2. Overview

National Summary

The United States had the following proved reserves as of December 31, 2007:

- **Crude Oil — 21,317 million barrels**
- **Dry Natural Gas — 237,726 billion cubic feet**
- **Natural Gas Liquids — 9,143 million barrels.**

This Overview summarizes the 2007 proved reserves balances of crude oil, dry natural gas, and natural gas liquids on a national level and provides historical comparisons between 2007 and prior years. **Table 1** lists the estimated annual reserve balances since 1997 for crude oil, dry natural gas, and natural gas liquids.

Crude Oil

U.S. crude oil proved reserves increased 2 percent (345 million barrels) in 2007. **Figure 1** shows the crude oil proved reserves levels by major region and **Figure 2** shows the components of reserves changes from 1997 through 2007.

As indicated in **Figure 1**, U.S. crude oil proved reserves increased onshore in the lower 48 States and in Alaska, but declined slightly in the Gulf of Mexico Federal Offshore.

The components of reserves changes for crude oil are shown in **Figure 2**. EIA tracks all components of reserves changes: adjustments, revision increases, revision decreases, sales, acquisitions, extensions, new field discoveries, new reservoir discoveries in old fields, and estimated production. These components are discussed below.

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 790 million barrels in 2007, 28 percent less than the prior 10-year average (1,100 million barrels) and 37 percent more than 2006's discoveries of 577 million barrels.

The majority of crude oil total discoveries in 2007 came from extensions to fields in Texas, the Gulf of Mexico, North Dakota, New Mexico and Alaska. Operators discovered 651 million barrels in extensions in 2007, 29 percent more than in 2006 and 18 percent more than the prior 10-year average (554 million barrels).

New field discoveries accounted for 66 million barrels of crude oil total discoveries. This was more than twice the new field discoveries of 2006 (30 million barrels), and only 16 percent of the prior 10-year average (407 million barrels). More than two-thirds of these discoveries (45 of 66 million barrels) were in Alaska.

New reservoir discoveries in old fields were 73 million barrels, 70 percent more than 2006 (43 million barrels) but 48 percent lower than the prior 10-year average (140 million barrels).

Crude oil net revisions totaled 1,200 million barrels in 2007. The net of sales and acquisitions of crude oil proved reserves was a decline of 19 million barrels.

U.S. 2007 crude oil production was 1,691 million barrels, up 2 percent from 2006's estimated production (1,652 million barrels) and the first increase in 4 years. Alaska and the lower 48 States each contributed about half of the U.S. total increase. Reserves additions of crude oil replaced 120 percent of 2007 crude oil production.

Dry Natural Gas

Natural gas proved reserves increased by 26,641 billion cubic feet in 2007. **Figure 3** shows the dry natural gas proved reserves levels by major region. It indicates that additions of natural gas reserves in the Lower 48 onshore are raising the national total despite declining Federal offshore natural gas reserves. **Figure 4** shows the components of reserves changes from 1997 through 2007.

Total discoveries of dry natural gas reserves, which is the sum of field extensions, new field discoveries, and new reservoir discoveries in old fields, were 29,091 billion cubic feet in 2007. This was 59 percent more than the prior 10-year average (18,357 billion cubic feet) and 25 percent more than in 2006 (23,342 billion cubic feet).

The majority of natural gas total discoveries in 2007 were from extensions to existing fields. Field extensions were 27,107 billion cubic feet, 25 percent more than in 2006 (21,778 billion cubic feet) and 82

Table 1. Total U.S. Proved Reserves of Crude Oil, Dry Natural Gas, and Natural Gas Liquids, 1997-2007

Year	Adjustments (1)	Net Revisions (2)	Revisions[a] and Adjustments (3)	Net of Sales[b] and Acquisitions (4)	Extensions (5)	New Field Discoveries (6)	New Reservoir Discoveries in Old Fields (7)	Total[c] Discoveries (8)	Estimated Production (9)	Proved[d] Reserves 12/31 (10)	Change from Prior Year (11)
	Crude Oil (million barrels of 42 U.S. gallons)										
1997	520	914	1,434	NA	477	637	119	1,233	2,138	22,546	+529
1998	-638	518	-120	NA	327	152	120	599	1,991	21,034	-1,512
1999	139	1,819	1958	NA	259	321	145	725	1,952	21,765	+731
2000	143	746	889	-20	766	276	249	1,291	1,880	22,045	+280
2001	-4	-158	-162	-87	866	1,407	292	2,565	1,915	22,446	+401
2002	416	720	1,136	24	492	300	154	946	1,875	22,677	+231
2003	163	94	257	-398	426	705	101	1,232	1,877	21,891	-786
2004	74	420	494	23	617	33	132	782	1,819	21,371	-520
2005	221	569	790	278	805	205	41	1,051	1,733	21,757	+386
2006	94	2	96	194	504	30	43	577	1,652	20,972	-785
2007	65	1,200	1,265	-19	651	66	73	790	1,691	21,317	+345
	Dry Natural Gas (billion cubic feet, 14.73 psia, 60° Fahrenheit)										
1997	-590	4,902	4,312	NA	10,585	2,681	2,382	15,648	19,211	167,223	+749
1998	-1,635	5,740	4,105	NA	8,197	1,074	2,162	11,433	18,720	164,041	-3,182
1999	982	10,504	11,486	NA	7,043	1,568	2,196	10,807	18,928	167,406	+3,365
2000	-891	6,962	6,071	4,031	14,787	1,983	2,368	19,138	19,219	177,427	+10,021
2001	2,742	-2,318	424	2,630	16,380	3,578	2,800	22,758	19,779	183,460	+6,033
2002	3,727	937	4,664	380	14,769	1,332	1,694	17,795	19,353	186,946	+3,486
2003	2,841	-1,638	1,203	1,034	16,454	1,222	1,610	19,286	19,425	189,044	+2,098
2004	-114	744	630	1,844	18,198	759	1,206	20,163	19,168	192,513	+3,469
2005	1,887	2,699	4,586	2,544	21,050	942	1,208	23,200	18,458	204,385	+11,872
2006	743	-1,836	-1,093	2,996	21,778	409	1,155	23,342	18,545	211,085	+6,700
2007	1,147	15,461	16,608	408	27,107	796	1,188	29,091	19,466	237,726	+26,641
	Natural Gas Liquids (million barrels of 42 U.S. gallons)										
1997	-15	289	274	NA	535	114	90	739	864	7,973	+150
1998	-361	208	-153	NA	383	66	88	537	833	7,524	-449
1999	99	727	826	NA	313	51	88	452	896	7,906	+382
2000	-83	459	376	145	645	92	102	839	921	8,345	+439
2001	-429	-132	-561	102	717	138	142	997	890	7,993	-352
2002	62	31	93	54	612	48	78	738	884	7,994	+1
2003	-338	-161	-499	30	629	35	72	736	802	7,459	-535
2004	273	97	370	112	734	26	54	814	827	7,928	+469
2005	-89	21	-68	156	863	32	42	937	788	8,165	+237
2006	173	-165	8	117	924	16	53	993	811	8,472	+307
2007	-139	422	283	101	1,030	30	58	1,118	831	9,143	+671

[a]Revisions and adjustments = Col. 1 + Col. 2.
[b]Net of sales and acquisitions = acquisitions - sales.
[c]Total discoveries = Col. 5 + Col. 6 + Col. 7.
[d]Proved reserves = Col. 10 from prior year + Col. 3 + Col. 4 + Col. 8 - Col. 9.
NA=Not available.

Notes: Old means discovered in a prior year. New means discovered during the report year. The production estimates in this table are based on data reported on 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." They may differ from the official EIA production data for crude oil, natural gas, and natural gas liquids for 2007 contained in the *Petroleum Supply Annual 2007*, DOE/EIA-0340(07) and the *Natural Gas Annual 2007,* DOE/EIA-0131(07).

Sources: *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, 1996 through 2006 annual reports, DOE/EIA-0216.

Figure 1. U.S. Crude Oil Proved Reserves, 1997-2007

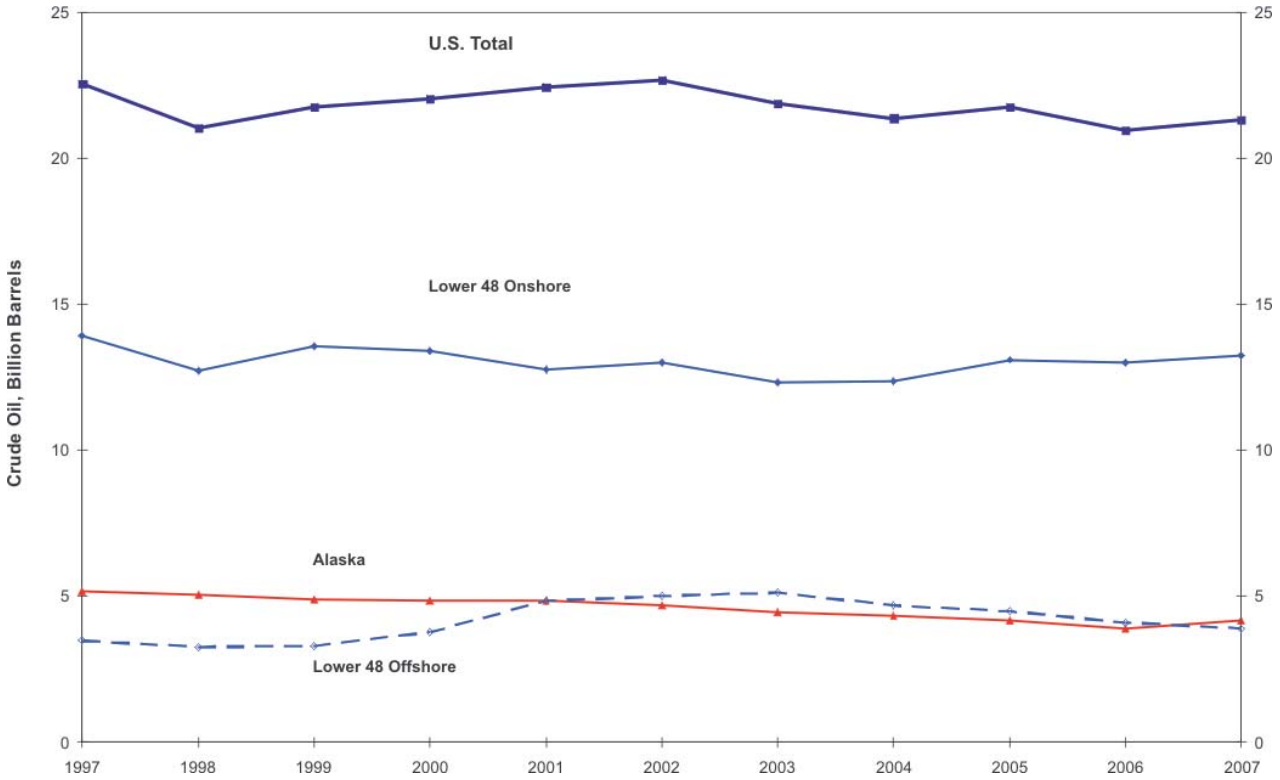
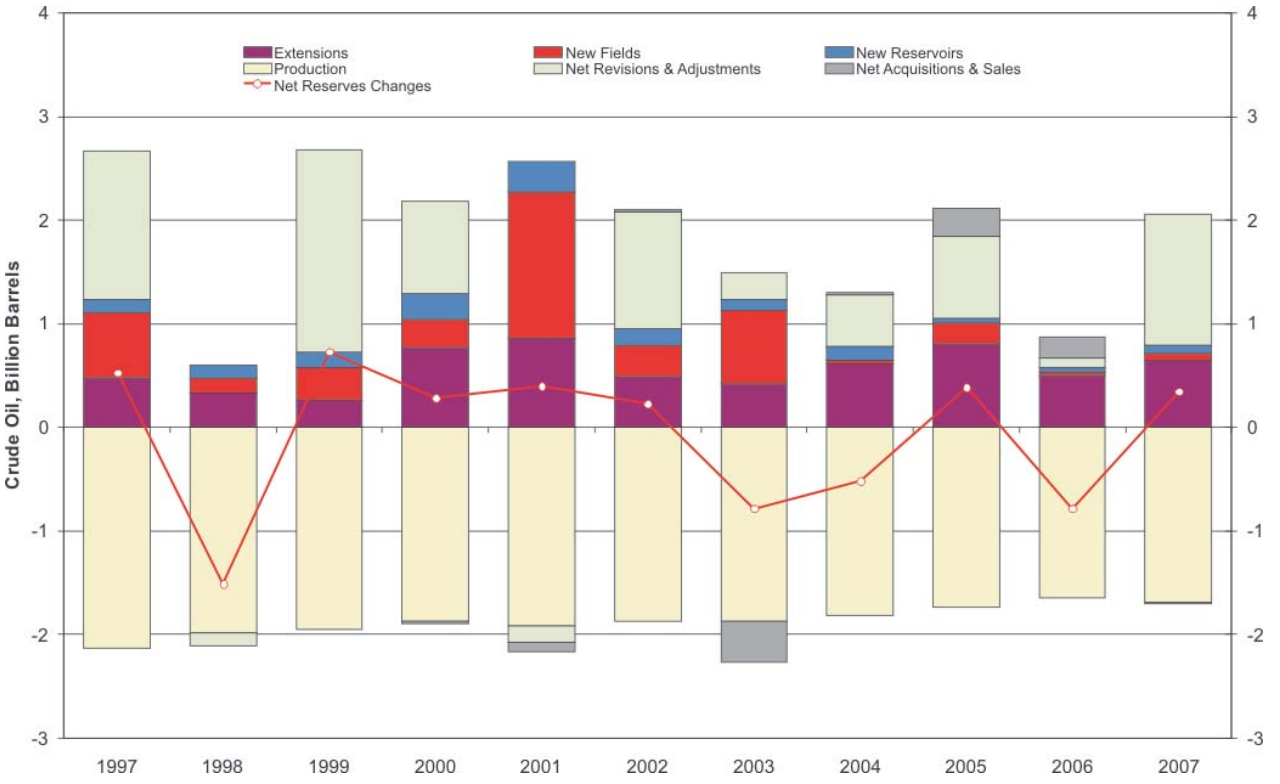


Figure 2. Components of Reserves Changes for Crude Oil, 1997-2007



Source: U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 1997-2006 annual reports, DOE/EIA-0216.{21-30}

Figure 3. U.S. Dry Natural Gas Proved Reserves, 1997-2007

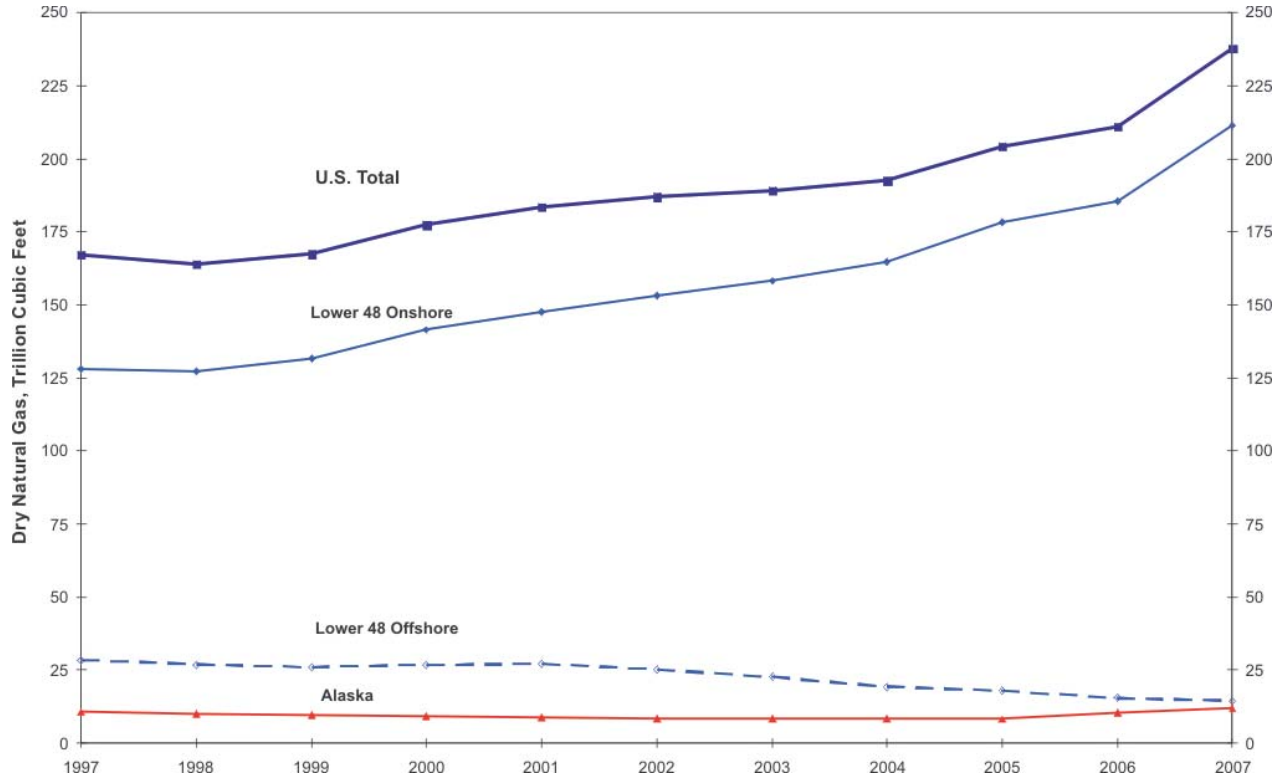
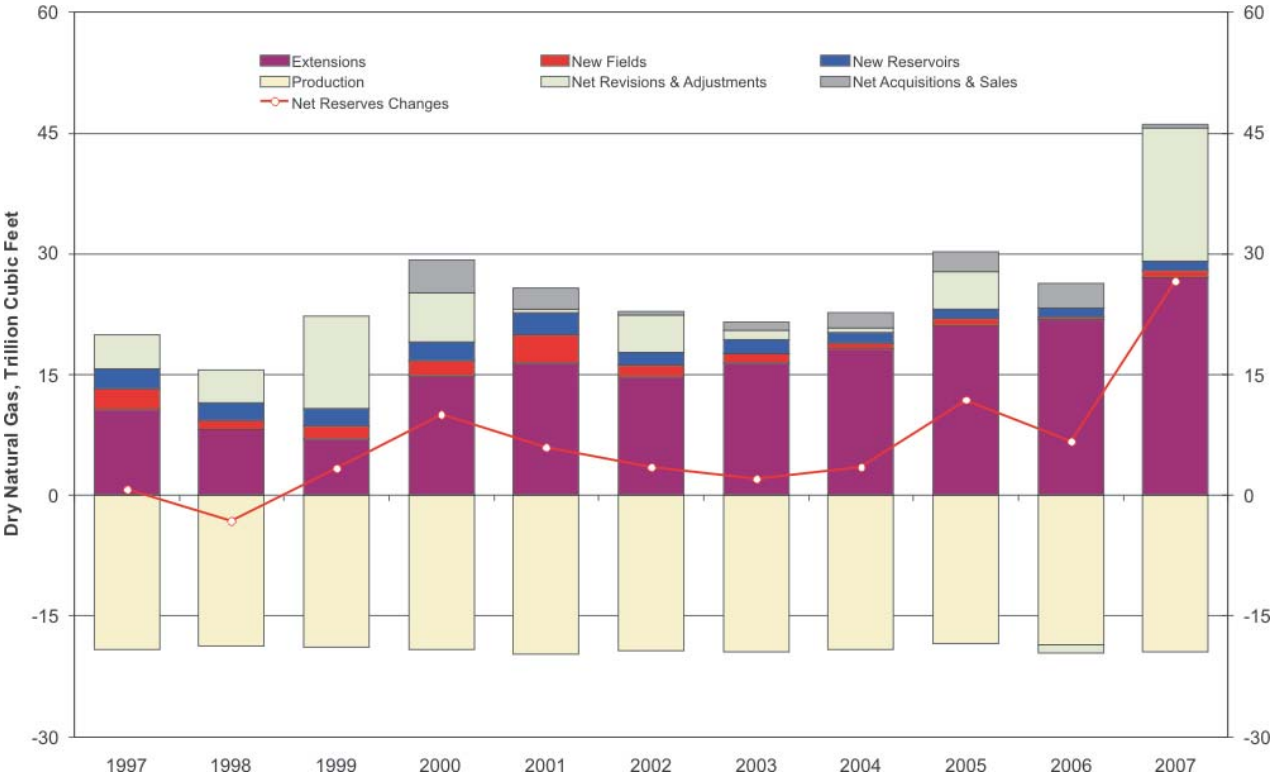


Figure 4. Components of Reserves Changes for Dry Natural Gas, 1997-2007



Source: U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 1997-2006 annual reports, DOE/EIA-0216.{21-30}

percent more than the prior 10-year average (14,924 billion cubic feet).

New field discoveries were 796 billion cubic feet, 95 percent more than the volume discovered in 2006 (409 billion cubic feet) and 51 percent of the prior 10-year average (1,555 billion cubic feet).

New reservoir discoveries in old fields were 1,188 billion cubic feet, 3 percent more than in 2006 (1,155 billion cubic feet) and 63 percent of the prior 10-year average (1,878 billion cubic feet).

In 2007, net revisions (15,461 billion cubic feet) accounted for 34 percent of total natural gas reserves additions (46,107 billion cubic feet). Over the last 10 years, about 15 percent of proved reserves additions have come from net revisions. The net of sales and acquisitions of dry natural gas proved reserves was 408 billion cubic feet.

U.S. dry natural gas production grew to 19,466 billion cubic feet in 2007, a 5-percent increase over 2006's dry natural gas production (18,545 billion cubic feet).

Unconventional resources are playing an increasingly important role in U.S. dry natural gas reserves and production. For example, improved technology now allows high economic returns for development of reserves in shale reservoirs at the prices seen in 2006 and 2007. As a result, proved reserves of shale gas have been increasing rapidly. EIA has collected data on proved natural gas reserves from shale reservoirs for two years. The shale gas proved reserves increased 50 percent in 2007 and are now at about 9 percent of the U.S. total.

Proved reserves and production from coal reservoirs increased rapidly from 1989 through 2002 before stabilizing and even dropping slightly in 2006. However, coalbed natural gas reserves saw an 11.5-percent increase in 2007. Coalbed proved reserves now account for about 9 percent of U.S. dry natural gas reserves. Coalbed natural gas production decreased in 2007 but still accounted for about 9 percent of U.S. dry natural gas production.

Natural Gas Liquids

Natural gas liquids reserves are associated with natural gas production and include lease condensate extracted at the well on the producing lease and natural gas plant liquids reserves extracted at plants. Large increases in natural gas proved reserves lead to large increases in natural gas liquids proved reserves, but the percent increases are not the same because natural gas from different fields varies in how much liquid is extractable. Overall, natural gas liquids proved reserves increased 8 percent in 2007. Operators replaced 181 percent of U.S. natural gas liquids production with reserves additions.

Natural gas liquids represented 30 percent of total liquid hydrocarbon proved reserves in 2007. Total proved reserves of liquid hydrocarbons (crude oil plus natural gas liquids) were 30.5 billion barrels in 2007, a 3-percent increase from the 2006 level.

Reserves Changes Since 1977

EIA has collected oil and gas reserves estimates annually since 1977. **Table 2** lists the cumulative totals of the components of reserves changes for crude oil and dry natural gas from 1977 through 2007. The table has two sections, one for the lower 48 States and another for the U.S. total (which includes Alaska's contribution). Annual averages for each component of reserves changes are also listed, along with the percentage of that particular component's impact on total U.S. proved reserves. In this section, we compare these averages to the 2007 proved reserves estimates as a means of gauging the past year against history.

Crude Oil: Since 1977 U.S. operators have:

- had average annual total discoveries of reserves of 891 million barrels,
- had average annual proved reserves additions of 2,027 million barrels from total discoveries, net revisions and adjustments, and net sales and acquisitions, and
- had an average annual proved reserves decline of 393 million barrels nationwide, because production exceeded proved reserves additions.

Since 1977, crude oil reserves have primarily been sustained by proved ultimate recovery appreciation in existing fields rather than by the discovery of new oil fields. Only 11 percent of reserves additions since 1977 were booked as new field discoveries. Proved ultimate recovery appreciation is the sum of net revisions, adjustments, net sales and acquisitions, extensions, and new reservoir discoveries in old fields (see the Proved Ultimate Recovery section later in this chapter.) Since 1977, the 27,627 million barrels of total discoveries accounted for 44 percent of reserves additions.

Figure 5. U.S. Natural Gas Liquids Proved Reserves, 1997-2007

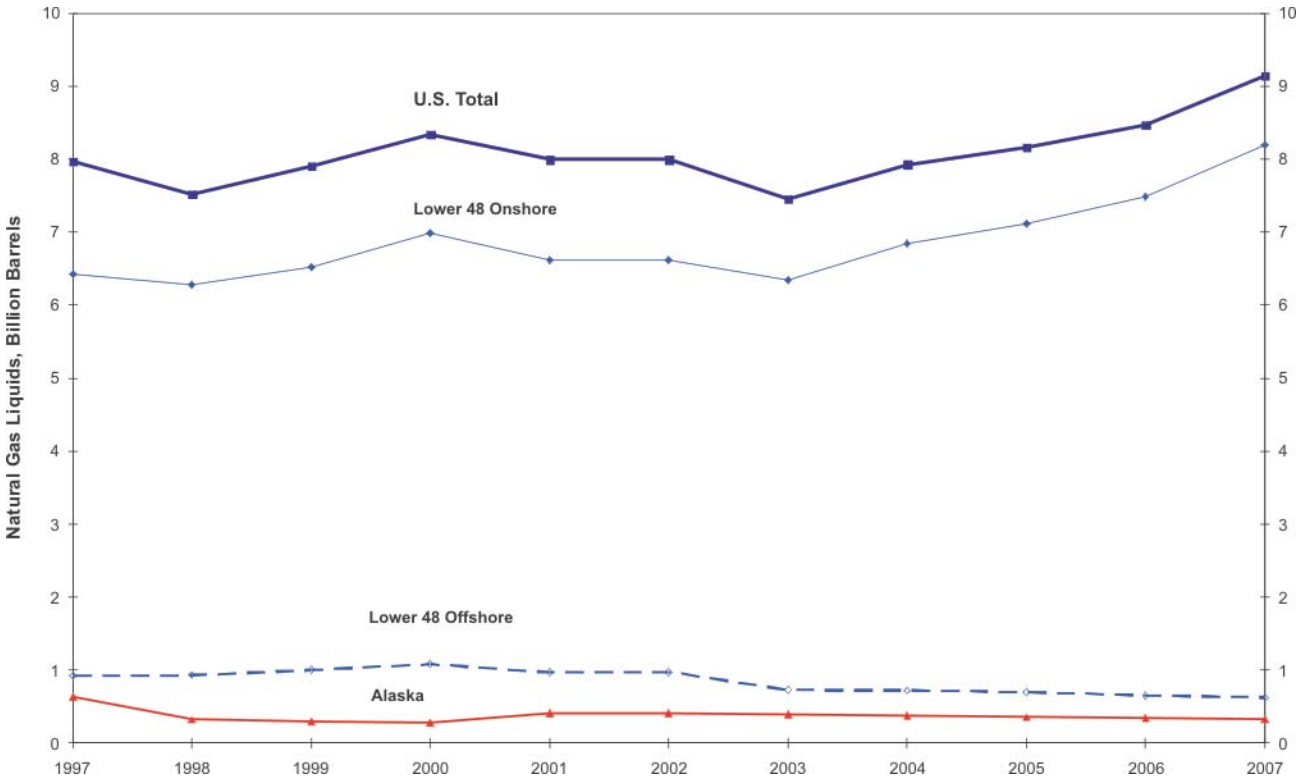
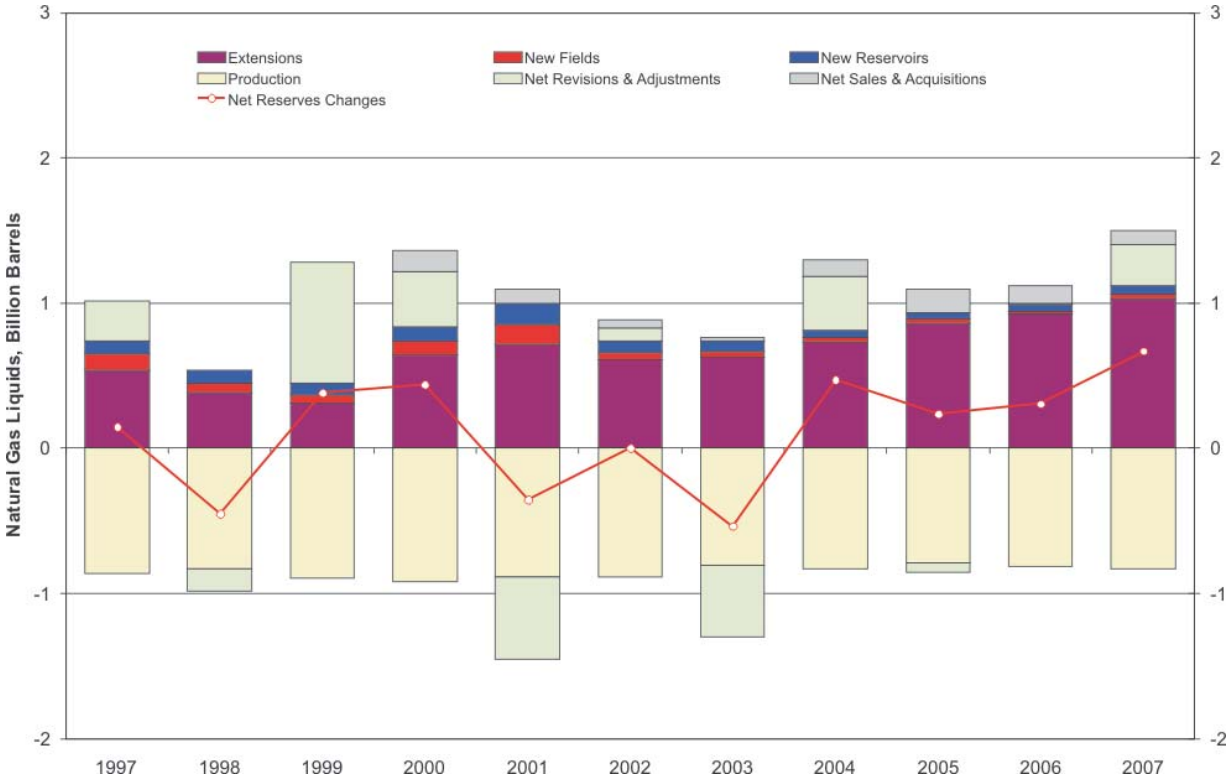


Figure 6. Components of Reserves Changes for Natural Gas Liquids, 1997-2007



Source: U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 1997-2006 annual reports, DOE/EIA-0216.{21-30}

Table 2. Reserves Changes, 1977-2007

Components of Change	Lower 48 States			U.S. Total		
	Volume	Average per Year	Percent of Reserves Additions	Volume	Average per Year	Percent of Reserves Additions
	Crude Oil (million barrels of 42 U.S. gallons)					
Proved Reserves as of 12/31/76	**24,928**	—	—	**33,502**	—	—
New Field Discoveries	5,981	193	11.6	6,977	225	11.1
New Reservoir Discoveries in Old Fields	4,071	131	7.9	4,259	137	6.8
Extensions	14,493	468	28.1	16,391	529	26.1
Total Discoveries	**24,545**	**792**	**47.5**	**27,627**	**891**	**44.0**
Revisions, Adjustments, Sales & Acquisitions[a]	27,081	874	52.5	35,218	1,136	56.0
Total Reserves Additions	**51,626**	**1,665**	**100.0**	**62,845**	**2,027**	**100.0**
Production	**59,336**	**1,914**	**114.9**	**75,030**	**2,420**	**119.4**
Net Reserves Change (since 1976)	**-7,710**	**-249**	**-14.9**	**-12,185**	**-393**	**-19.4**
	Dry Natural Gas (billion cubic feet at 14.73 psia and 60° Fahrenheit)					
Proved Reserves as of 12/31/76	**180,838**	—	—	**213,278**	—	—
New Field Discoveries	55,054	1,776	9.3	55,318	1,784	9.4
New Reservoir Discoveries in Old Fields	71,629	2,311	12.0	72,090	2,325	12.3
Extensions	319,388	10,303	53.7	322,738	10,411	55.1
Total Discoveries	**446,071**	**14,389**	**75.0**	**450,146**	**14,521**	**76.9**
Revisions, Adjustments, Sales & Acquisitions[a]	148,557	4,792	25.0	135,570	4,373	23.1
Total Reserves Additions	**594,628**	**19,182**	**100.0**	**585,716**	**18,894**	**100.0**
Production	**549,657**	**17,731**	**92.4**	**541,792**	**17,477**	**92.5**
Net Reserves Change (since 1976)	**44,971**	**1,451**	**7.6**	**43,924**	**1,417**	**7.5**

[a] EIA did not separately collect data on sales and acquisitions of proved reserves until the year 2000.
Source: *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves* 1977-2007 annual reports, DOE/EIA-0216.{1-30}

Compared to the averages of reserves changes since 1977, 2007 was a down year for crude oil discoveries, but an up year for net revisions, adjustments, and net sales & acquisitions. Total discoveries of crude oil (790 million barrels) in 2007 were 11 percent less than the post-1976 U.S. average (891 million barrels per year).

Looking at the components of total discoveries in 2007:

- Extensions in 2007 (651 million barrels) were 23 percent more than the post-1976 average (529 million barrels),
- 2007's new field discoveries (66 million barrels) were 71 percent less than the post-1976 average for crude oil (225 million barrels), and
- New reservoir discoveries in old fields (73 million barrels) in 2007 were 47 percent less than the post-1976 average (137 million barrels).

Revisions, Adjustments, Sales & Acquisitions were 1,246 million barrels in 2007. This was 10 percent more than the post-1976 average of 1,136 million barrels per year.

Dry Natural Gas: Since 1977 U.S. operators have:

- had average annual new reserves discoveries of 14,521 billion cubic feet,
- had average annual proved reserves additions of 18,894 billion cubic feet from total discoveries, net revisions and adjustments, and net sales and acquisitions, and
- had an average annual production of 17,477 billion cubic feet, increasing U.S. dry natural gas reserves by an average 1,417 billion cubic feet per year. In 2006 and prior years, this average was negative.

Like crude oil reserves, natural gas reserves have primarily been sustained by proved ultimate recovery appreciation since 1977. For gas, extensions rather than net revisions and adjustments are usually the largest component. Extensions accounted for 55 percent of all reserves additions since 1977 while net revisions, adjustments, sales, and acquisitions accounted for only 23 percent.

Table 3. U.S. Average Annual Domestic First Purchase Prices for Crude Oil, Wellhead Prices for Natural Gas, and the Average Number of Active Rotary Drilling Rigs, 1977-2007

Year		Crude Oil		Natural Gas		
		Current	2007 Constant	Current	2007 Constant	
		(dollars per barrel)		(dollars per thousand cubic feet)		Number of Rigs
1977		8.57	24.02	0.79	2.21	2,001
1978		9.00	23.56	0.91	2.38	2,259
1979		12.64	30.56	1.18	2.85	2,177
1980		21.59	47.85	1.59	3.52	2,909
1981		31.77	64.38	1.98	4.01	3,970
1982		28.52	54.47	2.46	4.70	3,105
1983		26.19	48.12	2.59	4.76	2,232
1984		25.88	45.83	2.66	4.71	2,428
1985		24.09	41.40	2.51	4.31	1,980
1986		12.51	21.03	1.94	3.26	964
1987		15.40	25.21	1.67	2.73	936
1988		12.58	19.91	1.69	2.67	936
1989		15.86	24.19	1.69	2.58	869
1990		20.03	29.41	1.71	2.51	1,010
1991		16.54	23.47	1.64	2.33	860
1992		15.99	22.17	1.74	2.41	721
1993		14.25	19.32	2.04	2.77	754
1994		13.19	17.51	1.85	2.46	775
1995		14.62	19.02	1.55	2.02	723
1996		18.46	23.57	2.17	2.77	779
1997		17.23	21.64	2.32	2.91	943
1998		10.87	13.50	1.96	2.43	827
1999		15.56	19.05	2.19	2.68	625
2000		26.72	32.02	3.68	4.41	918
2001		21.84	25.55	4.00	4.68	1,156
2002		22.51	25.89	2.95	3.39	830
2003		27.56	31.03	4.88	5.49	1,032
2004		36.77	40.25	5.46	5.98	1,192
2005		50.28	53.30	7.33	7.77	1,381
2006	January	57.85	60.15	8.66	9.00	1,473
	February	55.69	57.75	7.28	7.55	1,533
	March	55.64	57.56	6.52	6.74	1,551
	April	62.52	64.55	6.59	6.80	1,597
	May	64.40	66.34	6.19	6.38	1,635
	June	64.65	66.45	5.80	5.96	1,665
	July	67.71	69.42	5.82	5.97	1,681
	August	67.21	68.76	6.51	6.66	1,738
	September	59.37	60.62	5.51	5.63	1,739
	October	53.26	54.34	5.03	5.13	1,734
	November	52.42	53.35	6.43	6.54	1,706
	December	55.03	55.85	6.65	6.75	1,718
2006	**Average**	**59.69**	**61.30**	**6.42**	**6.59**	**1,649**
2007	January	49.32	49.82	5.92	5.98	1,714
	February	52.94	53.32	6.66	6.71	1,736
	March	54.95	55.23	6.56	6.59	1,749
	April	58.2	58.43	6.84	6.87	1,750
	May	58.9	59.04	6.98	7.00	1,748
	June	62.35	62.41	6.86	6.87	1,771
	July	69.23	69.26	6.19	6.19	1,777
	August	67.77	67.68	5.90	5.89	1,804
	September	73.27	73.03	5.61	5.59	1,783
	October	79.32	78.84	6.25	6.21	1,762
	November	87.16	86.43	6.37	6.32	1,798
	December	85.28	84.38	6.53	6.46	1,811
2007	**Average**	**66.52**	**66.52**	**6.39**	**6.39**	**1,768**

Sources: Crude oil first purchase prices, natural gas wellhead prices, and number of rigs: Tables 9.1, 9.11, and 5.1, *Monthly Energy Review October 2008*, DOE/EIA-0035(2008/10). 2007 constant dollars: U.S. Department of Commerce, Bureau of Economic Analysis, Gross Domestic Product Implicit Price Deflators, August 2008.

Compared to the averages of reserves changes since 1977, 2007 was an up year for dry natural gas total discoveries. Operators reported 29,091 billion cubic feet of total discoveries of dry natural gas proved reserves, twice as much as the post-1976 average (14,521 billion cubic feet).

The net of revisions, adjustments, sales, and acquisitions was 17,016 billion cubic feet in 2007, almost quadruple the post-1976 U.S. average (4,373 billion cubic feet per year).

For the ninth year in a row (and 13 out of the last 14 years), the annual change to the national total of gas reserves has been an increase. Consequently, the average since 1977 is now a positive volume.

Economics and Drilling

Economics: Table 3 lists the average annual domestic wellhead prices of crude oil and natural gas from 1977 to 2007.

In 2007, the U.S. crude oil first purchase price started at a monthly average of $49.32 per barrel in January, rose to a high of $87.16 in November, and ended the year at $85.28 per barrel in December. The average annual U.S. crude oil first purchase price increased from $59.69 in 2006 to $66.52 per barrel in 2007.

Oil prices vary by region. The average annual 2007 crude oil first purchase price ranged from a low of $58.34 per barrel in Wyoming to a high of $71.63 per barrel in Louisiana. {31}

The average annual wellhead natural gas price decreased from $6.42 per thousand cubic feet in 2006 to $6.39 in 2007. Monthly average natural gas prices started at $5.92 per thousand cubic feet in January 2007, rose to $6.98 in May, and ended the year at $6.53 per thousand cubic feet in December 2007. {32}

Drilling: Also listed in **Table 3** is the average number of active rotary drilling rigs from 1977 to 2007. From 2006 to 2007, the annual average active rig count rose from 1,649 to 1,768, a 7-percent increase.

Looking first at exploratory wells, there were 5,509 exploratory wells drilled in 2007 (**Table 4**). Of these, 14 percent were completed as oil wells, 60 percent were completed as gas wells, and 26 percent were dry holes. Exploratory oil and gas completions (excluding dry holes) in 2007 were 29 percent more (**Figure 7**) than the revised 2006 total.

The number of successful development wells decreased for oil and natural gas in 2007 **(Figure 8**). Including dry holes, there were an estimated 48,501 exploratory and development wells drilled in 2007. This is 1 percent less than in 2006 and 49 percent more than the average number of wells drilled annually in the prior 10 years (32,495).

Figures 9 and 10 show the average volume of discoveries per exploratory well for dry natural gas and oil, respectively, since 1977. The 2007 average volume of oil discoveries per exploratory well increased 17 percent compared to 2006. The 2007 average volume of gas discoveries per exploratory well decreased 5 percent compared to 2006.

For the fourteenth year in a row, the number of gas well completions exceeded the number of oil well completions in both the exploratory and development categories.

Mergers and Acquisitions

The following large mergers and acquisitions were announced in 2007 and are expected to have an impact on the energy industry in the future:

On June 4, 2007, Dominion announced it would sell most of its onshore natural gas and oil exploration and production operations in two separate transactions for a total of approximately $6.5 billion. This included 3.51 trillion cubic feet equivalent of natural gas and oil reserves. Loews Corporation acquired Dominion's operations in the Permian Basin, Michigan, and Alabama. XTO Energy Inc. acquired operations in the Rocky Mountains, Gulf Coast, San Juan Basin, and south Louisiana. {33}

On July 18, 2007, Plains Exploration & Production Company agreed to acquire Pogo Producing Company for $3.42 billion in cash and stock. {34}

Reserve-to-Production Ratio and Ultimate Recovery

R/P Ratios

The relationship between proved reserves and production levels, expressed as the ratio of reserves to production (R/P ratio), is often used in analyses. For a mature producing area the R/P ratio tends to be reasonably stable, so that the proved reserves at the end

Table 4. U.S. Exploratory and Development Well Completions[a], 1973-2007

	Exploratory				Total Exploratory and Development			
Year	Oil	Gas	Dry	Total	Oil	Gas	Dry	Total
1973	642	1,067	5,952	7,661	10,167	6,933	10,320	27,420
1974	859	1,190	6,833	8,882	13,647	7,138	12,116	32,901
1975	982	1,248	7,129	9,359	16,948	8,127	13,646	38,721
1976	1,086	1,346	6,772	9,204	17,688	9,409	13,758	40,855
1977	1,164	1,548	7,283	9,995	18,745	12,122	14,985	45,852
1978	1,171	1,771	7,965	10,907	19,181	14,413	16,551	50,145
1979	1,321	1,907	7,437	10,665	20,851	15,254	16,099	52,204
1980	1,777	2,099	9,081	12,957	32,959	17,461	20,785	71,205
1981	2,651	2,522	12,400	17,573	43,887	20,250	27,953	92,090
1982	2,437	2,133	11,307	15,877	39,459	19,076	26,379	84,914
1983	2,030	1,605	10,206	13,841	37,366	14,684	24,355	76,405
1984	2,209	1,528	11,321	15,058	42,906	17,338	25,884	86,128
1985	1,680	1,200	8,954	11,834	35,261	14,324	21,211	70,796
1986	1,084	797	5,567	7,448	19,213	8,599	12,799	40,611
1987	926	756	5,052	6,734	16,210	8,096	11,167	35,473
1988	855	747	4,711	6,313	13,646	8,578	10,119	32,343
1989	607	706	3,934	5,247	10,230	9,522	8,236	27,988
1990	664	693	3,793	5,150	12,445	11,126	8,496	32,067
1991	601	544	3,390	4,535	12,035	9,611	7,882	29,528
1992	498	427	2,550	3,475	9,019	8,305	6,284	23,608
1993	509	541	2,509	3,559	8,764	10,174	6,513	25,451
1994	579	740	2,465	3,784	7,001	9,739	5,515	22,255
1995	549	583	2,279	3,411	7,827	8,454	5,319	21,600
1996	496	591	2,246	3,333	8,760	9,539	5,587	23,886
1997 R	491	561	2,108	3,160	11,044	11,435	5,848	28,327
1998 R	327	566	1,585	2,478	7,556	11,510	4,745	23,811
1999 R	196	565	1,157	1,918	4,734	11,899	3,517	20,150
2000 R	288	657	1,333	2,278	7,986	16,935	4,117	29,038
2001 R	353	1,046	1,714	3,113	8,805	21,959	4,539	35,303
2002 R	255	843	1,271	2,369	6,724	17,225	3,706	27,655
2003 R	349	991	1,285	2,625	8,026	20,587	3,898	32,511
2004 R	386	1,652	1,331	3,370	8,676	23,728	3,975	36,379
2005 R	515	2,087	1,431	4,033	10,381	27,780	4,512	42,673
2006 R	637	2,498	1,400	4,535	12,693	31,597	4,812	49,101
2007	747	3,307	1,455	5,509	12,543	31,303	4,655	48,501

[a]Excludes service wells and stratigraphic and core testing.

R = Revised Data.

Notes: Estimates include only the original drilling of a hole intended to discover of further develop already discovered oil or natural gas resources. Other drilling activities, such as drilling an old well deeper, drilling of laterals from the original well, drilling of service and injection wells, and drilling for resources other than oil and gas are excluded.

Source: Table 5.2, EIA *Monthly Energy Review October 2008*, DOE/EIA-0035(2008/10). These estimates are subject to continuous revision as new data, some of which pertain to earlier months and years, become available.

Figure 7. U.S. Exploratory Well Completions, 1997-2007

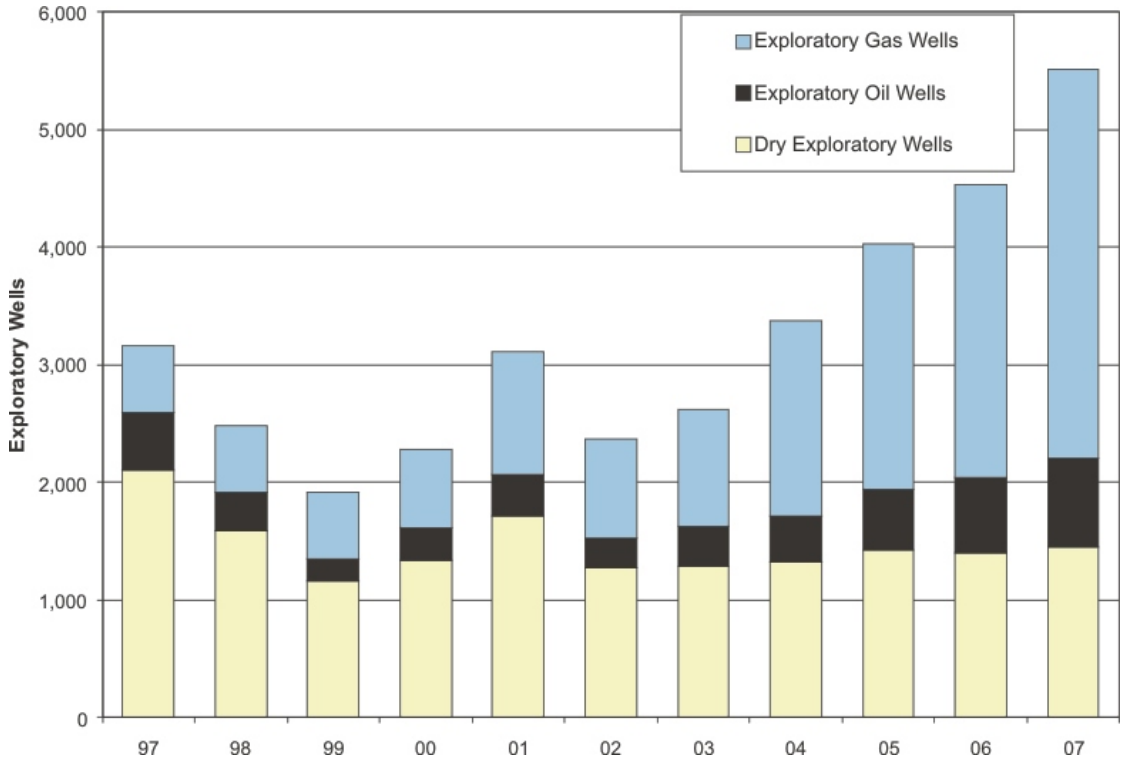
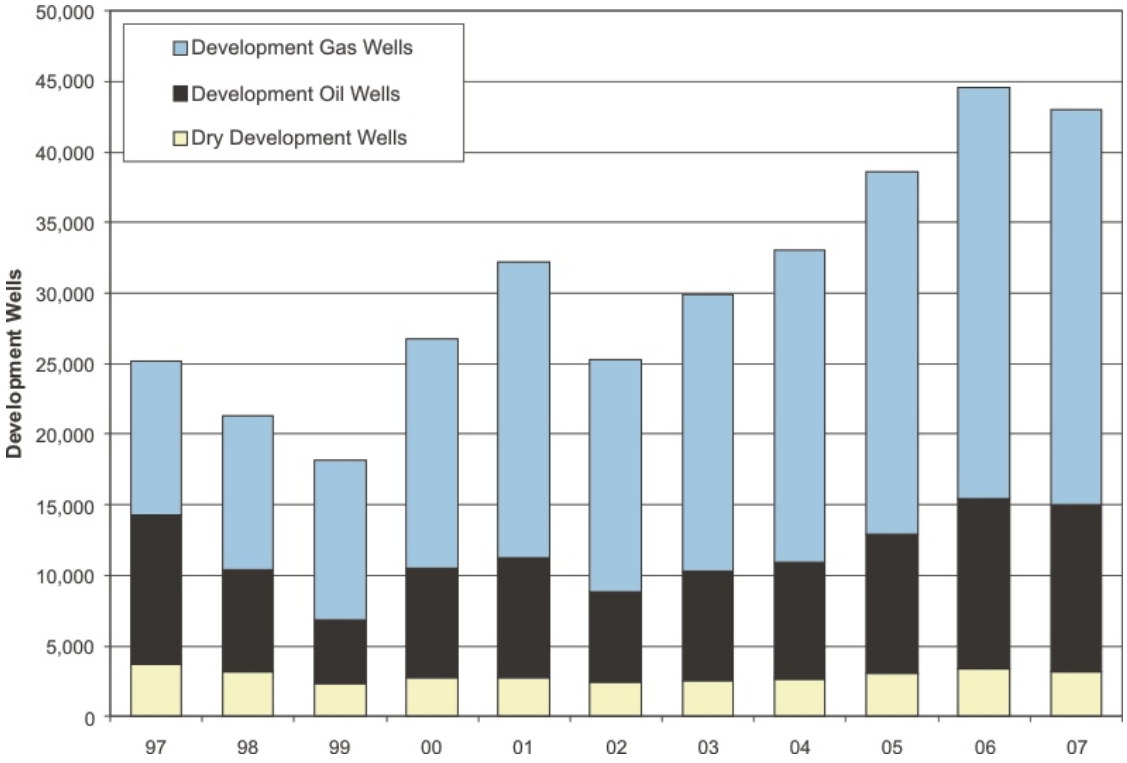


Figure 8. U.S. Development Well Completions, 1997-2007



Source: Energy Information Administration, Office of Oil and Gas.

Figure 9. U.S. Total Discoveries of Dry Natural Gas per Exploratory Gas Well Completion, 1977-2007

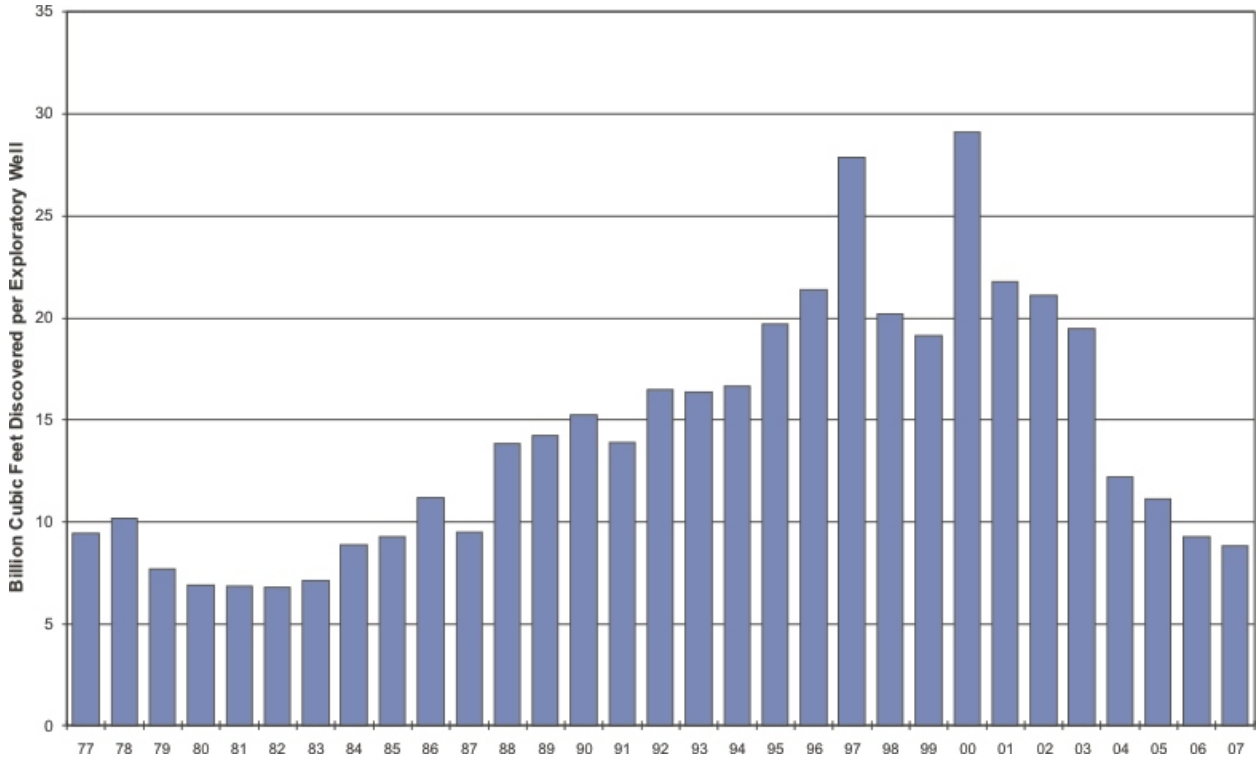
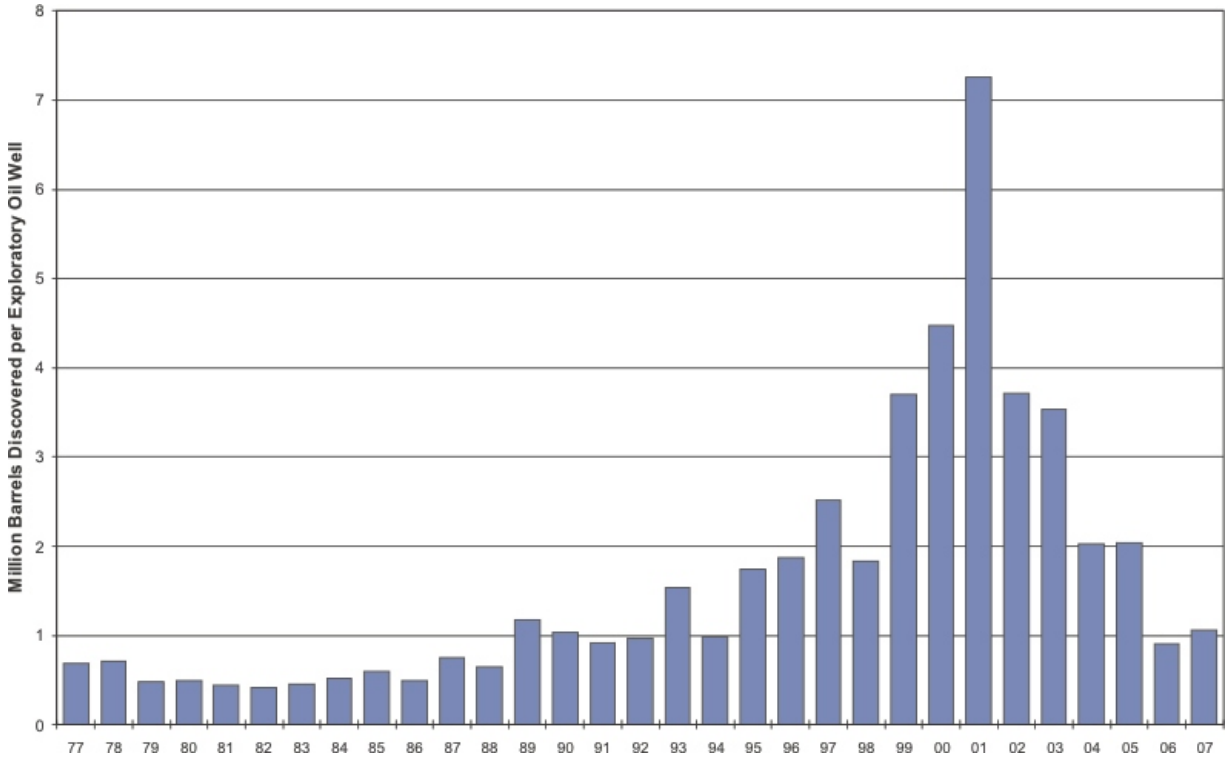


Figure 10. U.S. Total Discoveries of Crude Oil per Exploratory Oil Well Completion, 1977-2007



Source: Energy Information Administration, Office of Oil and Gas.

of a year serve as a rough guide to the production level that can be maintained during the following year. Operators report data which yield R/P ratios that vary widely by area depending upon:

- category of operator
- geology and economics
- number and size of new discoveries
- amount of drilling that has occurred.

R/P ratios are a general indication of the state of development in an area and, over time, the ratios change. For example, when the Alaskan North Slope oil reserves were booked in 1970, the U.S. R/P ratio for crude oil increased because significant production from these reserves did not begin until 7 years later due to the need to build the Trans Alaska pipeline first. The U.S. R/P ratio for crude oil decreased from 11.1-to-1 to 9.4-to-1 between 1977 and 1982 as Alaskan North Slope reserves development and oil production reached high levels.

In 2007 the national average R/P ratio decreased from 12.7 to 12.6, although both crude oil proved reserves and production increased. **Figure 11** shows the U.S. R/P ratio trend for crude oil since 1945. After World War II, increased drilling and discoveries led to a greater R/P ratio. Later, when drilling found fewer reserves than were produced, the ratio became smaller. R/P ratios also vary geographically, because of differences in development history and reservoir conditions.

The areas with relatively high R/P ratios in 2007 were the Permian Basin of Texas and New Mexico, and California, where enhanced oil recovery techniques such as carbon dioxide (CO_2) injection and steamflooding have improved the recoverability of oil in old, mature fields. Areas that have the lowest R/P ratios, like the Mid-Continent region, usually have many older fields. There, new technologies such as horizontal drilling are helping add new reserves equivalent to the annual production, keeping the regional reserves and R/P ratio for oil relatively stable.

Figure 12 shows the historical R/P ratio for wet natural gas since 1945. Prior to 1945, R/P ratios were very high since the interstate pipeline infrastructure was not yet well developed. The market for natural gas grew rapidly after World War II, lowering the R/P ratio. From 2006 to 2007, the U.S. average R/P ratio for natural gas increased from 11.4 to 12.2, since proved reserves increased more than production increased.

Different marketing, transportation, and production characteristics for gas are seen when looking at regional average R/P ratios as compared to the 2007 U.S. average R/P ratio of about 12.2-to-1. Areas with a higher range of R/P ratios than the national average were the Pacific offshore and the Rockies. Several major gas producing areas have R/P ratios below the national average, particularly Texas, the Gulf of Mexico Federal Offshore, and Oklahoma.

Proved Ultimate Recovery

Proved Ultimate Recovery is the sum of proved reserves and cumulative production at a specified point in time. It measures the maximum recoverable volume *known* at that time and is a dynamic quantity that is expected to change over time for any field, group of fields, State, or country. In most instances, therefore, an estimate of Proved Ultimate Recovery does not represent the all-time maximum recoverable volume of resources for a given field or area. In fact, the proved ultimate recovery of a field, a group of fields, a State, a region, or a country grows (appreciates) over time in most instances.

Figures 13 and 14 show successive estimates of proved ultimate recovery for the United States. The figures show proved reserves and cumulative production over the period 1977 through 2007 for *crude oil plus lease condensate* and *wet natural gas.* They illustrate the continued appreciation (growth) of proved ultimate recovery over time.

In 1977, U.S. *crude oil plus lease condensate* proved reserves were 33,615 million barrels. Cumulative production of *crude oil plus lease condensate* for 1977 through 2007 was 77,346 million barrels. This substantially exceeds the 1977 proved reserves, but at the end of 2007 there were still 22,812 million barrels of *crude oil plus lease condensate* proved reserves. Therefore, the Nation's estimated proved ultimate recovery of crude oil primarily increased during this period owing to the *proved ultimate recovery appreciation* phenomenon that typically accompanies the continued development of old fields. In fact, only 11 percent of proved reserves additions of crude oil were booked as *new field discoveries* from 1976 through 2007. The other 89 percent came from the proved reserves categories related to the proved ultimate recovery appreciation process.

Similarly, the 1977 *wet natural gas* proved reserves were 209,490 billion cubic feet, but 571 trillion cubic feet of gas was produced from 1977 through 2007; there are

Figure 11. Reserves-to-Production Ratios for Crude Oil, 1945-2007

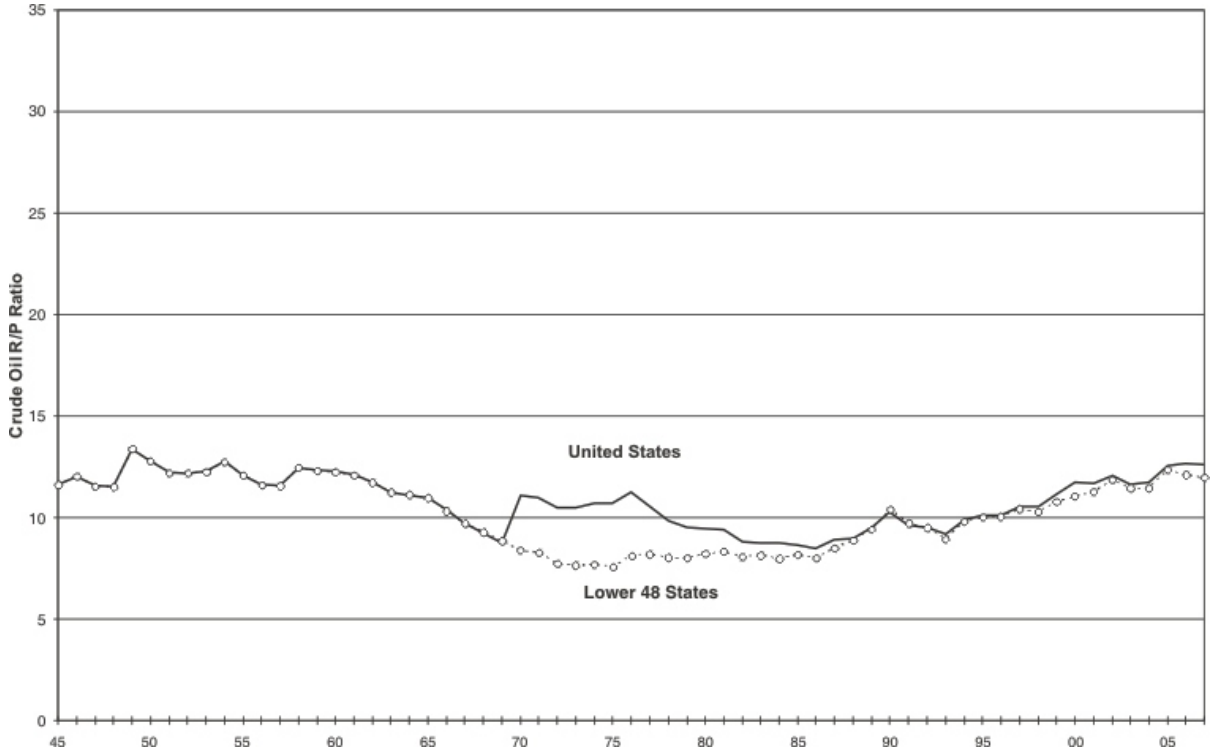
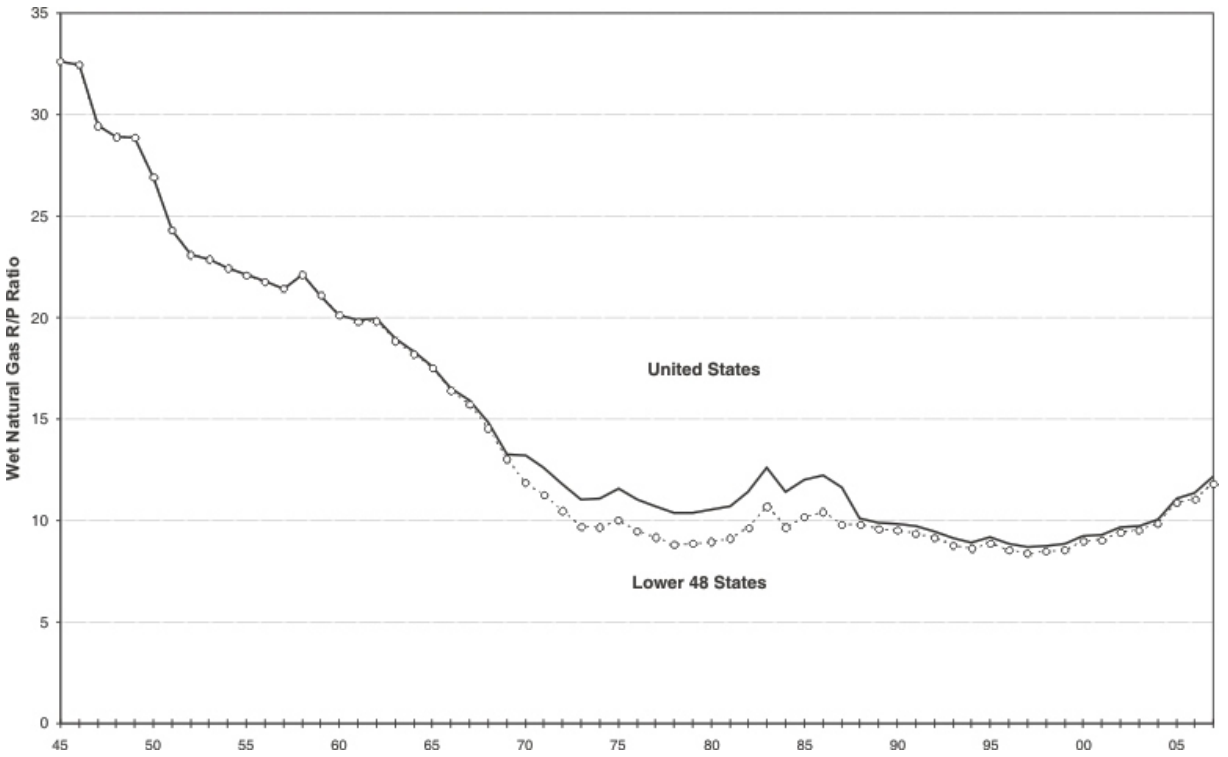


Figure 12. Reserves-to-Production Ratios for Wet Natural Gas, 1945-2007



Sources: Annual reserves and production - American Petroleum Institute and American Gas Association (1945–1976) {35} and Energy Information Administration, Office of Oil and Gas (1977–2006){1-30}. Cumulative production: *U.S. Oil and Gas Reserves by Year of Field Discovery* (1977-1988).{36}

Figure 13. Components of Proved Ultimate Recovery for Crude Oil and Lease Condensate, 1977-2007

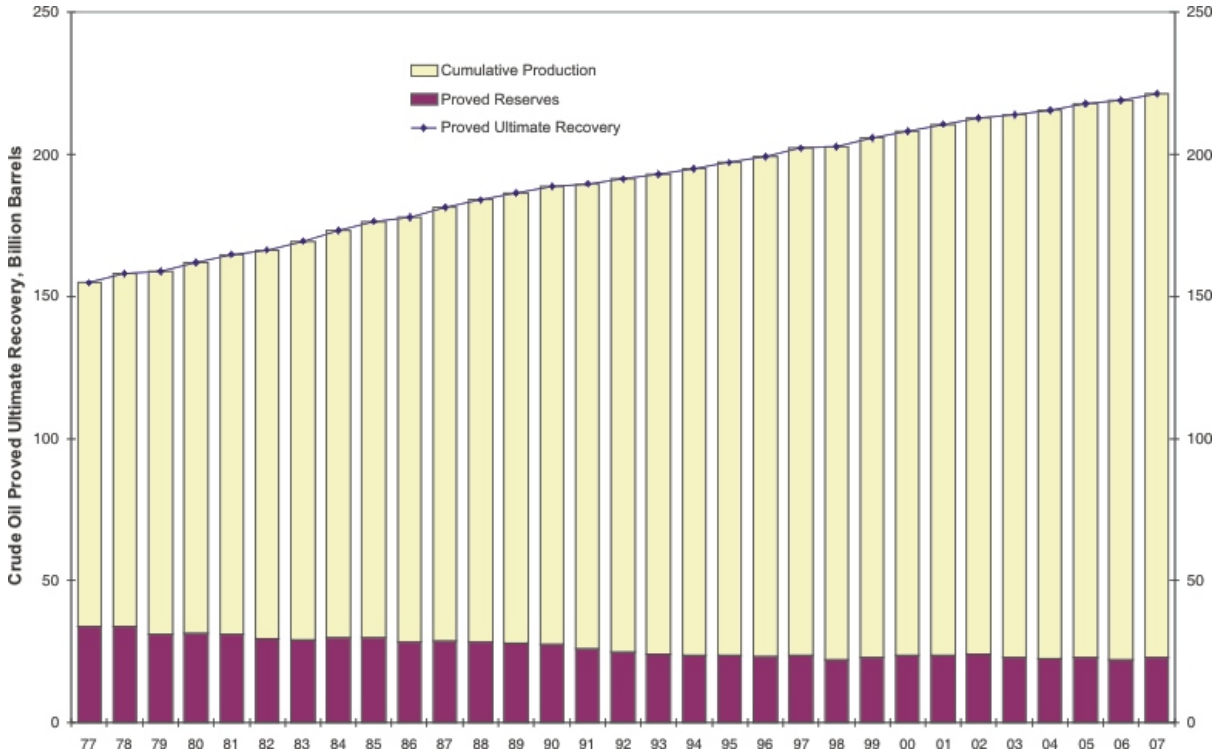
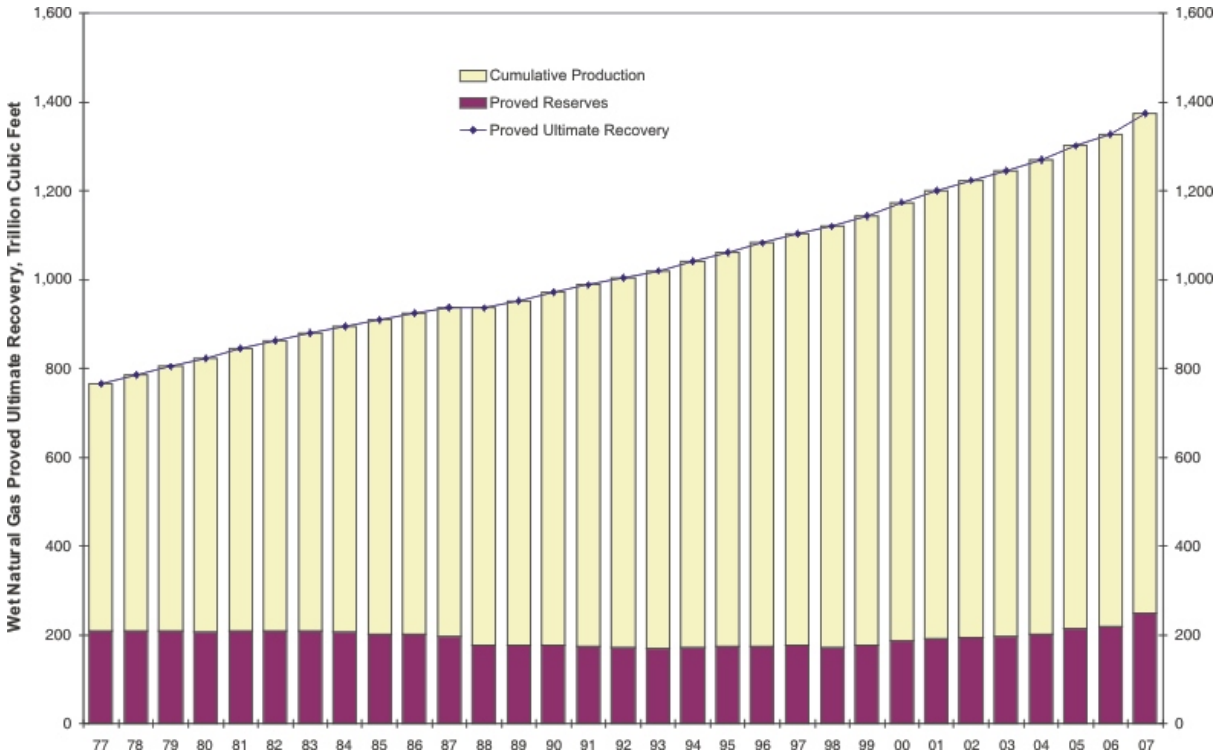


Figure 14. Components of Proved Ultimate Recovery for Wet Natural Gas, 1977-2007



Sources: Annual reserves and production - American Petroleum Institute and American Gas Association (1945–1976) {35} and Energy Information Administration, Office of Oil and Gas (1977–2006){1-30}. Cumulative production: *U.S. Oil and Gas Reserves by Year of Field Discovery* (1977-1988).{36}

Table 5. International Oil and Natural Gas Reserves as of December 31, 2007

Oil (million barrels)				Natural Gas (billion cubic feet)			
Rank[a]	Country	Oil & Gas Journal	World Oil	Rank[b]	Country	Oil & Gas Journal	World Oil
1	Saudia Arabia[c]	[d]266,751	[d]264,825	1	Russia	1,680,000	1,654,000
2	Iran[c]	138,400	137,000	2	Iran[c]	948,200	985,000
3	Iraq[c]	115,000	126,000	3	Qatar[c]	905,300	905,450
4	Canada[e]	178,592	25,157	4	Saudia Arabia[c]	[d]253,107	[d]254,000
5	Kuwait[c]	[d]104,000	[d]99,425	5	United States	211,085	217,500
6	Venezuela[c]	87,035	81,000	6	United Arab Emirates[c]	213,200	196,300
7	United Arab Emirates[c]	97,800	68,105	7	Nigeria[c]	183,990	184,500
8	Russia	60,000	76,000	8	Algeria[c]	159,000	160,000
9	Libya[c]	41,464	36,500	9	Venezuela[c]	166,260	152,000
10	Nigeria[c]	36,220	37,200	10	Iraq[c]	111,940	91,000
Top 10 Total		**1,125,262**	**951,212**	**Top 10 Total**		**4,832,082**	**4,799,750**
11	Kazakhstan	30,000	-	11	Kazakhstan	100,000	-
12	United States	20,972	21,000	12	Turkmenistan	100,000	-
13	Qatar[c]	15,207	20,000	13	Indonesia[c]	93,900	92,000
14	China	16,000	18,052	14	Australia	30,370	151,900
15	Brazil	12,182	12,539	15	Norway	79,130	81,683
16	Algeria[c]	12,200	11,900	16	China	80,000	61,800
17	Mexico	11,650	11,061	17	Malaysia	83,000	88,010
18	Angola[c]	9,035	9,500	18	Uzbekistan	65,000	-
19	Azerbaijan	7,000	-	19	Egypt	58,500	68,450
20	Norway	6,865	6,693	20	Kuwait[c]	[d]56,015	[d]66,300
21	Sudan	5,000	6,700	21	Canada	58,200	58,256
22	Oman	5,500	5,700	22	Libya[c]	50,100	52,800
23	India	5,625	4,042	23	Netherlands	50,000	48,800
24	Malaysia	4,000	5,458	24	Ukraine	39,000	-
25	Ecuador[c]	4,517	4,780	25	India	37,960	31,755
Top 25 Total		**1,291,015**	**1,088,637**	**Top 25 Total**		**5,819,531**	**5,601,504**
OPEC Total		**927,482**	**900,744**	**OPEC Total**		**3,151,742**	**3,145,380**
World Total		**1,331,698**	**1,183,891**	**World Total**		**6,185,693**	**6,255,963**

[a]Rank is based on an average of oil reserves reported by *Oil & Gas Journal* and *World Oil*.
[b]Rank is based on an average of natural gas reserves reported by *Oil & Gas Journal* and *World Oil*.
[c]Member of the Organization of Petroleum Exporting Countries (OPEC).
[d]Includes one-half of the reserves in the Neutral Zone.
[e]*Oil and Gas Journal* Canadian oil reserves include heavy (low gravity) oil.

Note: The Energy Information Administration does not certify these international reserves data, but reproduces the information as a matter of convenience for the reader.

Sources: PennWell Publishing Company, *Oil and Gas Journal*, Vol. 105, No.48 (December 24, 2007). Gulf Publishing Company, *World Oil*, Vol.229, No. 9 (September, 2008).

still 247,789 billion cubic feet of *wet natural gas* proved reserves in 2007. Only 9 percent of proved reserves additions of natural gas were booked as *new field discoveries* from 1976 through 2007. The other 91 percent came from proved ultimate recovery appreciation.

International Perspective

International Reserves

The EIA estimates domestic oil and gas reserves but does not comprehensively estimate worldwide reserves. As shown in **Table 5**, international reserves estimates are presented in two widely circulated trade publications. The world's total reserves are estimated to be roughly 1.3 trillion barrels of oil and 6.2 quadrillion cubic feet of gas.

The United States ranked 12th in the world for proved reserves of crude oil and 5th for natural gas in 2007. A comparison of EIA's U.S. proved reserves estimates with worldwide estimates obtained from other sources shows that the United States had 2 percent of the world's total crude oil proved reserves and 3 percent of the world's total natural gas proved reserves at the end of 2007. There are sometimes substantial differences between the estimates from these sources. The *Oil & Gas Journal* reported oil reserves for Canada at about 179 billion barrels. This is much higher than the *World Oil* estimate of 25 billion. The *Oil and Gas Journal* estimate includes a larger contribution of heavy oil from Canadian tar sands. Another reason (among many) for these differences is that condensate is often included in foreign oil reserve estimates.

The *Oil & Gas Journal* {37} estimate for world oil reserves increased 1 percent in 2007 owing to an increase in Saudi Arabian and Iranian reserves. The *World Oil* {38} estimate increased 3 percent in 2007 for the same reasons. For world gas reserves in 2007, the *Oil & Gas Journal* reported a slight (less than 0.5 percent) increase, while *World Oil* reported a 1-percent decrease.

Several foreign countries have oil reserves considerably larger than those of the United States. Saudi Arabian oil reserves are the largest in the world, dwarfing U.S. oil reserves. Iraqi oil reserves are more than five times the U.S. reserves.

Petroleum Consumption

The United States is the world's largest energy consumer. The EIA estimates energy consumption and publishes it in its *Annual Energy Review*.{39} In 2007:

- The U.S. consumed 101.6 quadrillion Btu of energy. This was an increase of 1.74 quadrillion Btu from the 2006 level of consumption. One quadrillion Btu is equivalent to the amount of energy in 45 million tons of coal, 170 million barrels of crude oil, or one trillion cubic feet of natural gas.
- 62 percent of U.S. energy consumption was provided by petroleum and natural gas—crude oil and natural gas liquids combined (39 percent), and natural gas (23 percent).
- U.S. petroleum consumption was about 21 million barrels of oil and natural gas liquids and 63 billion cubic feet of gas per day.

Dependence on Imports

The United States remains dependent on imported oil and gas. In 2007, crude oil imports made up 66 percent of the U.S. crude oil supply. Canada, Mexico, Saudi Arabia, Venezuela, Nigeria, and Iraq were the primary foreign suppliers of petroleum to the United States.{40}

Net natural gas imports increased slightly from the 2006 total of 3.5 trillion cubic feet to 3.8 trillion cubic feet in 2007 (4.6 trillion imported; 0.8 trillion exported). Imports satisfied approximately 20 percent of consumption. Almost all of this gas was pipelined from Canada. Some liquefied natural gas was imported from Trinidad and Tobago, Egypt, Nigeria, and Algeria.

List of Appendices

Appendix A: Operator Level Data - How much of the national total of proved reserves are operated by the large oil and gas corporations? Appendix A separates the large operators from the small and presents reserves data according to operator production size classes. Table A6 lists the top U.S. operators by reported 2007 production.

Appendix B: Top 100 Oil and Gas Fields - What fields have the most reserves and production in the United States? The top 100 fields for oil and natural gas out of the national inventory of more than 45,000 oil and gas fields are listed in Appendix B. These fields hold 66 percent of U.S. crude oil proved reserves and 60 percent of U.S. natural gas proved reserves.

Appendix C: Conversion to the Metric System - To simplify international comparisons, a summary of U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves expressed in metric units is included as Appendix C.

Appendix D: Historical Reserves Statistics - Appendix D contains selected historical reserves data presented at the national level. Readers interested in a historical look at one specific State or region can review these tables in an electronic data archive on the EIA website. Table D9 contains the production and proved reserves for 1997-2007 for the Gulf of Mexico Federal Offshore region by water depths greater than 200 meters, and less than 200 meters. Table D10 contains Nonproducing Reserves.

Appendix E: Summary of Data Collection Operations - This report is based on two annual EIA surveys. Proved reserves data is collected from U.S. oil and gas field operators on Form EIA-23. Natural gas liquids production data is collected annually from U.S. natural gas plant operators on Form EIA-64A. Appendix E describes the survey designs, response statistics, reporting requirements, and sampling frame maintenance.

Appendix F: Statistical Considerations - The EIA strives to maintain or improve the accuracy of its reports. Because a census of all oil and gas operators is impractical, the EIA has adopted sound statistical methods to impute data for those operators not sampled and for those data elements that smaller operators are not required to file. These methods are described in Appendix F.

Appendix G: Estimation of Reserves and Resources - Reserves are not directly measurable. They are estimated on the basis of the best geological, engineering, and economic data available to the estimator. Appendix G describes reserve estimation techniques commonly used by oil and gas field operators and by EIA personnel who perform quality assurance checks for selected fields. A discussion of the relationship of reserves to overall U.S. oil and gas resources is also included.

Appendix H: Maps of Selected State Subdivisions - Certain large producing States have been subdivided into smaller regions to allow more specific reporting of reserves data. Maps of these States identifying the smaller regions are provided in Appendix H.

Appendix I: Annual Survey Forms for Domestic Oil and Gas Reserves - Samples of Form EIA-23 and Form EIA-64A are presented in Appendix I.

Glossary - Provides definitions of the technical terms used in this report.