

U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves

2002 Annual Report

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Preface

The *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves 2002 Annual Report* is the 26th prepared by the Energy Information Administration (EIA) to fulfill its responsibility to gather and report annual proved reserves estimates. The EIA annual reserves report series is the only source of comprehensive domestic proved reserves estimates. This publication is used by the Congress, Federal and State agencies, industry, and other interested parties to obtain accurate estimates of the Nation's proved reserves of crude oil, natural gas, and natural gas liquids. These data are essential to the development, implementation, and evaluation of energy policy and legislation.

This report presents estimates of proved reserves of crude oil, natural gas, and natural gas liquids as of December 31, 2002, as well as production volumes for the United States and selected States and State subdivisions for the year 2002. Estimates are presented for the following four categories of natural gas: total gas (wet after lease separation), nonassociated gas and associated-dissolved gas (which are the two major types of wet natural gas), and total dry gas (wet gas adjusted for the removal of liquids at natural gas processing plants). In addition, reserve estimates for two types of natural gas liquids, lease condensate and natural gas plant liquids, are presented. The estimates are based upon data obtained from two annual EIA surveys: Form EIA-23, "Annual Survey of Domestic Oil and Gas Reserves" and Form EIA-64A, "Annual Report of the Origin of Natural Gas Liquids Production." Also included is information on indicated additional crude oil reserves and crude oil, natural gas, and lease condensate reserves in nonproducing reservoirs. A discussion of notable oil and gas exploration and development activities during 2002 is provided.

The appendices contain data by operator production size class for crude oil and natural gas reserves and production; the top 100 U.S. fields ranked within an oil or gas proved reserves group for 2002; Table 1 converted to metric units; historical State data; a summary of survey operations; a discussion of statistical considerations; methods used to develop

the estimates provided in this report; maps of selected State subdivisions; and examples of the survey forms. A glossary of the terms used in this report and in survey Forms EIA-23 and EIA-64A is provided to assist readers in more fully understanding the data.

This annual reserves report was prepared by the Reserves and Production Division (located in Dallas, Texas), Office of Oil and Gas, Energy Information Administration. General information regarding preparation of the report may be obtained from Kenneth A. Vagts, Director, Office of Oil and Gas and John H. Wood, Director, Reserves and Production Division (214-720-6160).

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Executive Summary: U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves 2002 Annual Report

Proved reserves of natural gas and crude oil have increased for the fourth year in a row. In fact, natural gas proved reserves have increased in eight of the past nine years.

U.S. crude oil proved reserves increased by 1 percent in 2002. Reserves additions were 112 percent of production. Ninety-seven percent of all new field discoveries of crude oil reported in 2002 were in the Gulf of Mexico Federal Offshore.

As of December 31, 2002 proved reserves were:

Crude Oil (million barrels)	
2001	22,446
2002	22,677
Increase	1.0%
Dry Natural Gas (billion cubic feet)	
2001	183,460
2002	186,946
Increase	1.9%
Natural Gas Liquids (million barrels)	
2001	7,993
2002	7,994
Increase	0.0%

U.S. natural gas reserves increased by 2 percent in 2002. Reserves additions were 118 percent of production. However, gas production declined 2 percent in 2002. Sharp production declines in the Gulf of Mexico were partially offset by large production increases in the Rocky Mountain States.

In 2002, the Rocky Mountain States and Texas had large gas reserves additions. These additions highlight a shift from conventional gas fields to unconventional gas fields, i.e., tight sands, shales, and coalbeds. Eleven of the top 20 natural gas fields of 2002 are located in the Rocky Mountain States. Significant reserves were added in the Powder River Basin coalbed methane fields and the Pinedale Field (deep and tight sand) in Wyoming, and the Wattenberg Field (tight sand) and coalbed methane fields in Colorado. In Texas, significant reserves were

added in the Newark East Field (Barnett Shale), the Nation's tenth largest natural gas field.

When gas reserves increase the natural gas liquids reserves usually do too, but natural gas liquids reserves remained level in 2002. That was because coalbed methane, which usually has no natural gas liquids content, accounted for a large portion of new gas reserves in 2002.

Proved reserves are the estimated quantities which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions. Petroleum engineering and geological judgment are required in estimating proved reserves, therefore the results are not precise measurements. This report of 2002 U.S. proved reserves of crude oil, natural gas, and natural gas liquids is the 26th in an annual series prepared by the Energy Information Administration.

Crude Oil

Total discoveries are those reserves attributable to field extensions, new field discoveries, and new reservoir discoveries in old fields. They result from the drilling of exploratory wells. Total discoveries of crude oil were 946 million barrels in 2002, 7 percent less than the prior 10-year average and 63 percent less than 2001's discoveries of 2,565 million barrels. This is not surprising because 2001, which featured new proved reserves from bp's Thunder Horse Field, was an unusually successful year. Domestic field discoveries of that magnitude are no longer common.

The majority of crude oil total discoveries in 2002 were extensions, particularly in Texas, California, and the Gulf of Mexico Federal Offshore. The north slope of Alaska (normally a major contributor to total discoveries) had no significant impact on the Nation's total discoveries in 2002. Operators discovered 492 million barrels in extensions in 2002, 1 percent more than the prior 10-year average.

New field discoveries accounted for 300 million barrels of crude oil reserves additions. Almost all were in the Gulf of Mexico Federal Offshore (290 of 300 million). This was 15 percent less than the prior 10-year average.

New reservoir discoveries in old fields were 154 million barrels, 47 percent less than in 2001 and 10 percent less than the prior 10-year average.

Reserves additions are the sum of total discoveries, revisions and adjustments, and sales and acquisitions. In 2002 the net of revisions and adjustments (1,136 million barrels) contributed more to crude oil reserves additions than did total discoveries, accounting for 54 percent of total reserves additions.

The sales component of the crude oil reserves changes (804 million barrels) was less than the revision decreases component in 2002 and acquisitions (828 million barrels) were less than revision increases. The net of sales and acquisitions of crude oil proved reserves was 24 million barrels.

Other 2002 crude oil events of note:

- Exploratory and developmental oil completions were down 38 percent from 2001.
- The annual average domestic first purchase price for crude oil increased 3 percent from the 2001 level to \$22.51 per barrel.

Natural Gas

Total discoveries of dry gas reserves were 17,795 billion cubic feet in 2002. This was 36 percent more than the prior 10-year average but 22 percent less than in 2001. The majority of natural gas total discoveries in 2002 were from extensions of existing conventional and unconventional gas fields.

Field extensions were 14,769 billion cubic feet, 10 percent less than extensions in 2001 but 65 percent more than the prior 10-year average of 8,931 billion cubic feet.

New field discoveries were 1,332 billion cubic feet, 63 percent less than the volume discovered in 2001 and 24 percent less than the prior 10-year average.

New reservoir discoveries in old fields were 1,694 billion cubic feet, down 40 percent from 2001 and 31 percent less than the prior 10-year average.

Natural gas net revisions and adjustments were 4,664 billion cubic feet. The net of sales and acquisitions of dry natural gas proved reserves was 380 billion cubic feet.

Coalbed methane proved reserves and production continued to grow in 2002. Coalbed methane proved reserves were 18,491 billion cubic feet, an increase of 5 percent from 2001 and accounted for 10 percent of

U.S. dry gas proved reserves. Coalbed methane production was 1,614 billion cubic feet, an increase of 3 percent from 2001 and accounted for 8 percent of U.S. dry gas production.

Other 2002 natural gas events of note:

- Exploratory gas well completions decreased 30 percent in 2002 and development well drilling was down 28 percent. Operators drilled 28 percent less wells for gas in 2002 than in 2001.
- Natural gas prices were down 27 percent in 2002 to an average of \$2.95 per thousand cubic feet at the wellhead, as compared to \$4.02 per thousand cubic feet in 2001. Prices did, however, steadily rise in the winter months of 2002 to a monthly average of \$3.84 per thousand cubic feet in December.
- U.S. gas production decreased by 2 percent in 2002. Two severe hurricanes, Isadore and Lilly, caused shutins of Gulf of Mexico production in September and October of 2002.

Natural Gas Liquids

U.S. natural gas liquids proved reserves remained level in 2002 (7,994 million barrels). Natural gas liquids reserves are the sum of natural gas plant liquids and lease condensate reserves.

Total proved reserves of liquid hydrocarbons (crude oil plus natural gas liquids) were 30,671 million barrels in 2002, a 0.8 percent increase from the 2001 level. Natural gas liquids represented 26 percent of total liquid hydrocarbon proved reserves in 2002.

Data

These estimates are based upon analysis of data from Form EIA-23, Annual Survey of Domestic Oil and Gas Reserves, filed by 1,577 operators of oil and gas wells, and Form EIA-64A, Annual Report of the Origin of Natural Gas Liquids Production, filed by operators of 527 active natural gas processing plants. The U.S. proved reserves estimates for crude oil and natural gas are associated with sampling errors of less than 1 percent.

Almost 97 percent of the total natural gas production estimate was reported on the EIA-23 survey, 3 percent came from State or commercial sources, and only 0.2 percent was imputed from sampling data. Over 94 percent of the total crude oil production data was reported on the EIA-23 survey, 5 percent came from State or commercial sources, and only 0.4 percent was imputed from sampling data.