Carbonate AU	*Oil*	8	27	56	29	21	72	161	79	1	5	11	5
	Gas					43	146	308	158	1	4	9	4
Pennsylvanian–Lower Permian (Wolfcamp) Central Basin Platform and Shelf Carbonate AU	*Oil*	12	40	79	42	43	150	330	164	3	10	24	11
	Gas					57	183	355	192	3	9	18	9
Pennsylvanian–Lower Permian (Wolfcamp) Horseshoe Platform and Eastern Shelf Carbonate and Sandstone AU	*Oil*	28	93	175	96	42	143	299	154	5	17	38	18
	Gas					15	38	69	40	0	1	3	1
Pennsylvanian–Lower Permian (Wolfcamp) Val Verde Slope and Basinal Sandstone and Carbonate AU	*Oil*	3	9	22	10	16	56	139	64	1	3	9	4
	Gas					183	702	1,517	758	8	31	74	35
Pennsylvanian–Lower Permian (Wolfcamp) Slope and Basinal Carbonates AU	*Oil*	3	12	27	13	9	32	83	37	0	2	5	2
	Gas					62	222	481	241	2	9	20	10
Abo Fluvial Sandstones AU	*Oil*	0	0	0	0	0	0	0	0	0	0	0	0
	Gas					0	0	23	8	0	0	0	0
Abo Shelf and Shelf Edge Carbonates AU	*Oil*	11	39	83	42	23	83	194	93	2	6	15	7
	Gas					25	65	123	69	1	2	5	3
Leonardian NW and E Shelf Restricted Platform Carbonates AU	*Oil*	22	74	146	78	16	57	125	62	1	4	10	5
	Gas					0	0	0	0	0	0	0	0
Leonardian Central Basin Platform Restricted Carbonates AU	*Oil*	10	31	61	33	29	96	209	105	2	7	16	8
	Gas					13	33	62	35	1	1	3	2
Leonardian Midland Basin Carbonate Sediment Gravity Flow Reservoirs AU	*Oil*	28	93	185	98	47	161	355	176	3	10	25	12
	Gas					0	0	0	0	0	0	0	0
Bone Spring Slope and Basin Reservoirs AU	*Oil*	15	50	100	53	55	192	423	210	2	9	21	10
	Gas					0	0	0	0	0	0	0	0
Spraberry Conventional Sandstones AU	*Oil*	5	18	43	20	4	14	36	16	0	1	4	2
	Gas					0	0	0	0	0	0	0	0
San Andres NW Shelf Platform Carbonates AU	*Oil*	2	5	8	5	2	4	8	4	0	0	1	0
	Gas					0	0	0	0	0	0	0	0
San Andres Eastern Shelf Platform Carbonates AU	*Oil*	0	0	3	1	0	0	1	0	0	0	0	0
	Gas					0	0	0	0	0	0	0	0

Table 1. *Permian Basin Province assessment results.—Continued*

	Total Petroleum System (TPS) and Assessment Unit (AU)	Field Type	Total Undiscovered Resources											
			Oil (MMBO)				Gas (BCFG)				NGL (MMBNGL)			
			F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
	Paleozoic Composite TPS—Continued													
Conventional Oil and Gas Resources	San Andres Central Basin Platform Carbonates AU	Oil	5	17	33	18	8	25	53	27	1	2	6	3
		Gas					0	0	0	0	0	0	0	0
	San Andres–Grayburg Low-stand Carbonates AU	Oil	3	8	16	9	1	2	5	3	0	0	1	0
		Gas					0	0	0	0	0	0	0	0
	San Andres–Grayburg Artesia-Vacuum Trend Carbonates AU	Oil	0	2	5	2	0	3	8	3	0	0	0	0
		Gas					0	0	0	0	0	0	0	0
	Grayburg Central Basin Platform and Ozona Arch Carbonates AU	Oil	0	1	3	1	0	0	4	1	0	0	0	0
		Gas					0	4	21	7	0	0	1	0
	Delaware Mountain Group Reservoirs AU	Oil	18	64	134	69	37	137	314	152	2	6	15	7
		Gas					8	17	31	18	0	1	1	1
	Queen Sandstones AU	Oil	2	6	11	6	2	6	12	6	0	0	1	0
		Gas					17	42	73	43	1	1	3	2
	Upper Artesia Sandstones and Carbonates AU	Oil	0	0	3	1	0	0	6	2	0	0	0	0
		Gas					0	0	20	7	0	0	1	0
	Total Conventional Resources					**747**				**5,196**				**236**
Continuous Oil and Gas Resources	Delaware-Pecos Basins Wood-ford Continuous Shale Gas AU	Oil	0	0	0	0	0	0	0	0	0	0	0	0
		Gas					10,249	14,741	21,203	15,105	177	289	473	302
	Delaware-Pecos Basins Bar-nett Continuous Shale Gas AU	Oil	0	0	0	0	0	0	0	0	0	0	0	0
		Gas					1,008	16,437	26,698	17,203	177	322	585	344
	Midland Basin Woodford-Barnett Continuous Gas AU	Oil	0	0	0	0	0	0	0	0	0	0	0	0
		Gas					1,546	2,670	4,613	2,822	55	105	198	113
	Delaware Basin Wolfcamp Shale AU	Oil	Not quantitatively assessed											
		Gas												
	Spraberry Continuous Oil AU	Oil	340	497	725	510	127	240	453	258	11	24	48	26
		Gas					0	0	0	0	0	0	0	0
	Total Continuous Resources					**510**				**35,388**				**785**
	Total Undiscovered Oil and Gas Resources					**1,257**				**40,584**				**1,021**

References

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