

Chapter ES

EXECUTIVE SUMMARY

By USGS World Energy Assessment Team

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EXECUTIVE SUMMARY

The U.S. Geological Survey (USGS) World Petroleum Assessment 2000 provides estimates of the quantities of conventional oil, gas, and natural gas liquids outside the United States that have the potential to be added to reserves in the next 30 years (1995 to 2025). Excluding the U.S., the mean (expected) volumes of undiscovered resources are 649 billion barrels of oil (BBO), 4,669 trillion cubic feet of gas (TCFG), and 207 billion barrels of natural gas liquids (BBNGL). The estimated mean additions to reserves from discovered fields (potential reserve growth) are 612 BBO, 3,305 TCFG, and 42 BBNGL (table ES-1, fig. ES-1). Table ES-1 also shows the uncertainty ranges of these estimates.

The potential additions to reserves from reserve growth are nearly as large as the estimated undiscovered resource volumes. These estimates imply that 75 percent of the world's grown conventional oil endowment and 66 percent of the world's grown conventional gas endowment have already been discovered in the areas assessed (exclusive of the U.S.). Additionally, for these areas, 20 percent of the world's grown conventional oil endowment and 7 percent of the world's grown conventional gas endowment had been produced as of the end of 1995 (fig. ES-1).

The USGS undertook this world petroleum assessment in order to provide impartial, scientifically based, societally relevant petroleum-resource information essential to the economic and strategic security of the United States.

This assessment is based on extensive geologic studies as opposed to statistical analysis. A team of more than 40 geoscientists and additional supporting staff conducted the study over a five-year period from 1995 to 2000. The petroleum

assessed occurs in fields exceeding a stated minimum size, which varies between 1 and 20 million barrels of oil equivalent in different areas, and in accumulation categories judged to be viable in a 30-year forecast span.

The critical geologic controls on petroleum distribution are encompassed by the Total Petroleum System (TPS) and were studied using this approach. Assessment Units (AU), within the TPS, were the basic units for assessment. Overall, 159 TPS and 270 AU were identified in 96 countries and 2 jointly held areas. Of these, 149 TPS and 246 AU in 128 geologic provinces were quantitatively assessed. The assessed areas were those judged to be significant on a world scale in terms of known petroleum volumes, geologic potential for new petroleum discoveries, and political or societal importance. In the course of our geologic analyses, 24 AU were identified as containing continuous (nonconventional) resources, but these were not quantitatively assessed.

For each AU, allocations of undiscovered resources were made to the countries, geologic provinces, regions, and offshore areas (if any) involved. From these allocated portions, aggregations of estimates were made for higher levels such as to countries, geologic provinces, and groups of countries including the Organization of the Petroleum Exporting Countries (OPEC) and the Organization for Economic Co-operation and Development (OECD).

The United States was not reassessed in this study; estimates previously made by the USGS in 1995 and the Minerals Management Service in 1996 were used for comparative purposes.

Compared to the last USGS world petroleum assessment (Masters and others, 1994, 1997), undiscovered volumes from this assessment (exclusive of the U.S.) are 20 percent greater for oil, 14 percent smaller for gas, and 130 percent greater for NGL. The large estimated volumes of oil, gas, and NGL from reserve growth in this assessment represent a resource category not quantitatively assessed previously for the world by the USGS (fig. ES-2).

The volume of undiscovered oil estimated in this assessment is larger than that of the 1994 assessment, due in part to larger estimates for the Middle East and Atlantic offshore portions of South America and Africa. However, in some areas the estimated volumes of undiscovered oil were smaller, particularly for Mexico and China.

The volume of undiscovered gas estimated in this assessment is smaller than that of the previous world assessment mainly because of smaller estimates for arctic areas of the Former Soviet Union, some basins in China, and the Alberta Basin of Canada. The volume of undiscovered NGL estimated in this assessment is much larger than that of the previous assessment because of more detailed analysis, coupled with the incorporation of coproduct ratios into the assessment calculations.

Areas assessed in the World Petroleum Assessment 2000 that contain the greatest volumes of undiscovered conventional oil include the Middle East, northeast Greenland Shelf, the West Siberian and Caspian areas of the Former Soviet Union, and the Niger and Congo delta areas of Africa. Significant new undiscovered oil resource potential was identified in a number of areas with no significant production history, such as northeast Greenland and offshore Suriname.

Areas that contain the greatest volumes of undiscovered conventional gas include the West Siberia Basin, Barents and Kara Seas shelves of the Former Soviet Union, the Middle East, and offshore Norwegian Sea. A number of areas were identified that may contain significant additional undiscovered gas resources where large discoveries have been made but remain undeveloped. Examples include East Siberia and the Northwest Shelf of Australia.

Results of USGS World Petroleum Assessment 2000 offer opportunities for many studies beyond the initial analyses in this report. The material generated by this effort can serve as a foundation for additional geologic, economic, geopolitical, and environmental studies.

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Table 1. World level summary of petroleum estimates for undiscovered conventional petroleum and reserve growth for oil, gas, and natural gas liquids (NGL).

[BBOE, billions of barrels of oil equivalent. Six thousand cubic feet of gas equals one barrel of oil equivalent. F95 represents a 95 percent chance of at least the amount tabulated. Other fractiles are defined similarly. Production and reserves normalized to 1/1/96. Shading indicates not applicable]

Oil				Gas				BBOE	NGL			
Billion Barrels				Trillion Cubic Feet				Mean	Billion Barrels			
F95	F50	F5	Mean	F95	F50	F5	Mean	Mean	F95	F50	F5	Mean

World (excluding United States)

Undiscovered conventional	334	607	1,107	649	2,299	4,333	8,174	4,669	778	95	189	378	207
Reserve growth (conventional)	192	612	1,031	612	1,049	3,305	5,543	3,305	551	13	42	71	42
Remaining reserves*				859				4,621	770				68
Cumulative production*				539				898	150				7
Total				2,659				13,493	2,249				324

United States

Undiscovered conventional**	66		104	83	393		698	527	88	Combined with oil		
Reserve growth (conventional)**				76				355	59	Combined with oil		
Remaining reserves				32				172	29	Combined with oil		
Cumulative production				171				854	142	Combined with oil		
Total				362				1,908	318			

World Total

(including United States)

3,021

15,401

2,567

*World reserve and cumulative production data reflect only those parts of the world actually assessed and are from Petroconsultants (1996) and NRG Associates (1995).

**U.S. data from Gautier, D.L., Dolton, G.L., Takahashi, K.I., and Varnes, K.L., eds, 1996, 1995 National assessment of United States oil and gas resources--Results, methodology, and supporting data: U.S. Geological Survey Digital Data Series DDS-30, release 2, one CD-ROM, and from Minerals Management Service, 1996, An assessment of the undiscovered hydrocarbon potential of the Nation's outer continental shelf: Minerals Management Service OCS Report, MMS 96-0034, 40 pages.

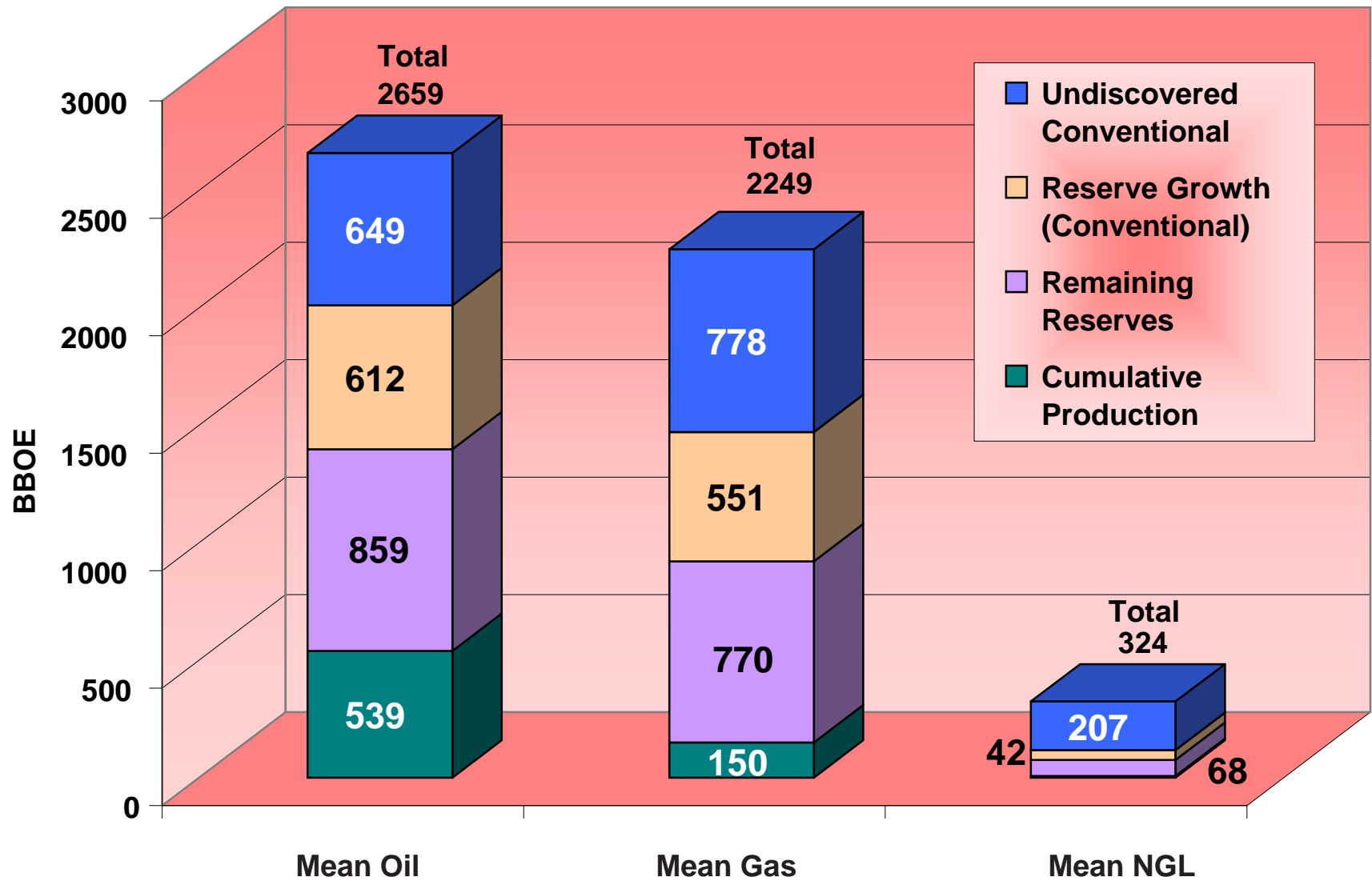


Figure 1. Graph showing the mean estimate of the world grown conventional endowment of oil, gas and NGL as from the 2000 World Assessment. Includes cumulative production, remaining reserves, and, in conventional accumulations, mean estimates of reserve growth and undiscovered resources. [in Billion Barrels of Oil Equivalent (BBOE); production and reserve data largely as of 1/1/96, Petroconsultants, 1996, NRG and Associates, 1995]

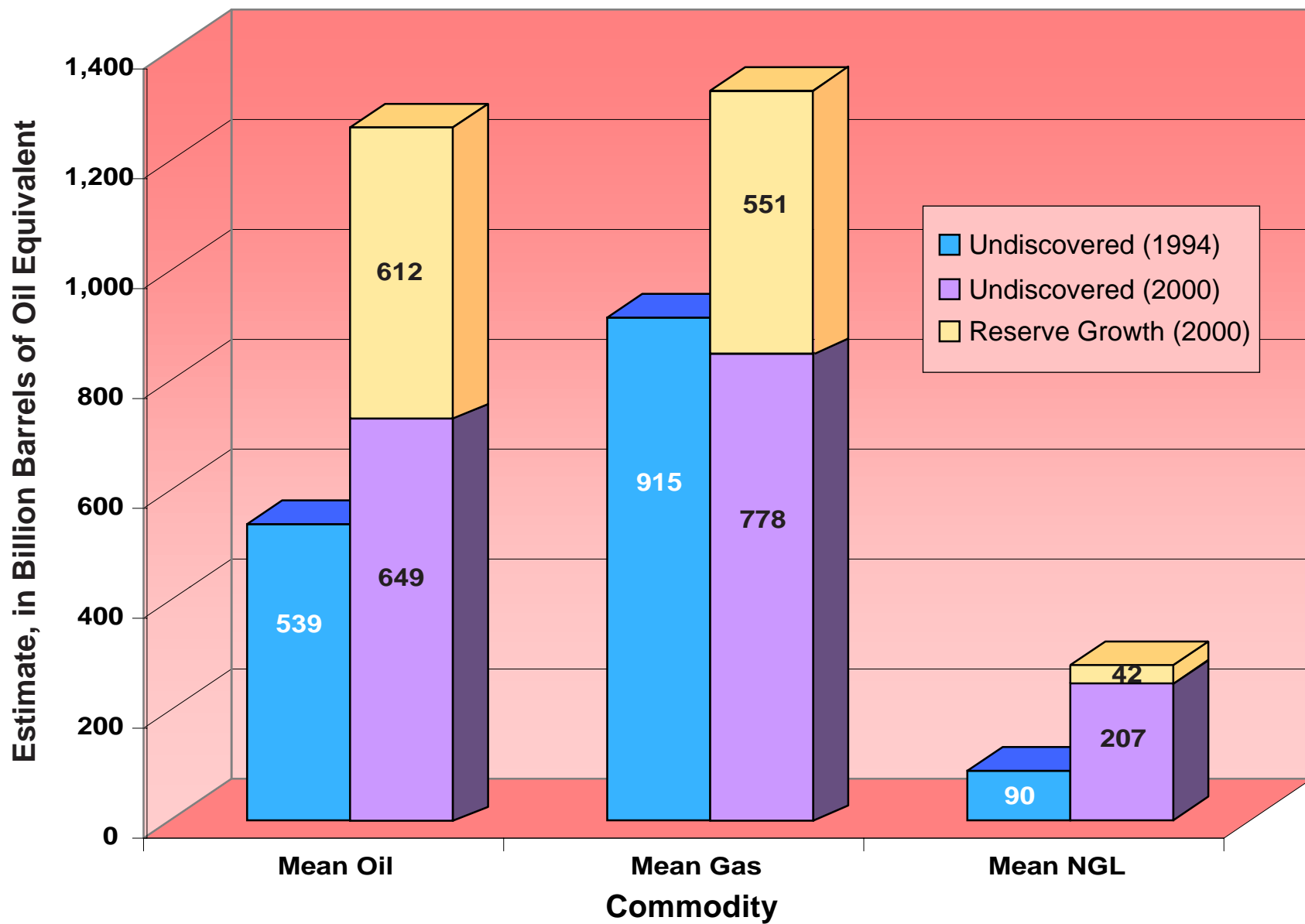


Figure 2. Graph comparing the 1994 and 2000 USGS world estimates exclusive of the U.S. for undiscovered conventional oil, gas and NGL in billion barrels of oil equivalent. For each commodity, the estimated reserve growth from the 2000 World Assessment is also shown. The 1994 assessment results are as reported in Masters and others (1997).