2. Overview

National Summary

The United States had the following proved reserves as of December 31, 2006:

- **Crude Oil — 20,972 million barrels**
- **Dry Natural Gas — 211,085 billion cubic feet**
- **Natural Gas Liquids — 8,472 million barrels.**

This Overview summarizes the 2006 proved reserves balances of crude oil, dry natural gas, and natural gas liquids on a National level and provides historical comparisons between 2006 and prior years. **Table 1** lists the estimated annual reserve balances since 1996 for crude oil, dry natural gas, and natural gas liquids.

Crude Oil

U.S. crude oil proved reserves declined 4 percent (785 million barrels) in 2006. **Figure 1** shows the crude oil proved reserves levels by major region and **Figure 2** shows the components of reserves changes from 1996 through 2006.

As indicated in **Figure 1**, U.S. crude oil proved reserves declined slightly (1 percent) onshore in the lower 48 States in 2006, but declined more in Alaska (7 percent) and the Gulf of Mexico Federal Offshore (10 percent).

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 577 million barrels in 2006, 49 percent less than the prior 10-year average (1,135 million barrels) and 45 percent less than 2005's discoveries of 1,051 million barrels.

The majority of crude oil total discoveries in 2006 came from extensions to fields in Texas, Alaska, the Gulf of Mexico, and Montana.

Operators discovered 504 million barrels in extensions in 2006, 37 percent less than in 2005 and 10 percent less than the prior 10-year average (558 million barrels).

New field discoveries accounted for 30 million barrels of crude oil total discoveries. This was 85 percent less than the new field discoveries of 2005 (205 million barrels), and only 7 percent of the prior 10-year average (428 million barrels). Seventy percent of these discoveries (21 of 30 million) were in the Gulf of Mexico Federal Offshore.

New reservoir discoveries in old fields were 43 million barrels in 2006, 5 percent more than 2005 and 71 percent less than the prior 10-year average (149 million barrels).

Reserves additions are the sum of total discoveries, revisions, adjustments, sales, and acquisitions. In 2006, crude oil reserves additions were 867 million barrels, 59 percent less than in 2005 and 54 percent less than the prior 10-year average (1,876 million barrels).

Crude oil net revisions and adjustments were 96 million barrels, 88 percent less than the net revisions and adjustments of 2005 and 87 percent less than the prior 10-year average (759 million barrels). The net of sales and acquisitions of crude oil proved reserves was 194 million barrels.

U.S. crude oil production declined 5 percent in 2006 due mostly to lower Alaskan production. Part of the decline resulted from an August 2006 shut-in of producing wells in half of Prudhoe Bay Field for inspection and repair of corrosion in the gathering system. For the second year in a row Montana had the largest annual oil production increase of any State (6 million barrels; a 20 percent increase) owing to continued development of the Bakken Formation in the Elm Coulee Field. Reserves additions of crude oil replaced only 52 percent of 2006 crude oil production.

Dry Natural Gas

Natural gas proved reserves increased by 6,700 billion cubic feet in 2006. **Figure 3** shows the dry natural gas proved reserves levels by major region. It indicates that additions of gas reserves in the Lower 48 onshore are raising the National total despite declining Federal

Table 1. Total U.S. Proved Reserves of Crude Oil, Dry Natural Gas, and Natural Gas Liquids, 1996-2006

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)										
1996	175	737	912	NA	543	243	141	927	2,173	22,017	-334
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
	Dry Natural Gas (billion cubic feet, 14.73 psia, 60° Fahrenheit)										
1996	3,785	4,086	7,871	NA	7,757	1,451	3,110	12,318	18,861	166,474	+1,328
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
	Natural Gas Liquids (million barrels of 42 U.S. gallons)										
1996	474	175	649	NA	451	65	109	625	850	7,823	+424
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

[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 2006 contained in the *Petroleum Supply Annual 2006*, DOE/EIA-0340(06) and the *Natural Gas Annual 2006, DOE/EIA-0131(06)*.

Figure 1. U.S. Crude Oil Proved Reserves, 1996-2006

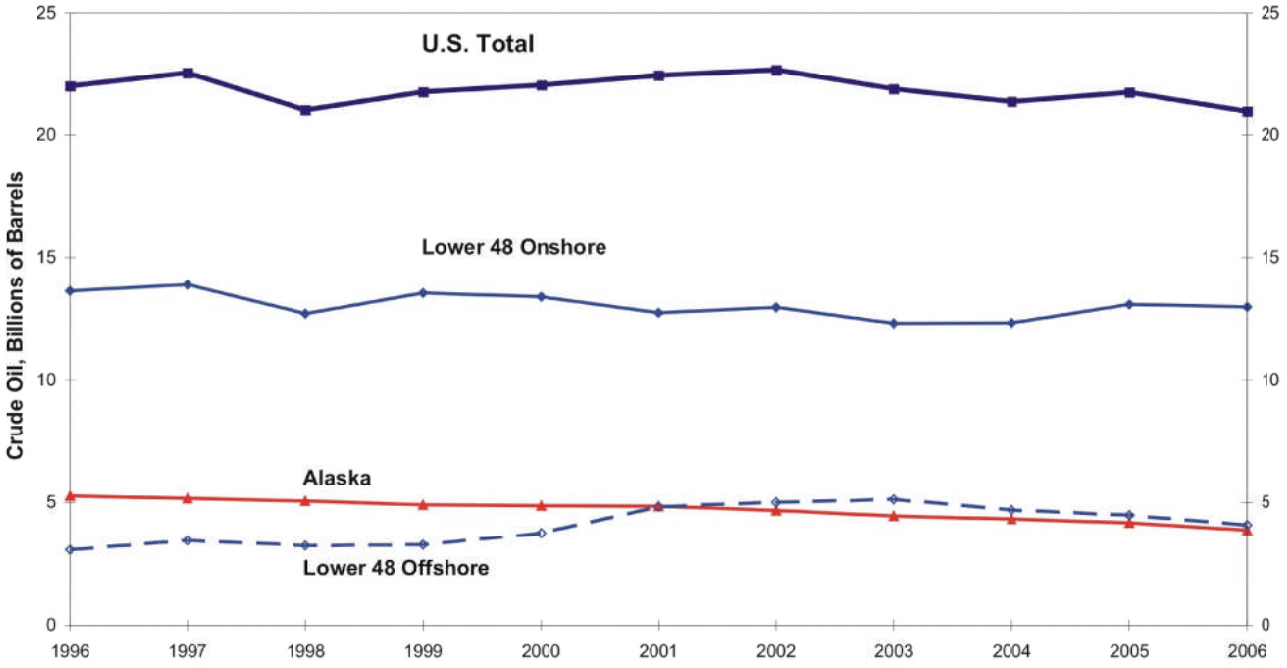
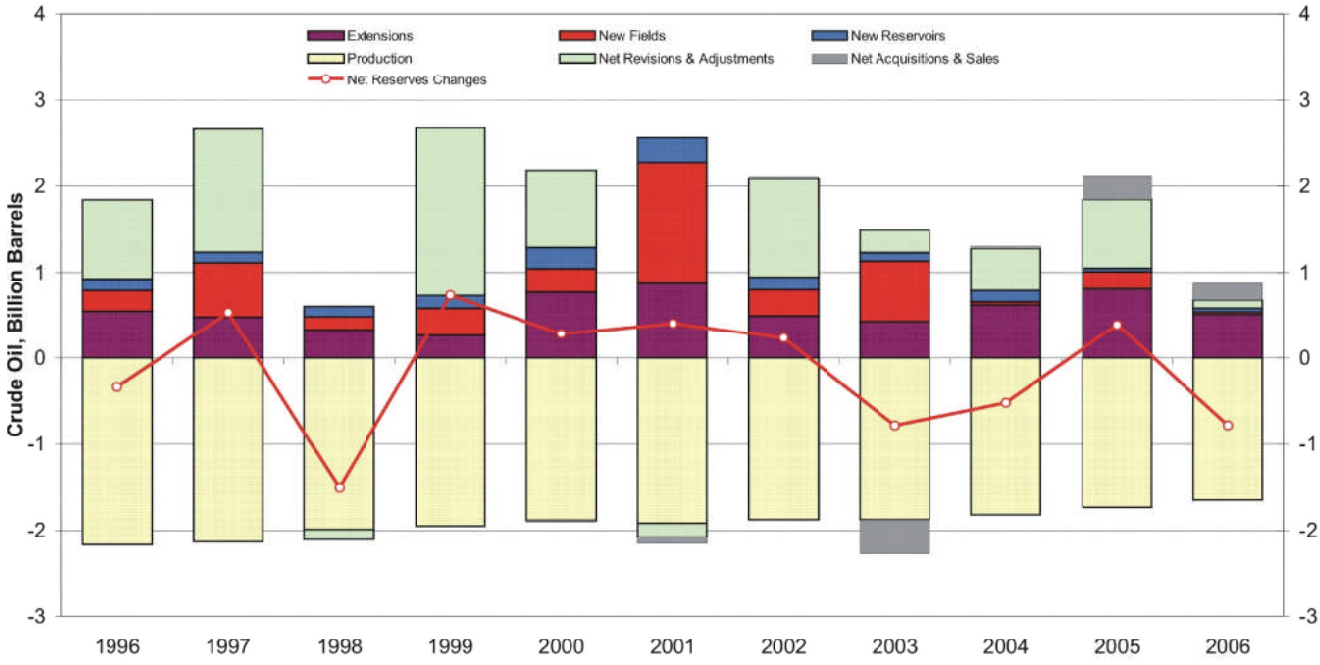


Figure 2. Components of Reserves Changes for Crude Oil, 1996-2006



Source: U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 1996-2005 annual reports, DOE/EIA-0216.{20-29}

Figure 3. U.S. Dry Natural Gas Proved Reserves, 1996-2006

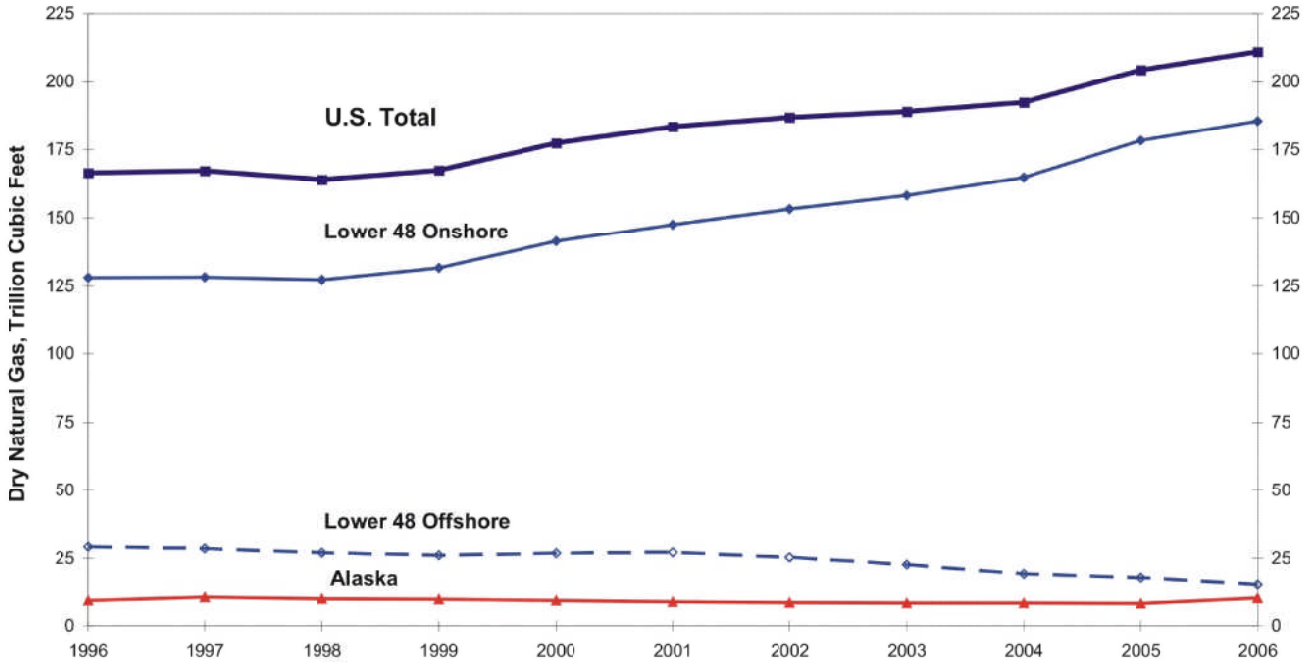
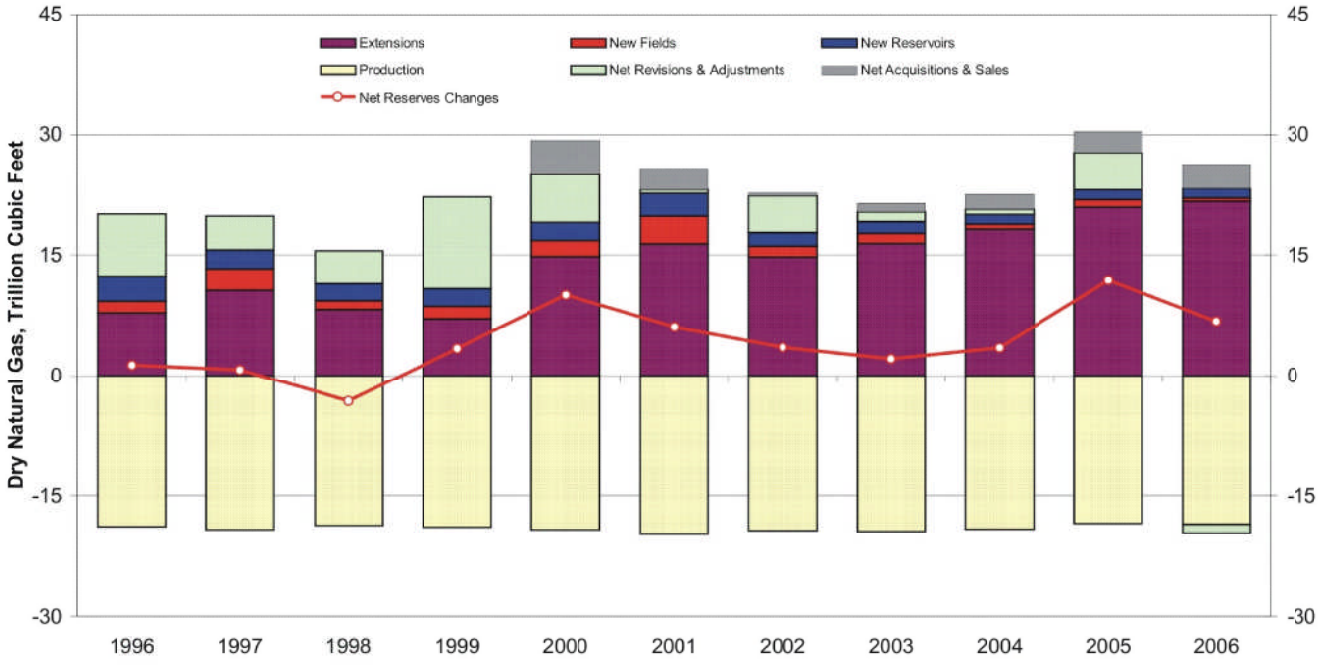


Figure 4. Components of Reserves Changes for Dry Natural Gas, 1996-2006



Source: U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 1996-2005 annual reports, DOE/EIA-0216.{20-29}

offshore gas reserves. **Figure 4** shows the components of reserves changes from 1996 through 2006.

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 23,342 billion cubic feet in 2006. This was 35 percent more than the prior 10-year average (17,255 billion cubic feet) and 1 percent more than in 2005.

The majority of natural gas total discoveries in 2006 were from extensions to existing fields. Field extensions were 21,778 billion cubic feet, 4 percent more than in 2005 and 61 percent more than the prior 10-year average (13,522 billion cubic feet).

New field discoveries were 409 billion cubic feet, 57 percent less than the volume discovered in 2005 and 75 percent less than the prior 10-year average (1,659 billion cubic feet).

New reservoir discoveries in old fields were 1,155 billion cubic feet, 4 percent less than in 2005 and 44 percent less than the prior 10-year average (2,074 billion cubic feet).

Natural gas net revisions and adjustments were a net loss of 1,093 billion cubic feet in 2006. The prior occurrence of negative net revisions was in 1988. The net of sales and acquisitions of dry natural gas proved reserves was 2,996 billion cubic feet.

Total U.S. natural gas production increased slightly in 2006 due to production increases in Texas (Barnett Shale), Louisiana, and the Rocky Mountain states (Colorado, Wyoming, Utah, and Montana). Gulf of Mexico natural gas production declined the most with a 6 percent drop.

Coalbed natural gas reserves decreased 1 percent in 2006 and accounted for 9 percent of U.S. dry natural gas reserves. Coalbed natural gas production increased 2 percent in 2006 and accounted for 9 percent of U.S. dry natural gas production.

Natural Gas Liquids

Natural gas liquids reserves are the sum of lease condensate reserves and natural gas plant liquids reserves. Natural gas liquids proved reserves increased 4 percent in 2006. Operators replaced 138 percent of U.S. natural gas liquids production with reserves additions.

Total proved reserves of liquid hydrocarbons (crude oil plus natural gas liquids) were 29,444 million barrels in 2006, a 2 percent decrease from the 2005 level. Natural gas liquids represented 29 percent of total liquid hydrocarbon proved reserves in 2006.

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 2006. 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 2006 proved reserves estimates as a means of gauging the past year against history.

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

- had average annual new reserves discoveries of 895 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 418 million barrels Nationwide, because production exceeded reserve 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 26,837 million barrels of total discoveries accounted for 44 percent of reserves additions.

Compared to the averages of reserves changes since 1977, 2006 was a down year for crude oil discoveries. Total discoveries of crude oil (577 million barrels) in 2006 were 36 percent less than the post-1976 U.S. average (895 million barrels per year).

Looking at the components of total discoveries in 2006:

- Extensions in 2006 (504 million barrels) were slightly less than the post-1976 average (525 million barrels),

Figure 5. U.S. Natural Gas Liquids Proved Reserves, 1996-2006

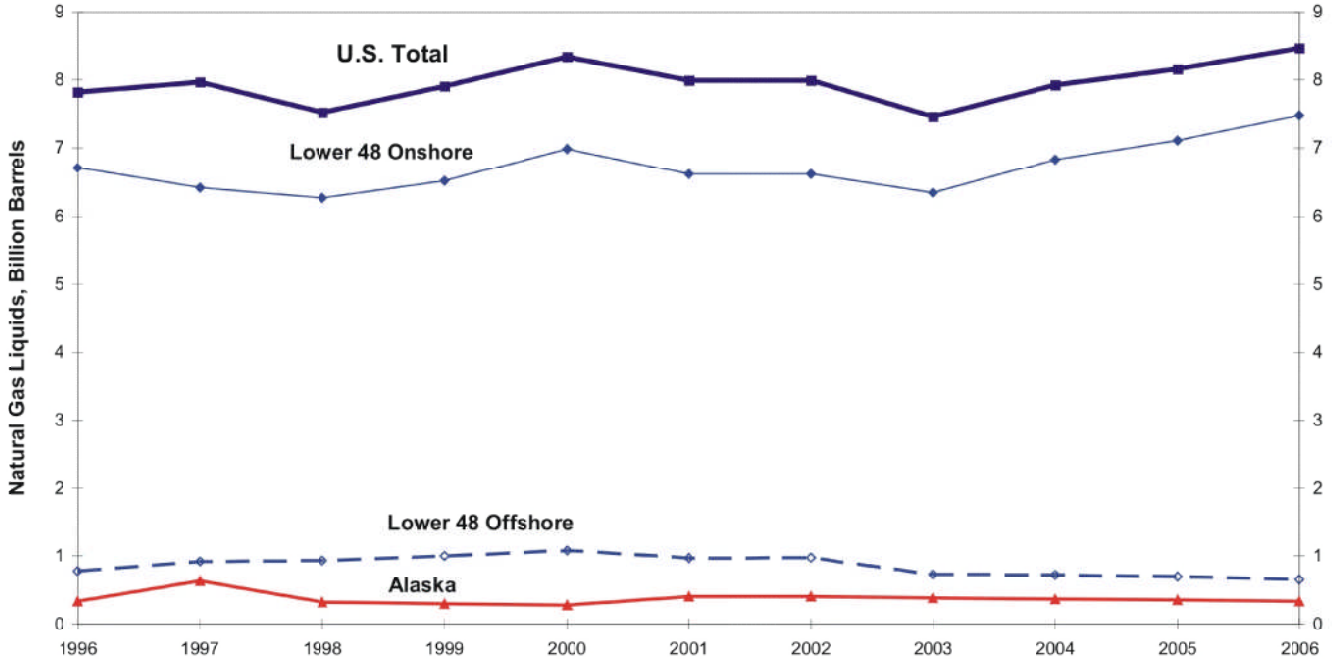
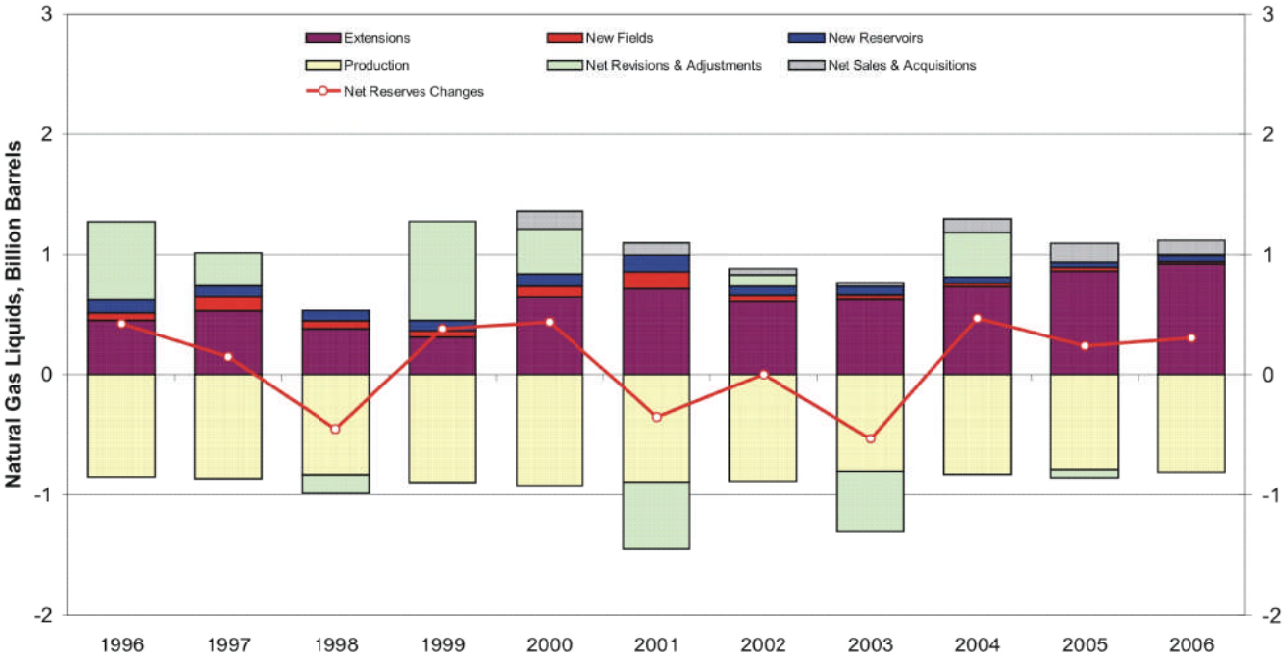


Figure 6. Components of Reserves Changes for Natural Gas Liquids, 1996-2006



Source: U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 1996-2005 annual reports, DOE/EIA-0216.{20-29}

Table 2. Reserves Changes, 1977-2006

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	5,960	199	11.9	6,911	230	11.4
New Reservoir Discoveries in Old Fields	3,998	133	8.0	4,186	140	6.9
Extensions	13,882	463	27.7	15,740	525	25.9
Total Discoveries	**23,840**	**795**	**47.6**	**26,837**	**895**	**44.1**
Revisions, Adjustments, Sales & Acquisitions[a]	26,295	877	52.4	33,972	1,132	55.9
Total Reserves Additions	**50,135**	**1,671**	**100.0**	**60,809**	**2,027**	**100.0**
Production	**57,906**	**1,930**	**115.5**	**73,339**	**2,445**	**120.6**
Net Reserves Change (since 1976)	**-7,771**	**-259**	**-15.5**	**-12,530**	**-418**	**-20.6**
	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	54,258	1,809	9.9	54,522	1,817	10.1
New Reservoir Discoveries in Old Fields	70,441	2,348	12.8	70,902	2,363	13.1
Extensions	292,309	9,744	53.1	295,631	9,854	54.8
Total Discoveries	**417,008**	**13,900**	**75.7**	**421,055**	**14,035**	**78.0**
Revisions, Adjustments, Sales & Acquisitions[a]	133,573	4,452	24.3	118,544	3,951	22.0
Total Reserves Additions	**550,581**	**18,353**	**100.0**	**539,599**	**17,987**	**100.0**
Production	**530,579**	**17,686**	**96.4**	**541,792**	**18,060**	**100.4**
Net Reserves Change (since 1976)	**20,002**	**667**	**3.6**	**-2,193**	**-73**	**-0.4**

[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* 1977-2006 annual reports, DOE/EIA-0216.{1-29}

- 2006's new field discoveries (30 million barrels) were 87 percent less than the post-1976 average for crude oil (230 million barrels), and
- New reservoir discoveries in old fields (43 million barrels) in 2006 were 69 percent less than the post-1976 average (140 million barrels).

Revisions, Adjustments, Sales & Acquisitions were 290 million barrels in 2006. This was 74 percent less than the post-1976 average of 1,132 million barrels per year.

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

- had average annual new reserves discoveries of 14,035 billion cubic feet,
- had average annual proved reserves additions of 17,987 billion cubic feet from total discoveries, net revisions and adjustments, and net sales and acquisitions, and
- had an average annual production of 18,060 billion cubic feet, decreasing U.S. dry natural gas reserves by an average 73 billion cubic feet per year.

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 22 percent.

Compared to the averages of reserves changes since 1977, 2006 was an up year for dry natural gas total discoveries. Operators reported 23,342 billion cubic feet of total discoveries of dry natural gas proved reserves, 66 percent more than the post-1976 average (14,035 billion cubic feet).

The net of revisions, adjustments, sales, and acquisitions was 1,903 billion cubic feet in 2006, 52 percent lower than the post-1976 U.S. average (3,951 billion cubic feet per year).

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, 1977-2006

Year		Crude Oil		Natural Gas		
		Current	2006 Constant	Current	2006 Constant	
		(dollars per barrel)		(dollars per thousand cubic feet)		Number of Rigs
1977		8.57	22.22	0.79	2.05	2,001
1978		9.00	21.78	0.91	2.20	2,259
1979		12.64	28.24	1.18	2.64	2,177
1980		21.59	44.16	1.59	3.25	2,909
1981		31.77	59.45	1.98	3.70	3,970
1982		28.52	50.23	2.46	4.33	3,105
1983		26.19	44.38	2.59	4.39	2,232
1984		25.88	42.28	2.66	4.35	2,428
1985		24.09	38.15	2.51	3.97	1,980
1986		12.51	19.38	1.94	3.01	964
1987		15.40	23.17	1.67	2.51	936
1988		12.58	18.30	1.69	2.46	936
1989		15.86	22.23	1.69	2.37	869
1990		20.03	27.01	1.71	2.31	1,010
1991		16.54	21.53	1.64	2.13	860
1992		15.99	20.32	1.74	2.21	721
1993		14.25	17.68	2.04	2.53	754
1994		13.19	16.03	1.85	2.25	775
1995		14.62	17.39	1.55	1.84	723
1996		18.46	21.54	2.17	2.53	779
1997		17.23	19.72	2.32	2.66	943
1998		10.87	12.29	1.96	2.22	827
1999		15.56	17.35	2.19	2.44	625
2000		26.72	29.17	3.68	4.02	918
2001		21.84	23.29	4.00	4.27	1,156
2002		22.51	23.74	2.95	3.11	830
2003		27.56	28.60	4.88	5.06	1,032
2004		36.77	38.16	5.46	5.67	1,192
2005	January	40.18	41.23	5.80	5.95	1,255
	February	42.19	43.23	5.74	5.88	1,276
	March	47.56	48.67	5.95	6.09	1,306
	April	47.26	48.30	6.58	6.72	1,334
	May	44.03	44.94	6.24	6.37	1,320
	June	49.83	50.79	6.09	6.21	1,355
	July	53.35	54.32	6.71	6.83	1,398
	August	58.90	59.89	6.48	6.59	1,436
	September	59.64	60.56	8.96	9.10	1,452
	October	56.99	57.77	10.35	10.49	1,479
	November	53.20	53.84	9.91	10.03	1,486
	December	53.24	53.79	9.08	9.17	1,470
2005	**Average**	**50.28**	**51.15**	**7.33**	**7.46**	**1,381**
2006	January	57.85	58.32	8.66	8.73	1,473
	February	55.69	56.05	7.28	7.33	1,533
	March	55.64	55.92	6.52	6.55	1,551
	April	62.52	62.75	6.59	6.61	1,597
	May	64.40	64.55	6.19	6.20	1,635
	June	64.65	64.71	5.80	5.81	1,665
	July	67.71	67.69	5.82	5.82	1,681
	August	67.21	67.09	6.51	6.50	1,738
	September	59.37	59.17	5.51	5.49	1,739
	October	53.26	52.99	5.03	5.00	1,734
	November	52.42	52.06	6.43	6.39	1,706
	December	55.03	54.55	6.65	6.59	1,718
2006	**Average**	**59.69**	**59.69**	**6.42**	**6.42**	**1,649**

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 2007*, DOE/EIA-0035(2007/10). 2006 constant dollars: U.S. Department of Commerce, Bureau of Economic Analysis, Gross Domestic Product Implicit Price Deflators, October 2007.

For the eighth year in a row (and 12 out of the last 13 years), the annual change to the National total of gas reserves has been positive, not negative.

Economics and Drilling

Economics: Table 3 lists the average annual domestic wellhead prices of crude oil and natural gas from 1977 to 2006.

In 2006, the U.S. crude oil first purchase price started at a monthly average of $57.85 per barrel in January, rose to a high of $67.71 in July, and ended the year at $55.03 per barrel in December. The average annual U.S. crude oil first purchase price increased from $50.28 in 2005 to $59.69 per barrel in 2006.

Oil prices vary by region. The average annual 2006 crude oil first purchase price ranged from $64.23 per barrel in Louisiana to $63.80 per barrel in Colorado, $61.31 per barrel in Texas, $57.34 per barrel in California, and a low of $51.85 per barrel in South Dakota. {30}

The average annual wellhead natural gas price decreased from $7.33 per thousand cubic feet in 2005 to $6.42 in 2006. Monthly average natural gas prices started at $8.66 per thousand cubic feet in January 2006, declined to $5.03 in October, and ended the year at $6.65 per thousand cubic feet in December 2006. {31}

Drilling: Also listed in **Table 3** is the average number of active rotary drilling rigs from 1977 to 2006. From 2005 to 2006, the annual average active rig count rose from 1,381 to 1,649, a 19 percent increase.

Looking first at exploratory wells, there were 4,005 exploratory wells drilled in 2006 (**Table 4**). Of these, 14 percent were completed as oil wells, 39 percent were completed as gas wells, and 47 percent were dry holes. Exploratory oil and gas completions (excluding dry holes) in 2006 were 8 percent more (**Figure 7**) than the revised 2005 total.

Figures 9 and 10 show the average volume of discoveries per exploratory well for dry natural gas and oil, respectively, since 1977. The 2006 average volume of oil discoveries per exploratory well decreased 57 percent compared to 2005. The 2006 average volume of gas discoveries per exploratory well decreased 1 percent compared to 2005.

The number of successful development wells increased by 28 percent for oil and by 18 percent for gas from their 2005 levels (**Figure 8**). Including dry holes, there were an estimated 49,507 exploratory and development wells drilled in 2006. This is 22 percent more than in 2005 and 73 percent more than the average number of wells drilled annually in the prior 10 years (28,630).

For the thirteenth 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 2006 and are expected to have an impact on the energy industry in the future:

On December 13, 2005, ConocoPhillips Company (ConocoPhillips) announced that it had agreed to acquire Burlington Resources Incorporated for about $35.6 billion of cash and stock. Additionally, ConocoPhillips would assume approximately $1,078 million of Burlington Resources debt. Burlington's natural gas assets in North America would balance political risks in [ConocoPhillips'] Venezuelan and Russian ventures. {32}

On June 23, 2006, Anadarko Petroleum Corporation agreed to acquire Kerr-McGee Corporation and Western Gas Resources Incorporated for $21.1 billion plus the assumption of about $2.2 billion of debt. The resulting company would have industry-leading positions in the deepwater Gulf of Mexico and the Rockies. {33}

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 of a year serve as a rough guide to the production level that can be maintained during the following year.

Table 4. U.S. Exploratory and Development Well Completions,[a] 1973-2006

	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	434	543	2,178	3,155	10,445	11,186	5,955	27,586
1998	286	510	1,649	2,445	6,979	11,127	4,805	22,911
1999	156	519	1,167	1,842	4,314	11,121	3,504	18,939
2000	267	615	1,349	2,231	7,585	16,242	4,046	27,873
2001	330	972	1,716	3,018	8,186	21,403	4,432	34,021
2002	239	701	1,283	2,223	6,226	16,728	3,610	26,564
2003	326	892	1,266	2,484	7,465	19,522	3,688	30,675
2004 R	368	1,323	1,200	2,891	7,806	21,816	3,474	33,096
2005 R	448	1,532	1,358	3,338	9,668	27,014	4,063	40,745
2006	576	1,559	1,870	4,005	12,339	31,587	5,581	49,507

[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 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 2007*, DOE/EIA-0035(2007/10).

Figure 7. U.S. Exploratory Well Completions, 1996-2006

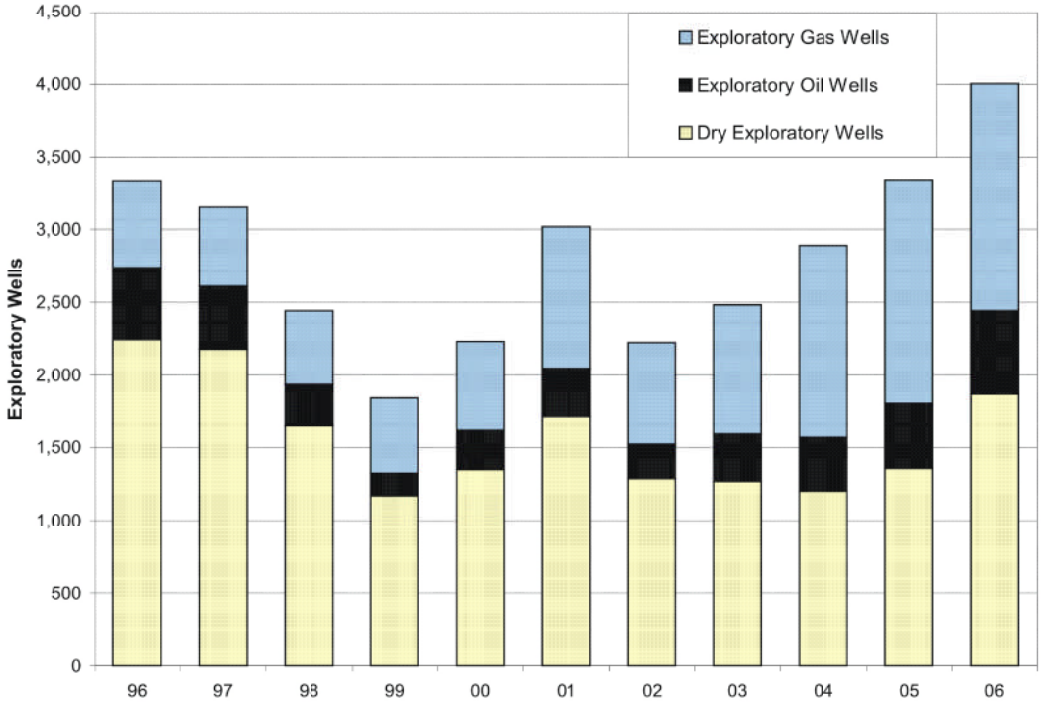
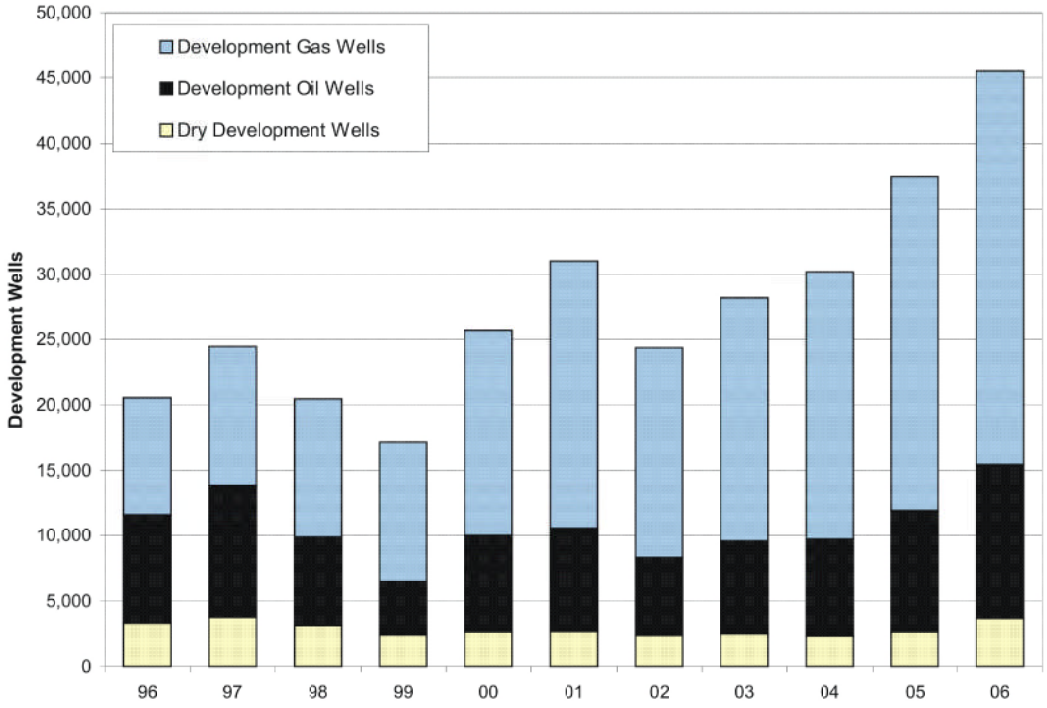


Figure 8. U.S. Development Well Completions, 1996-2006



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

Figure 9. U.S. Total Discoveries of Dry Natural Gas per Exploratory Gas Well Completion, 1977-2006

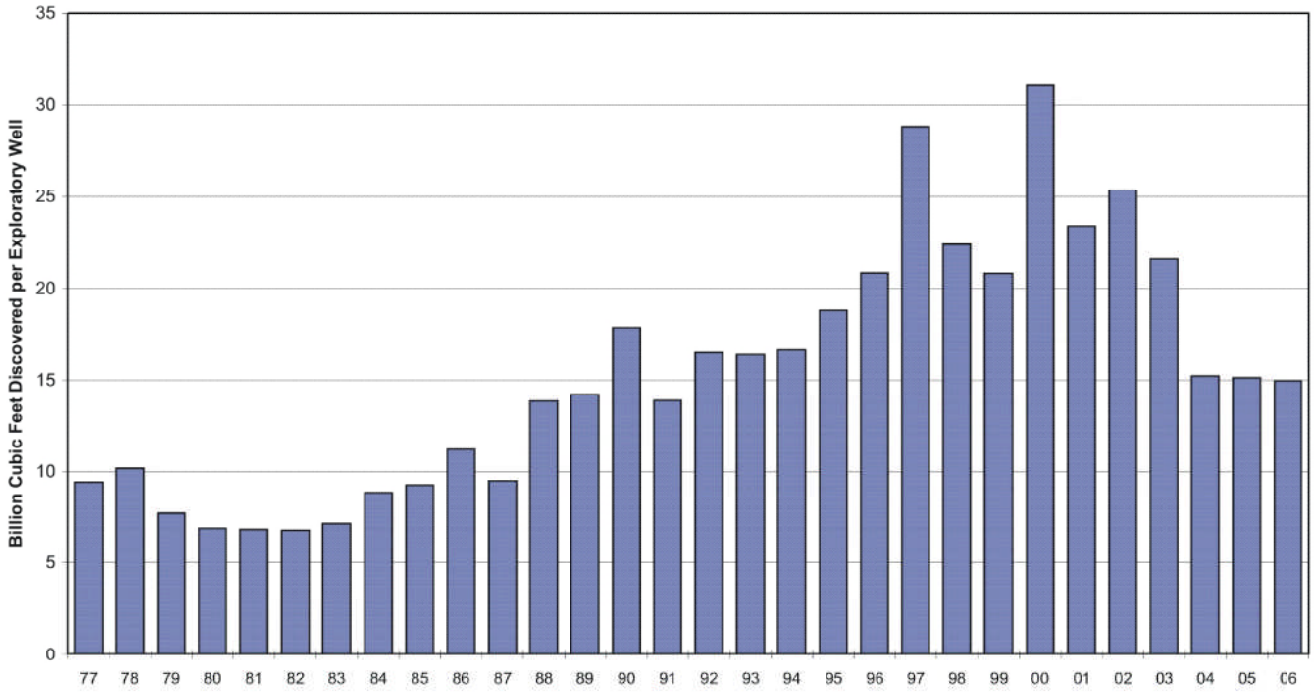
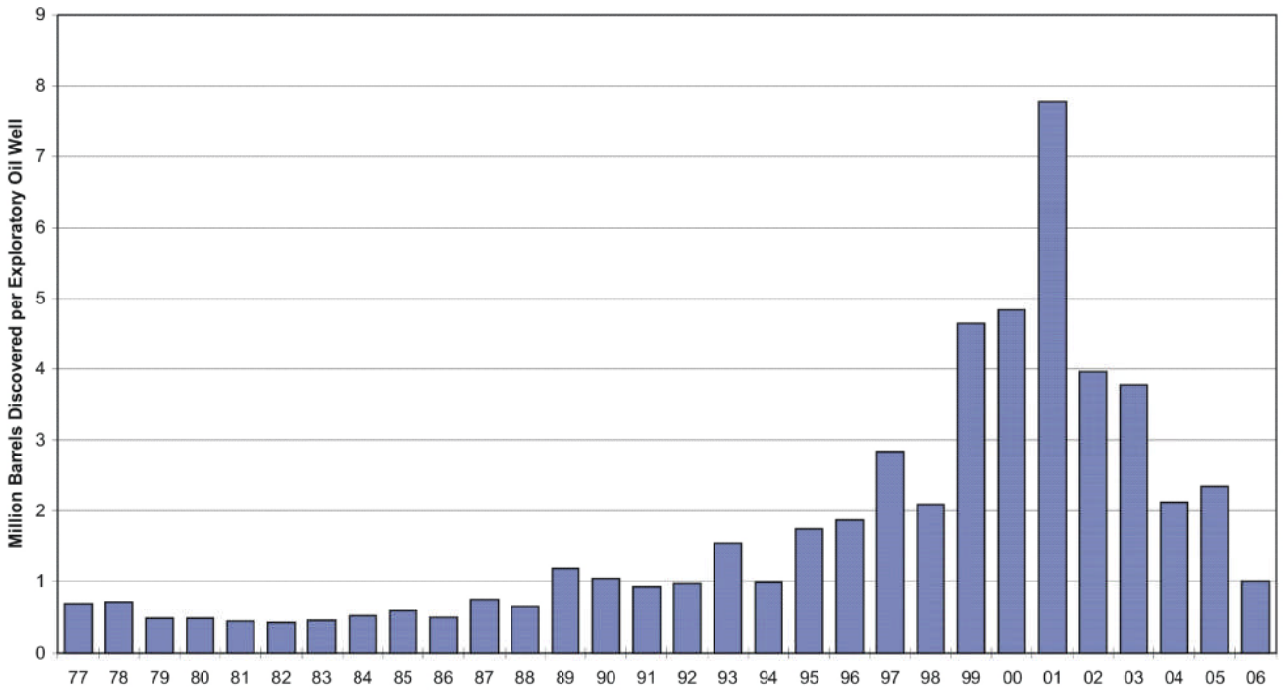


Figure 10. U.S. Total Discoveries of Crude Oil per Exploratory Oil Well Completion, 1977-2006



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

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 an 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, the U.S. R/P ratio for crude oil increased because significant production from these reserves did not begin until 7 years after booking due to the need to first build the Trans Alaska pipeline. 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 oil production and reserves development reached high levels.

In 2006, U.S. crude oil proved reserves decreased and oil production decreased, increasing the National average R/P ratio from 12.6 to 12.7.

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 2006 National average R/P ratio for crude oil was 12.7-to-1. Areas with relatively high R/P ratios are the Permian Basin of Texas and New Mexico, and California, where enhanced oil recovery techniques such as carbon dioxide (CO_2) injection or 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 have helped to add 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 well developed. The market for natural gas grew rapidly after World War II, lowering the R/P ratio. From 2005 to 2006 the U.S. average R/P ratio for natural gas increased from 11.1 to 11.4 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 2006 U.S. average R/P ratio of about 11.4-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 for *crude oil plus lease condensate* and *wet natural gas*, over the period 1977 through 2006. 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 2006 was 75,474 million barrels. This substantially exceeds the 1977 proved reserves, but at the end of 2006 there were still 22,312 million barrels of *crude oil plus lease condensate* proved reserves. Therefore, the Nation's estimated proved ultimate recovery of crude oil was fundamentally 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 2006. 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 551 trillion cubic feet of gas was produced from 1977 through 2006 and there are still 220,416 billion cubic feet of *wet natural gas* proved reserves in 2006. Only 10 percent of proved

Figure 11. Reserves-to-Production Ratios for Crude Oil, 1945-2006

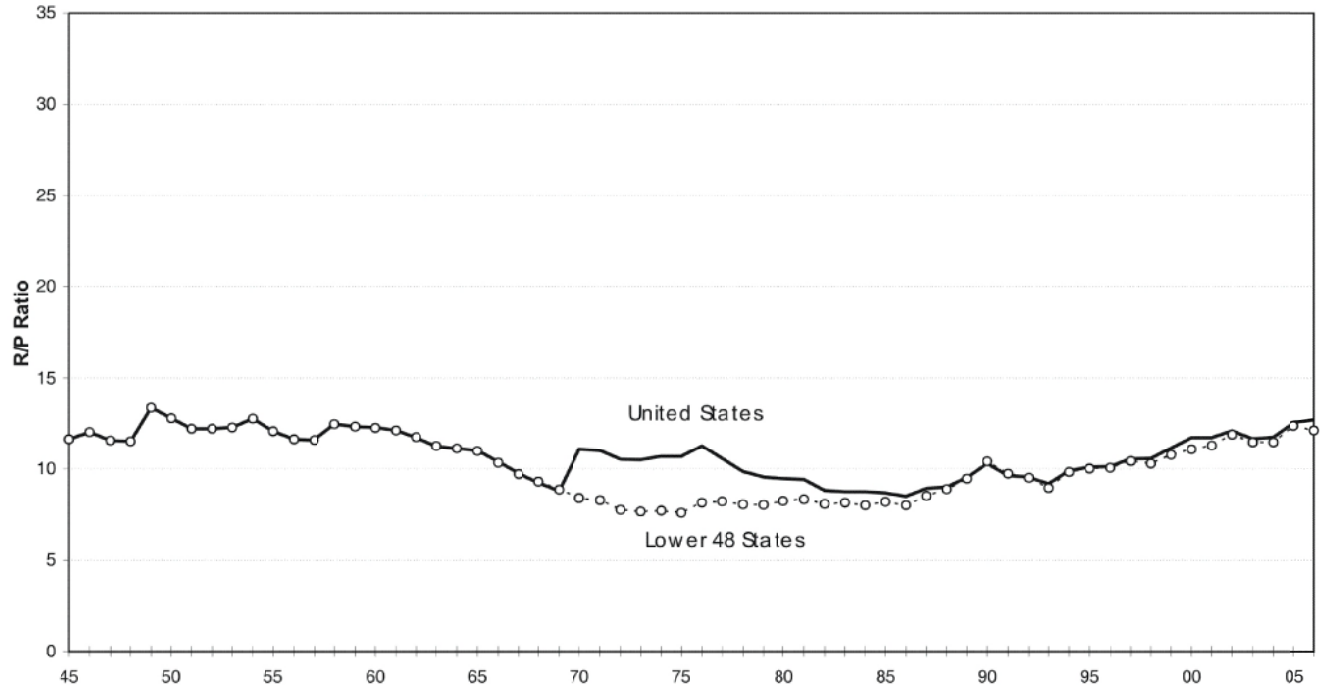
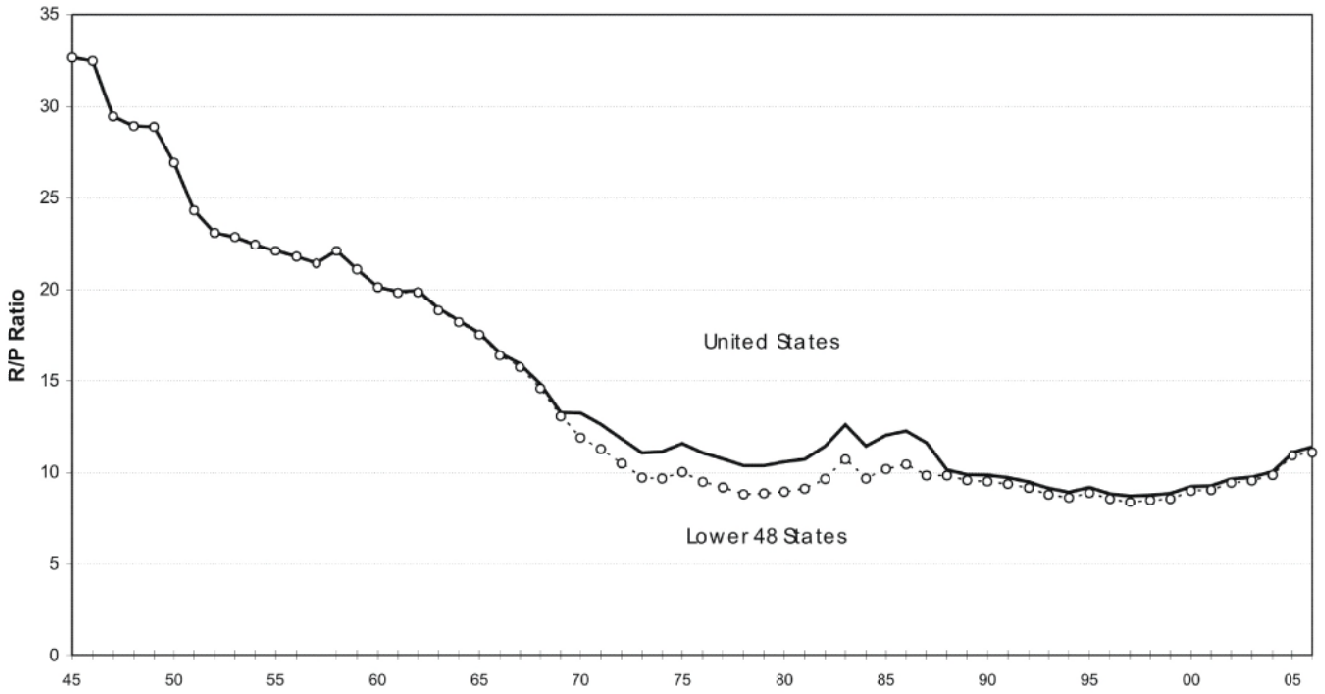


Figure 12. Reserves-to-Production Ratios for Wet Natural Gas, 1945-2006



Sources: Annual reserves and production - American Petroleum Institute and American Gas Association (1945–1976) {34} and Energy Information Administration, Office of Oil and Gas (1977–2005){1-29}. Cumulative production: *U.S. Oil and Gas Reserves by Year of Field Discovery* (1977-1988).{35}

Figure 13. Components of Proved Ultimate Recovery for Crude Oil and Lease Condensate, 1977-2006

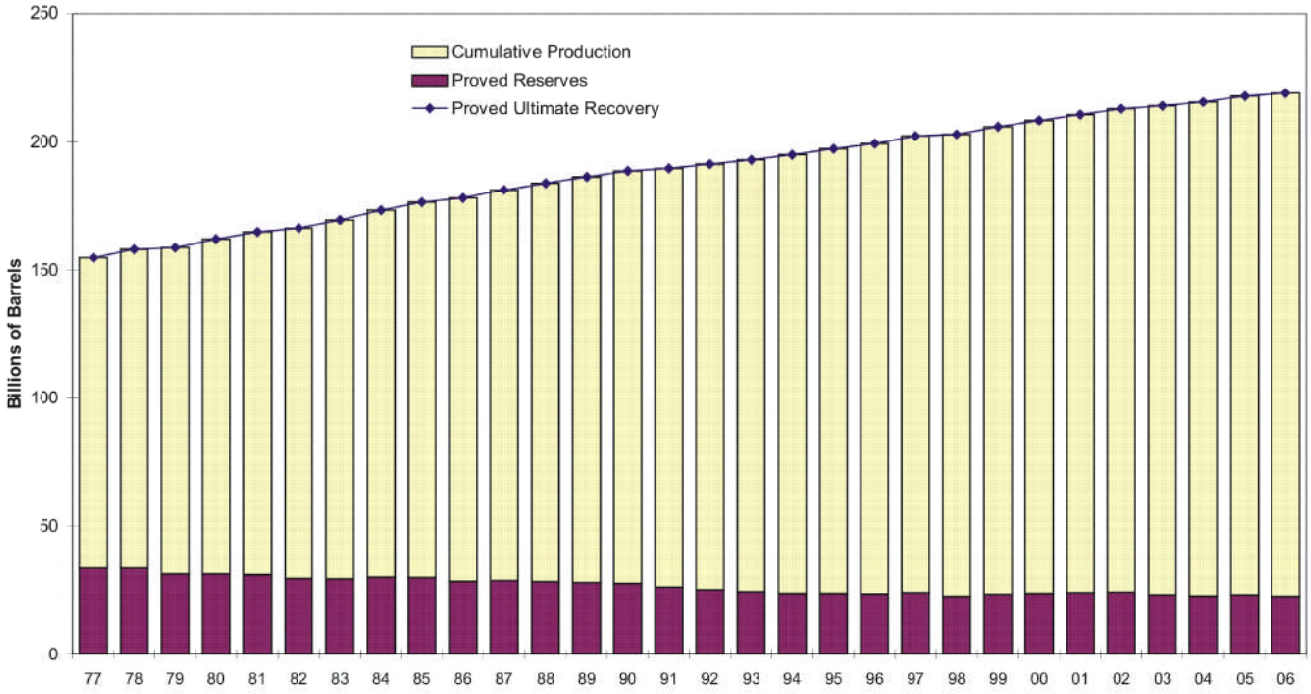
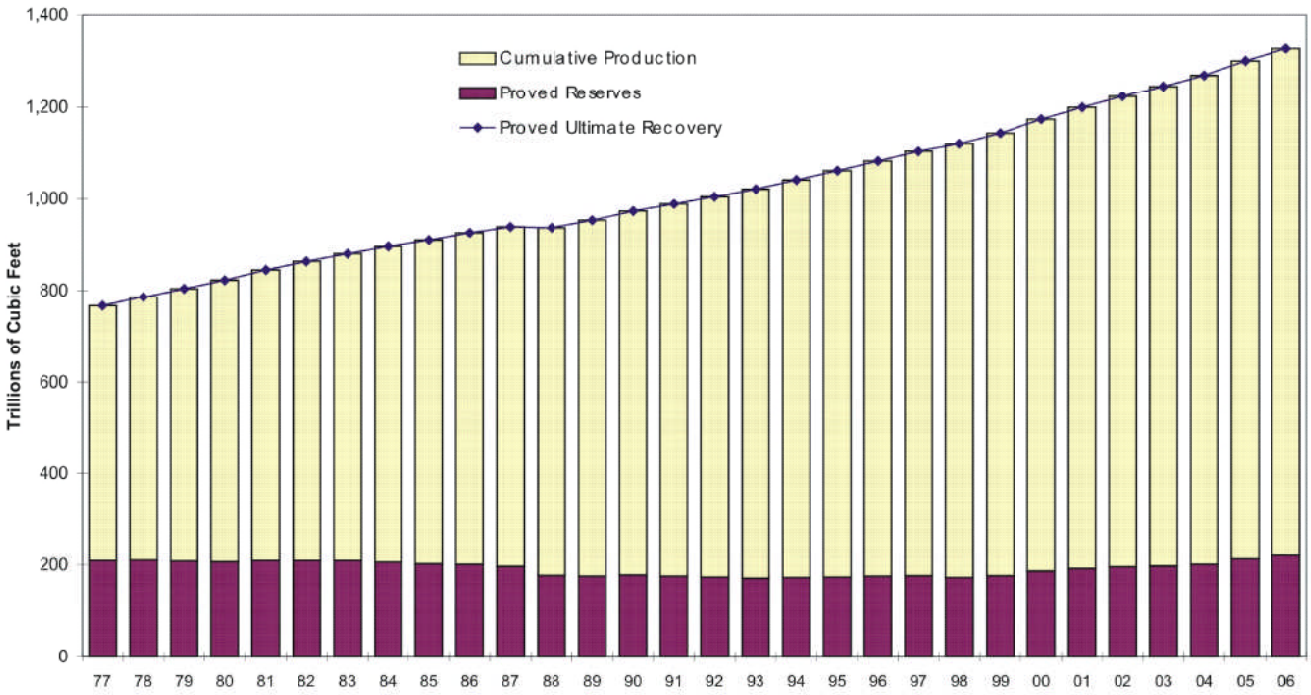


Figure 14. Components of Proved Ultimate Recovery for Wet Natural Gas, 1977-2006



Sources: Annual reserves and production - American Petroleum Institute and American Gas Association (1945–1976) {34} and Energy Information Administration, Office of Oil and Gas (1977–2005){1-29}. Cumulative production: *U.S. Oil and Gas Reserves by Year of Field Discovery* (1977-1988).{35}

Table 5. International Oil and Natural Gas Reserves as of December 31, 2006

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]262,300	[d]262,275	1	Russia	1,680,000	1,688,755
2	Iran[c]	136,270	133,000	2	Iran[c]	974,000	971,154
3	Iraq[c]	115,000	125,100	3	Qatar[c]	910,500	906,000
4	Canada[e]	179,210	25,591	4	Saudia Arabia[c]	[d]240,000	[d]240,000
5	Kuwait[c]	[d]101,500	[d]100,110	5	United States	211,085	211,085
6	United Arab Emirates[c]	97,800	70,560	6	United Arab Emirates[c]	214,400	205,550
7	Russia	60,000	74,435	7	Nigeria[c]	181,900	182,000
8	Venezuela[c]	80,012	52,945	8	Algeria[c]	161,740	160,682
9	Libya[c]	41,464	34,970	9	Venezuela[c]	152,380	150,890
10	Nigeria[c]	36,220	37,200	10	Iraq[c]	112,000	88,000
Top 10 Total		**1,109,776**	**916,186**	**Top 10 Total**		**4,838,005**	**4,804,116**
11	Kazakhstan	30,000	-	11	Turkmenistan	100,000	-
12	United States	20,972	20,972	12	Kazakhstan	100,000	-
13	Qatar[c]	15,207	20,400	13	Indonesia[c]	97,780	91,800
14	China	16,000	16,256	14	Australia	30,370	152,359
15	Algeria[c]	12,270	11,921	15	Norway	82,320	83,272
16	Brazil	11,773	12,267	16	China	80,000	55,606
17	Mexico	12,352	11,656	17	Malaysia	75,000	58,000
18	Angola	8,000	9,330	18	Uzbekistan	65,000	-
19	Norway	7,849	7,070	19	Egypt	58,500	66,364
20	Azerbaijan	6,999	-	20	Canada	57,946	57,946
21	Sudan	5,000	6,615	21	Kuwait[c]	[d]55,000	[d]53,500
22	Oman	5,500	4,655	22	Libya[c]	52,650	51,500
23	Ecuador	4,517	4,933	23	Netherlands	50,000	50,500
24	India	5,625	3,812	24	Ukraine	39,000	-
25	Indonesia[c]	4,300	4,840	25	India	37,960	27,259
Top 25 Total		**1,276,140**	**1,050,913**	**Top 25 Total**		**5,819,531**	**5,552,222**
OPEC Total		**902,343**	**853,321**	**OPEC Total**		**3,152,350**	**3,101,076**
World Total		**1,317,447**	**1,144,358**	**World Total**		**6,182,692**	**6,332,193**

[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. 104, No.47 (December 18, 2006). Gulf Publishing Company, *World Oil*, Vol.228, No. 9 (September, 2007).

reserve additions of natural gas were booked as *new field discoveries* from 1976 through 2006. The other 90 percent came from proved ultimate recovery appreciation.

International Perspective

International Reserves

The EIA estimates domestic oil and gas reserves but does not systematically 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 1.2 trillion barrels of oil and 6.3 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 2006. 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 2006. 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 26 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* {35} estimate for world oil reserves increased 2 percent in 2006 owing to an increase in its estimate of Kazakstan and Iranian reserves. The *World Oil* {36} estimate increased 3 percent in 2006 due to its larger estimate of Canadian and Iranian reserves. For world gas reserves, the *Oil & Gas Journal* reported a 1 percent increase, while *World Oil* reported an 2 percent increase in 2006.

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 almost 5 times U.S. reserves. Closer to home, Canada has almost 5 times U.S. reserves based on averages of the *World Oil* and *Oil & Gas Journal* estimates.

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*.{38} In 2006:

- The U.S. consumed 99,873,000,000,000,000 Btu of energy (99.9 quadrillion Btu). This was a decrease of 0.82 quadrillion Btu from the 2005 level of consumption.
- 62 percent of U.S. energy consumption was provided by petroleum and natural gas—crude oil and natural gas liquids combined (40 percent), and natural gas (22 percent).
- U.S. petroleum consumption was about 21 million barrels of oil and natural gas liquids and 60 billion cubic feet of gas per day.

Dependence on Imports

The United States remains dependent on imported oil and gas. In 2006, 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.{39}

Net gas imports decreased from the 2005 total of 4.33 trillion cubic feet to 4.14 trillion cubic feet in 2006. Imports satisfied approximately 19 percent of consumption. Almost all of this gas was pipelined from Canada. Some liquefied natural gas was imported from Trinidad and Tobago, 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 2006 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 inventory of more than 45,000 oil and gas fields are listed in Appendix B. These fields hold two-thirds of U.S. crude oil 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 1996-2006 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 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. Since complete coverage 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 measured directly. Reserves 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 EIA personnel when in the field performing quality assurance checks. 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 of Domestic Oil and Gas Reserves - Samples of Form EIA-23 and Form EIA-64A are presented in Appendix I.

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