

National and Global Petroleum Assessment

Assessment of Undiscovered Conventional Oil and Gas Resources of the Greater Taranaki Basin and East Coast Basin of New Zealand, 2020

Using a geology-based assessment methodology, the U.S. Geological Survey estimated means of 806 million barrels of oil and 17.0 trillion cubic feet of gas within the greater Taranaki Basin and East Coast Basin of New Zealand.

Introduction

The U.S. Geological Survey (USGS) quantitatively assessed the potential for undiscovered, technically recoverable conventional oil and gas resources in three assessment units (AUs) within the greater Taranaki Basin and East Coast Basin of New Zealand (fig. 1). For this study, the greater Taranaki Basin includes what are locally called the Taranaki Basin, Western Platform, the Deepwater Taranaki Basin, and Deepwater Northland Basin (Uruski and Baillie, 2004).

Total Petroleum Systems and Assessment Units

The USGS defined a Mesozoic–Cenozoic Composite Total Petroleum System (TPS) with source rocks ranging in age from Late Cretaceous to Eocene coal beds, carbonaceous shales, and Paleogene organic-rich marine shales (Pilaar and Wakefield, 1984; Killops and others, 1994; Armstrong and others, 1996; Sykes and Raine, 2008). The Taranaki Mesozoic–Cenozoic Reservoirs AU and the Deepwater Taranaki–Northland Reservoirs AU were defined within this composite TPS. The geologic model for the Taranaki Mesozoic–Cenozoic Reservoirs AU is for oil and gas to have been generated from coal and shale source rocks and to have migrated into clastic reservoirs ranging from fluvial, alluvial, deltaic, shelf, and deep-water sandstones (Kroeger and others, 2019) and platform-margin carbonate reservoirs. The Deepwater Taranaki–Northland Reservoirs AU was defined to encompass clastic reservoirs beyond the shelf edge in the Deepwater Taranaki and Northland Basins (Stagpoole and others, 2001; Uruski and Baillie, 2004; Bierbrauer and others, 2008; Uruski, 2010; Duran and others, 2015; Grahame, 2015). Oil and gas sourced mainly from coal beds and from Paleogene organic-rich marine shales migrated into reservoirs ranging from synrift fluvial-deltaic sandstones to slope-channel and basin-floor fan sandstones (King and Funnell, 1997).

The East Coast Basin Mesozoic–Cenozoic TPS was defined to encompass oil and gas generated within the accretionary prism and trapped in convergent margin reservoirs (Burgreen-Chan and others, 2016). Within the Mesozoic–Cenozoic TPS, the East Coast Basin Convergent Margin Reservoirs AU includes potential sandstone reservoirs in the forearc basin and accretionary prism, with thermogenic oil and gas generated from Paleogene marine shales and gas of biogenic origin. Key assessment input data are summarized in table 1.

Undiscovered Resources Summary

The USGS quantitatively assessed undiscovered conventional oil, gas, and natural gas liquid (NGL) resources within the greater Taranaki Basin and East Coast Basin of New Zealand (table 2). The fully risked mean totals are 806 million barrels of oil (MMBO), or 0.8 billion barrels of oil, with an F95–F5 fracture range from 249 to 1,892 MMBO; 16,950 billion cubic feet of gas (BCFG), or 17.0 trillion cubic feet, with an F95–F5 range from 7,894 to 31,163 BCFG; and 367 million barrels of natural gas liquids (MMBNGL), or 0.4 billion barrels of natural gas liquids, with an F95–F5 range from 177 to 656 MMBNGL.

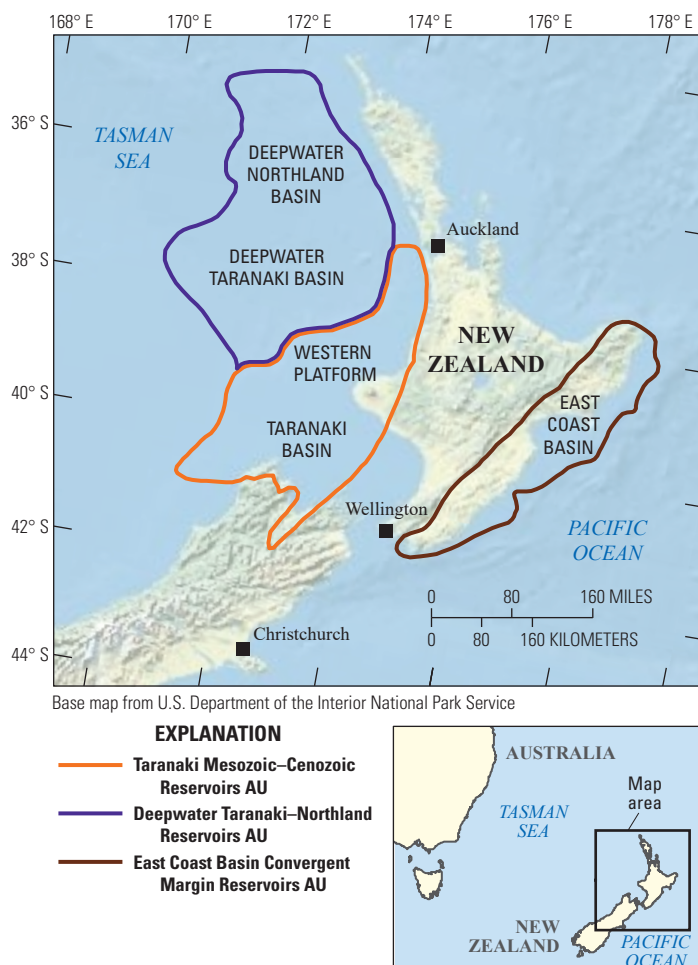


Figure 1. Map showing the location of three assessment units (AUs) in the greater Taranaki Basin and East Coast Basin of New Zealand.

Table 1. Key input data for three conventional assessment units in the greater Taranaki Basin and East Coast Basin.

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

Assessment input data— Conventional AUs	Mesozoic–Cenozoic Composite Total Petroleum System							
	Taranaki Mesozoic–Cenozoic Reservoirs AU				Deepwater Taranaki–Northland Reservoirs AU			
	Minimum	Median	Maximum	Calculated mean	Minimum	Median	Maximum	Calculated mean
Number of oil fields	1	5	10	5.1	1	20	60	21.3
Number of gas fields	1	50	100	51.2	1	30	90	31.9
Size of oil fields (MMBO)	5	8	30	8.8	5	10	2,000	33.7
Size of gas fields (BCFG)	30	60	2,000	102.0	30	60	10,000	185.7
AU probability	1.0				1.0			
Assessment input data— Conventional AUs	Mesozoic–Cenozoic Total Petroleum System				East Coast Basin Convergent Margin Reservoirs AU			
	Minimum	Median	Maximum	Calculated mean	Minimum	Median	Maximum	Calculated mean
	Minimum	Median	Maximum	Calculated mean	Minimum	Median	Maximum	Calculated mean
Number of oil fields	1	5	10	5.1				
Number of gas fields	1	40	80	41.0				
Size of oil fields (MMBO)	5	8	30	8.8				
Size of gas fields (BCFG)	30	60	1,500	94.1				
AU probability	1.0							

Table 2. Results for three conventional assessment units in the greater Taranaki Basin and East Coast Basin.

[Results shown are fully risked estimates. F95 represents a 95-percent chance of at least the amount tabulated; other fractiles are defined similarly. Shading indicates not applicable. MMBO, million barrels of oil; BCFG, billion cubic feet of gas; NGL, natural gas liquids; MMBNGL, million barrels of natural gas liquids]

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
Mesozoic–Cenozoic Composite Total Petroleum System														
Taranaki Mesozoic–Cenozoic Reservoirs AU	1.0	Oil	29	44	67	45	89	135	206	139	1	2	3	2
		Gas					3,092	5,066	7,992	5,243	124	203	320	210
Deepwater Taranaki–Northland Reservoirs AU	1.0	Oil	191	574	1,758	716	457	1,377	4,208	1,720	5	15	46	19
		Gas					1,908	5,083	12,748	5,901	40	107	268	124
Mesozoic–Cenozoic Total Petroleum System														
East Coast Basin Convergent Margin Reservoirs AU	1.0	Oil	29	44	67	45	54	83	127	86	0	0	0	0
		Gas					2,294	3,725	5,882	3,861	7	11	19	12
Total undiscovered conventional resources			249	662	1,892	806	7,894	15,469	31,163	16,950	177	338	656	367

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For More Information

Assessment results are also available at the USGS Energy Resources Program website at <https://www.usgs.gov/energy-and-minerals/energy-resources-program>.

New Zealand Basins Assessment Team

Christopher J. Schenk, Tracey J. Mercier, Marilyn E. Tennyson, Geoffrey S. Ellis, Cheryl A. Woodall, Phuong A. Le, Heidi M. Leathers-Miller, and Ronald M. Drake II.