

**Who Will Fund  
America's Energy Future?  
Petroleum Research and Development  
in the 21st Century**



**IOGCC**

**A Publication of the Interstate Oil and Gas Compact Commission**

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Summer 2002

## Introduction

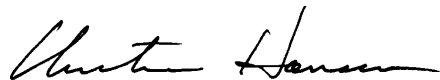
Advanced research and high technology is the single greatest contributor to low consumer natural gas and oil prices. A primary goal of the Interstate Oil and Gas Compact Commission (IOGCC) governors in their national energy policy is to “promote the expansion of research to recover domestic oil and gas resources.” While the governors have urged attention to national research in oil and natural gas, and have endorsed proper funding of important state and national institutions, adequate funding of research and development continues to be a grave concern.

This publication updates the 1998 “Who Will Fund America’s Energy Future.” In the four years since that publication, the funding situation for oil and natural gas research has not improved. The numbers are of special concern because the United States is so heavily dependent on oil and natural gas to fuel its way of life.

The research spending quantified in this report shows a continuing gap between research dollars spent by the petroleum industry versus other industries. It also demonstrates a gap in federal funds allocated through the Department of Energy versus other research-funded agencies.

Since being formed by the governors and chartered by Congress in 1935, the IOGCC has strongly supported programs that create new technology to increase environmental protection, improve recovery rates and lower exploration and production costs. Such research and development is an investment in the country’s future and its energy security. In fact, technological advancement may be the most important factor in ensuring the nation’s nonrenewable resources are fully developed and the principles of resource conservation served while achieving reasonable prices for consumers.

Research cannot be turned off and on like a water tap. The acquisition of new knowledge and the embodiment of that knowledge in new products and services for the benefit of the whole economy is a cumulative process requiring continuous effort to sustain. Accumulated cutbacks in public and private research in the oil and natural gas sector could set the stage for a major shortfall in development of this vital energy source.



Christine Hansen  
Executive Director

# Research and Development Expenditures by Industry Segment

**R**esearch and development spending by the petroleum industry continues to lag behind other industry sectors. This trend is evident in the data comparisons on the following pages. Simultaneously, federal support for R&D is being reduced, creating an outlook even more bleak and setting the stage for a major energy crisis.

Research and development is widely recognized as a key to economic growth. Decisions on how much the petroleum industry spends on R&D, and how the industry spends that money, is critical to the nation's energy security and to the future of the U.S. economy.

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**The oil and gas field services sector reported the lowest average annual R&D expenditure of the 19 industry groups.**

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While R&D spending in the energy sector has remained at about the same level for the period, total energy consumption has increased by about 4.5 percent, according to the U.S. Energy Information Administration. In addition, more mergers since 2000 have negatively impacted the spending numbers.

The data used for this study was compiled by Schonfeld & Associates, Inc., based on the 2001 edition of its publication "Research and Development Growth Trends." This report includes data for 1997 to 2000, updating the previous report that included results for the three-year period from 1995 to 1997. In most cases, the arithmetic average of R&D expenditures to sales is used to compare results among the industry sectors.

A company's ratio of R&D spending to net sales is an indicator of a company's long-term survival forecast. "Research that leads to proprietary products usually translates into higher profit margins," according to the June 2001 issue of Bloomberg Personal Finance magazine. "Indeed, a company that cuts back on research outlays as a percentage of sales may be mortgaging its future in order to generate higher profits today."

The analysis of R&D spending for the period of 1997 to 2000 indicates that R&D spending for the energy sector has held fairly steady with the average annual investment for the oil and gas field services and petroleum refining industries combined at \$3.1 billion. (See Table 1) However, the petroleum refining sector's average R&D expenditures rank in 17th place of the 19 groups, while the pharmaceutical and motor vehicle industries reported the highest expenditures. The oil and gas field services sector reported the lowest average annual R&D expenditure of the 19 industry groups. (See Table 2)

# Research and Development Expenditures by Industry Segment - Continued

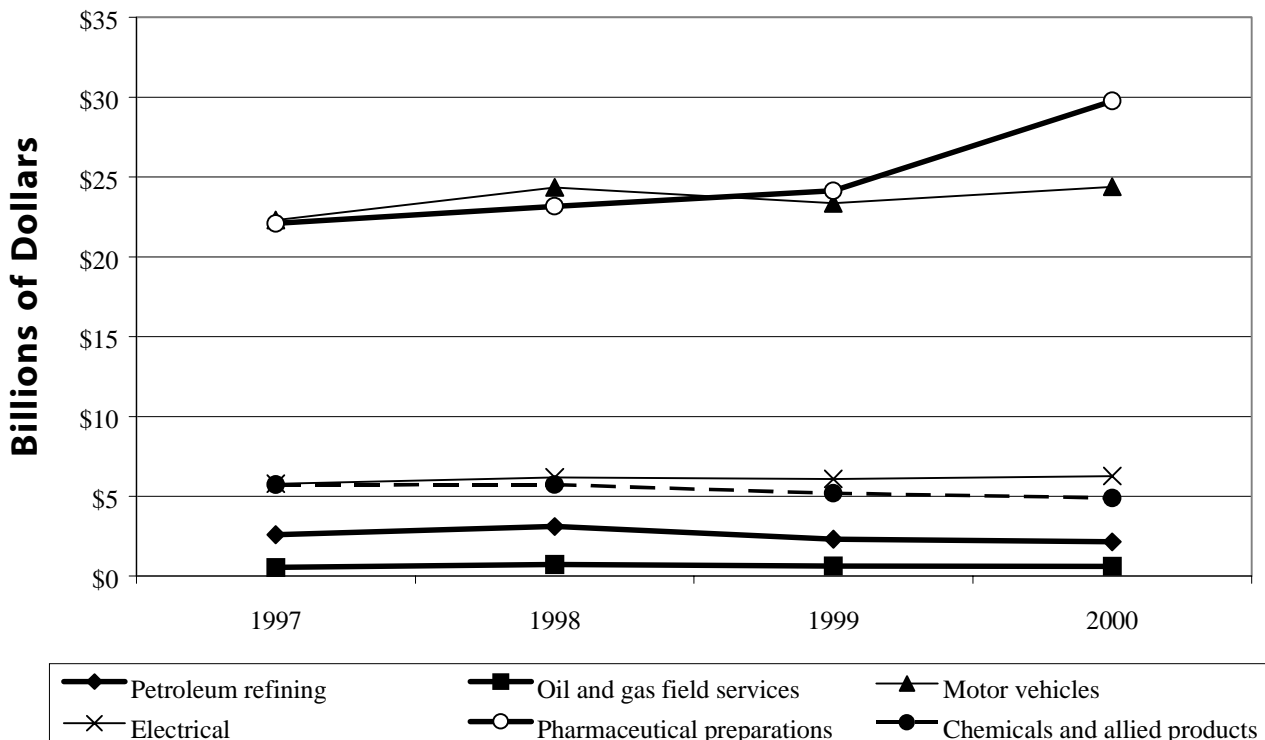
Public and private sector investments in energy R&D in the United States have varied greatly over the past quarter-century, according to "U.S. National Investment in Energy R&D: 1974-1999" published by Battelle. "After a step increase from 1974-1980, investments declined during the period 1980-1988, briefly increased between 1988-1990, rapidly decreased again between 1990-1997, and stabilized at approximately \$3.7 billion" during 1997-1999. Since then, R&D expenditures in the U.S. have risen through a period of "unprecedented growth, closely following the overall growth of the economy," according to the Battelle - R&D Magazine Research and Development Funding Forecast. However, the forecast expects industrial R&D growth to slow and increase only 3.2 percent in 2002. On the other hand, federal R&D, with all agencies getting increases, is expected to see its best growth in more than a decade.

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**A company's ratio of R&D spending to net sales is an indicator of a company's long-term survival forecast.**

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**Comparison: R&D Spending Among Industry Sectors**



**Table 1**  
**Industry R&D Expenses Summary**

Industry	R&D Spending (billions of U.S. dollars)				
	1997 R&D	1998 R&D	1999 R&D	2000 R&D	Average R&D
Pharmaceutical preparations	22.09	23.167	24.132	29.762	24.7878
Motor vehicles	22.299	24.352	23.358	24.393	23.6005
Semiconductor	10.953	11.966	13.575	16.355	13.2123
Prepackaged software	9.166	11.081	12.83	15.192	12.0673
Radio, TV, communication equipment	6.939	7.939	9.249	11.019	8.7865
Computer and office equipment	8.303	7.937	7.532	7.062	7.7085
Phone communications	6.717	6.337	6.129	5.885	6.267
Electrical	5.79	6.175	6.083	6.269	6.07925
Electronic computers	4.971	5.555	5.898	5.811	5.55875
Chemicals and allied products	5.714	5.738	5.189	4.894	5.38375
CMP integrated system design	4.562	4.674	4.855	5.143	4.8085
CMP programming, data processing	3.964	4.264	4.767	5.396	4.59775
Motor vehicle parts and accessories	3.662	3.589	4.126	4.025	3.8505
Computer communication equipment	2.698	3.244	3.821	4.617	3.595
Household audio and video	3.065	3.202	3.312	3.381	3.24
Photographic equipment	3.011	2.929	2.953	2.815	2.927
<b>Petroleum refining</b>	<b>2.597</b>	<b>3.11</b>	<b>2.315</b>	<b>2.144</b>	<b>2.5415</b>
Aircraft	2.379	2.471	2.133	2.707	2.4225
<b>Oil and gas field services</b>	<b>0.547</b>	<b>0.725</b>	<b>0.632</b>	<b>0.621</b>	<b>0.63125</b>
Total	129.427	138.455	142.889	157.491	142.066
Average	6.81195	7.28711	7.52047	8.289	7.47713
Maximum	22.299	24.352	24.132	29.762	25.1363
<b>Minimum</b>	<b>0.547</b>	<b>0.725</b>	<b>0.632</b>	<b>0.621</b>	<b>0.63125</b>

Data: "R&D Growth Trends: 2001 Edition," Schonfeld & Associates, Inc.

**Table 1-A**  
**Industry R&D Expenses in Billions of Dollars**

<b>1997</b>				
<b>Industry</b>	<b>R&amp;D Expense</b>	<b>R&amp;D as % of Sales</b>	<b>Annual % of R&amp;D Growth</b>	<b>Relative Average %</b>
Motor vehicles	22.299	4.20%	-5%	17.23%
Pharmaceutical preparations	22.09	13.60%	20.50%	17.07%
Semiconductor	10.953	10%	13.60%	8.46%
Prepackaged software	9.166	17.50%	19.20%	7.08%
Computer and office equipment	8.303	6%	-5%	6.42%
Radio, TV, communication equipment	6.939	9.30%	6.70%	5.36%
Phone communications	6.717	2.70%	0.90%	5.19%
Electrical	5.79	6%	-4.40%	4.47%
Chemicals and allied products	5.714	5.40%	-8.50%	4.41%
Electronic computers	4.971	5.20%	10.30%	3.84%
CMP integrated system design	4.562	8%	4.40%	3.52%
CMP programming, data processing	3.964	5.70%	9.40%	3.06%
Motor vehicle parts and accessories	3.662	4.30%	29.90%	2.83%
Household audio and video	3.065	5.70%	4.10%	2.37%
Photographic equipment	3.011	6.80%	5.10%	2.33%
Computer communication equipment	2.698	19.60%	34.30%	2.08%
<b>Petroleum refining</b>	<b>2.597</b>	<b>0.50%</b>	<b>-3.90%</b>	<b>2.01%</b>
Aircraft	2.379	5.10%	42.40%	1.84%
<b>Oil and gas field services</b>	<b>0.547</b>	<b>3.20%</b>	<b>9.10%</b>	<b>0.42%</b>
<hr/>				
Total	129.427	138.80%	183.10%	
Average	6.811947368	0.07%	9.64%	
Maximum	22.299	0.20%	42.40%	
Minimum	<b>0.547</b>	<b>0.01%</b>	-8.50%	

Data: "R&D Growth Trends: 2001 Edition," Schonfeld & Associates, Inc.

**Table 1-B**  
**Industry R&D Expenses in Billions of Dollars**

<b>1998</b>				
<b>Industry</b>	<b>R&amp;D Expense</b>	<b>R&amp;D as % of Sales</b>	<b>Annual % of R&amp;D Growth</b>	<b>Relative Average %</b>
Motor vehicles	24.352	4.10%	9.20%	17.59%
Pharmaceutical preparations	23.167	13.20%	4.90%	16.73%
Semiconductor	11.966	10.50%	9.40%	8.64%
Prepackaged software	11.081	17.30%	20.90%	8.00%
Computer and office equipment	7.937	5.80%	-4.40%	5.73%
Radio, TV, communication equipment	7.939	9.90%	14.40%	5.73%
Phone communications	6.337	2.50%	-5.70%	4.58%
Electrical	6.175	6.60%	6.60%	4.46%
Chemicals and allied products	5.738	5.60%	0.40%	4.14%
Electronic computers	5.555	5.30%	11.80%	4.01%
CMP integrated system design	4.674	7.70%	2.50%	3.38%
CMP programming, data processing	4.264	5.80%	7.60%	3.08%
Motor vehicle parts and accessories	3.589	3.90%	-3.10%	2.59%
Computer communication equipment	3.244	19.90%	20.20%	2.34%
Household audio and video	3.202	5.70%	4.50%	2.31%
<b>Petroleum refining</b>	<b>3.11</b>	<b>0.70%</b>	<b>19.60%</b>	<b>2.25%</b>
Photographic equipment	2.929	6.40%	-2.70%	2.12%
Aircraft	2.471	4.50%	3.90%	1.78%
<b>Oil and gas field services</b>	<b>0.725</b>	<b>2.90%</b>	<b>32.70%</b>	<b>0.52%</b>
Total	138.455	138.30%	152.70%	
Average	7.287105263	7.28%	8.04%	
Maximum	24.352	19.90%	<b>32.70%</b>	
Minimum	<b>0.725</b>	<b>0.70%</b>	-5.70%	

Data: "R&D Growth Trends: 2001 Edition," Schonfeld & Associates, Inc.



**Table 1-C**  
**Industry R&D Expenses in Billions of Dollars**

<b>1999</b>				
<b>Industry</b>	<b>R&amp;D Expense</b>	<b>R&amp;D as % of Sales</b>	<b>Annual % of R&amp;D Growth</b>	<b>Relative Average %</b>
Pharmaceutical preparations	24.132	12.50%	4.20%	16.89%
Motor vehicles	23.358	3.90%	-4.10%	16.35%
Semiconductor	13.575	10.70%	13.20%	9.50%
Prepackaged software	12.83	17.20%	15.80%	8.98%
Radio, TV, communication equipment	9.249	10.70%	16.50%	6.47%
Computer and office equipment	7.532	5.60%	-5.10%	5.27%
Phone communications	6.129	2.40%	-3.30%	4.29%
Electrical	6.083	6.90%	-1.50%	4.26%
Electronic computers	5.898	5.10%	6.20%	4.13%
Chemicals and allied products	5.189	5.90%	-9.50%	3.63%
CMP integrated system design	4.855	7.60%	3.90%	3.40%
CMP programming, data processing	4.767	6%	11.80%	3.34%
Motor vehicle parts and accessories	4.126	4.10%	15.60%	2.89%
Computer communication equipment	3.821	20.10%	17.80%	2.67%
Household audio and video	3.312	5.70%	3.40%	2.32%
Photographic equipment	2.953	6.30%	0.80%	2.07%
<b>Petroleum refining</b>	<b>2.315</b>	<b>0.40%</b>	<b>-25.60%</b>	<b>1.62%</b>
Aircraft	2.133	3.90%	-13.70%	1.49%
<b>Oil and gas field services</b>	<b>0.632</b>	<b>3.20%</b>	<b>-12.90%</b>	<b>0.44%</b>
<hr/>				
Total	142.889	138.20%	33.50%	
Average	7.520473684	7.27%	1.76%	
Maximum	24.132	20.10%	17.80%	
Minimum	<b>0.632</b>	<b>0.40%</b>	<b>-25.60%</b>	

Data: "R&D Growth Trends: 2001 Edition," Schonfeld & Associates, Inc.

**Table 1-D**  
**R&D Expenses in Billions of Dollars**

Industry	2000			
	R&D Expense	R&D as % of Sales	Annual % of R&D Growth	Relative Average %
Pharmaceutical preparations	29.762	13.20%	23.30%	18.90%
Motor vehicles	24.393	3.80%	4.40%	15.49%
Semiconductor	16.355	11%	20.50%	10.38%
Prepackaged software	15.192	17.50%	18.40%	9.65%
Radio, TV, communication equipment	11.019	11%	19.10%	7.00%
Computer and office equipment	7.062	5.50%	-6.20%	4.48%
Electrical	6.269	7.10%	3%	3.98%
Phone communications	5.885	2.30%	-4.30%	3.74%
Electronic computers	5.811	4.90%	-1.50%	3.69%
CMP programming, data processing	5.396	6.50%	13.20%	3.43%
CMP integrated system design	5.143	7.80%	5.90%	3.27%
Chemicals and allied products	4.894	6.10%	-5.70%	3.11%
Computer communication equipment	4.617	20.90%	20.80%	2.93%
Motor vehicle parts and accessories	4.025	4.10%	-2.40%	2.56%
Household audio and video	3.381	5.70%	2.10%	2.15%
Photographic equipment	2.815	6.20%	-4.70%	1.79%
Aircraft	2.707	5.60%	26.90%	1.72%
<b>Petroleum refining</b>	<b>2.144</b>	<b>0.30%</b>	<b>-7.40%</b>	<b>1.36%</b>
<b>Oil and gas field services</b>	<b>0.621</b>	<b>3.40%</b>	<b>-1.60%</b>	<b>0.39%</b>
Total	157.491	142.90%	123.80%	
Average	8.289	7.52%	6.52%	
Maximum	29.762	20.90%	26.90%	
Minimum	<b>0.621</b>	<b>0.30%</b>	<b>-7.40%</b>	

Data: "R&D Growth Trends: 2001 Edition," Schonfeld & Associates, Inc.

**Table 2**  
**Industry R&D as a Percentage of Sales**  
**Summary**

Industry	1997 R&D as % of Sales	1998 R&D as % of Sales	1999 R&D as % of Sales	2000 R&D as % of Sales	Average R&D as % of Sales
Computer communication equipment	19.60%	19.90%	20.10%	20.90%	20.13%
Prepackaged software	17.50%	17.30%	17.20%	17.50%	17.38%
Pharmaceutical preparations	13.60%	13.20%	12.50%	13.20%	13.13%
Semiconductor	10%	10.50%	10.70%	11%	11%
Radio, TV, communication equipment	9.30%	9.90%	10.70%	11%	10.23%
CMP integrated system design	8%	7.70%	7.60%	7.80%	8%
Electrical	6%	6.60%	6.90%	7.10%	7%
Photographic equipment	6.80%	6.40%	6.30%	6.20%	6.42%
CMP programming, data processing	5.70%	5.80%	6%	6.50%	6.00%
Chemicals and allied products	5.40%	5.60%	5.90%	6.10%	5.75%
Computer and office equipment	6%	5.80%	5.60%	5.50%	6%
Household audio and video	5.70%	5.70%	5.70%	5.70%	5.70%
Electronic computers	5.20%	5.30%	5.10%	4.90%	5.13%
Aircraft	5.10%	4.50%	3.90%	5.60%	4.78%
Motor vehicle parts and accessories	4.30%	3.90%	4.10%	4.10%	4.10%
Motor vehicles	4.20%	4.10%	3.90%	3.80%	4.00%
<b>Oil and gas field services</b>	<b>3.20%</b>	<b>2.90%</b>	<b>3.20%</b>	<b>3.40%</b>	<b>3.17%</b>
Phone communications	2.70%	2.50%	2.40%	2.30%	2.48%
<b>Petroleum refining</b>	<b>0.50%</b>	<b>0.70%</b>	<b>0.40%</b>	<b>0.30%</b>	<b>0.47%</b>
Average	7.31%	7.29%	7.27%	7.52%	7.34%
Maximum	19.60%	19.90%	20.10%	20.90%	20.13%
Minimum	<b>0.50%</b>	<b>0.70%</b>	<b>0.40%</b>	<b>0.30%</b>	<b>0.48%</b>

Data: "R&D Growth Trends: 2001 Edition," Schonfeld & Associates, Inc.

## Relative Percentage of Industry R&D Expenditures

Table 3 shows the slight downward trend of the fuel sector's relative share of the total R&D dollars spent over the four-year period.

**Table 3**  
**Relative Percentage of Industry R&D Expenditures**

Industry	1997	1998	1999	2000	Average
Pharmaceutical preparations	17.07%	16.73%	16.89%	18.90%	17.40%
Motor vehicles	17.23%	17.59%	16.35%	15.49%	16.67%
Semiconductor	8.46%	8.64%	9.50%	10.38%	9.25%
Prepackaged software	7.08%	8.00%	8.98%	9.65%	8.43%
Radio, TV, communication equipment	5.36%	5.73%	6.47%	7.00%	6.14%
Computer and office equipment	6.42%	5.73%	5.27%	4.48%	5.47%
Phone communications	5.19%	4.58%	4.29%	3.74%	4.45%
Electrical	4.47%	4.46%	4.26%	3.98%	4.29%
Electronic computers	3.84%	4.01%	4.13%	3.69%	3.92%
Chemicals and allied products	4.41%	4.14%	3.63%	3.11%	3.82%
CMP integrated system design	3.52%	3.38%	3.40%	3.27%	3.39%
CMP programming, data processing	3.06%	3.08%	3.34%	3.43%	3.23%
Motor vehicle parts and accessories	2.83%	2.59%	2.89%	2.56%	2.72%
Computer communication equipment	2.08%	2.34%	2.67%	2.93%	2.51%
Household audio and video	2.37%	2.31%	2.32%	2.15%	2.29%
Photographic equipment	2.33%	2.12%	2.07%	1.79%	2.08%
<b>Petroleum refining</b>	<b>2.01%</b>	<b>2.25%</b>	<b>1.62%</b>	<b>1.36%</b>	<b>1.81%</b>
Aircraft	1.84%	1.78%	1.49%	1.72%	1.71%
<b>Oil and gas field services</b>	<b>0.42%</b>	<b>0.52%</b>	<b>0.44%</b>	<b>0.39%</b>	<b>0.45%</b>
Total	100%	100%	100%	100%	100%

Data: "R&D Growth Trends: 2001 Edition," Schonfeld & Associates, Inc.

## Oil and Gas Research and Development Found Lacking

Pacific Northwest National Laboratory reports that the major oil and gas companies in the United States reduced their R&D investments by an average of 43 percent throughout the 1990s. R&D investments are being redirected from longer-term projects to near-term proprietary needs of companies operating in competitive markets. Public sector investments have primarily focused on basic energy research while private sector investments have focused on fossil energy research and development.

**Table 4**  
**R&D Expenditures for Energy Information Administration**  
**Financial Reporting System Companies, 1997-2000**

Sources of R&D Funds	(Millions of Dollars)						
	1994	1995	1996	1997	1998	1999	2000
Federal Government	15	W	6	9	W	27	W
Internal Company	2,985	2,817	2,675	2,841	1,688	1,377	1,316
Other Sources	50	W	W	W	W	20	W
<b>Total Sources</b>	<b>3,050</b>	<b>2,861</b>	<b>2,717</b>	<b>2,885</b>	<b>1,707</b>	<b>1,424</b>	<b>1,326</b>
Breakdown of R&D Expenditures	1994	1995	1996	1997	1998	1999	2000
Oil and Gas Recovery	572	494	482	585	606	430	453
Other Petroleum	531	461	432	380	365	345	327
Coal Gasification/Liquefaction	W	W	W	W	W	W	W
Other Coal	W	W	W	W	W	W	W
Nuclear and Other Energy	116	50	51	54	28	34	W
Non-energy	1,741	1,744	1,617	1,738	616	538	452
Unassigned	71	100	127	120	85	W	W
<b>Total Expenditures</b>	<b>3,050</b>	<b>2,861</b>	<b>2,717</b>	<b>2,885</b>	<b>1,707</b>	<b>1,424</b>	<b>1,326</b>

W = Data withheld to avoid disclosure. The EIA applies procedures to prevent the disclosure of "individually identifiable energy information" made by the companies required to report the FRS data. The EIA reviews the data to identify whether potential disclosure problems would result from having an insufficient number of reporters or from having values that represent primarily dominant companies in a particular energy sector or activity.

Source: Energy Information Administration, Financial Reporting System. Major energy-producing companies based in the United States annually report their worldwide financial and operating data to the EIA on a uniform and standardized basis on the FRS Form EIA-28. The FRS data system is designed to permit review of the functional performance of the major U.S. energy-producing companies in total, as well as by specific functions and geographic areas of operation. In 2000, 33 companies filed this information.

## Corporate Mergers Scaling Down Research and Development

Our nation has seen a dramatic increase in merger activity in the past few years in all areas of industry. The desire for oil reserves, cost cutting and higher refining/marketing shares has fueled the numerous mergers in the energy sector, creating not only a new name but a consolidated budget. Research and development efforts are combined, often translating into fewer dollars spent by the new corporate giants on R&D.

The \$81 billion merger between Exxon and Mobil, for example, formed the world's largest privately owned petroleum company in terms of revenue. But research and development expenditures by the new ExxonMobil decreased by 16.3 percent in 1999, the year of the merger, and in 2000 decreased by 10.5 percent from the 1999 level.

**Table 5**  
**Examination of Effect of Corporate Mergers  
on R&D Expenditures**

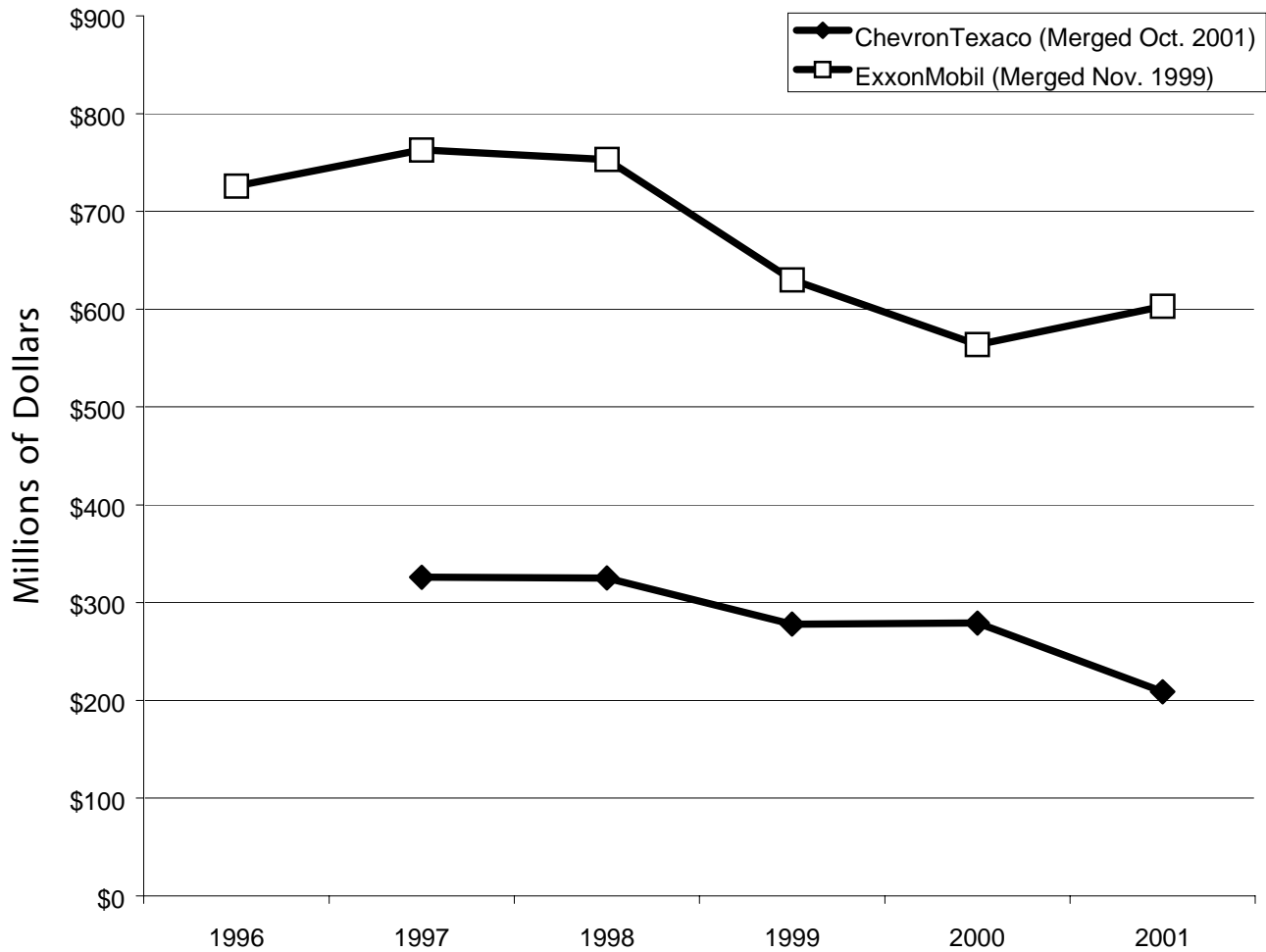
	R&D Expenditures (Millions of Dollars)				
	1997	1998	1999	2000	2001
Chevron Texaco (Merged Oct. 2001)					\$209
Texaco Inc.	\$147	\$138	\$96	\$108	
Chevron Corp.	\$179	\$187	\$182	\$171	
<b>Total</b>	<b>\$326</b>	<b>\$325</b>	<b>\$278</b>	<b>\$279</b>	<b>\$209</b>
ExxonMobil (Merged Nov. 1999)					
Exxon Corp.	\$520	\$529	\$549	\$630	\$603
Mobil Corp.	\$206	\$234	\$204		
<b>Total</b>	<b>\$726</b>	<b>\$763</b>	<b>\$753</b>	<b>\$630</b>	<b>\$603</b>

Source: 10K Annual Reports filed with the U.S. Securities and Exchange Commission

# Corporate Mergers Scaling Down Research and Development - Continued

When Chevron and Texaco merged in late 2001, the combined company's research and development expenditures decreased by 25 percent from the R&D dollars spent by both companies in the year prior to the merger.

### R&D Spending Before and After Corporate Mergers



## Federal Research and Development

Five federal agencies account for an average of 90 percent of the federal government's R&D funding: the Departments of Defense and Health and Human Services, National Aeronautics and Space Administration (NASA), the Department of Energy and the National Science Foundation.

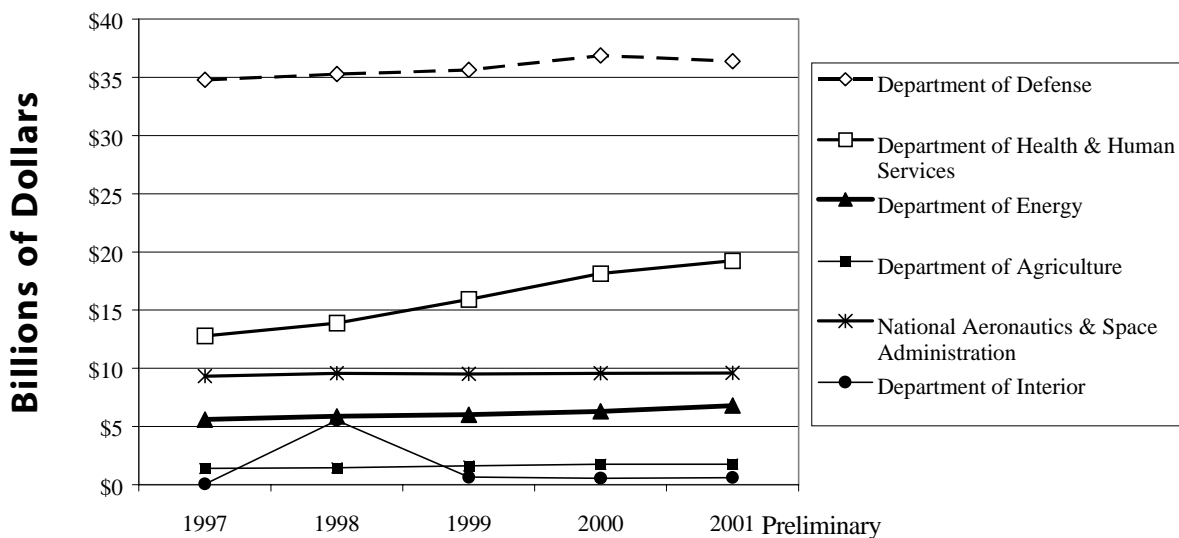
DOE's R&D spending has consistently ranked at the bottom of the scale among the top five research-funded agencies. Total DOE R&D for FY 2002 is \$8.1 billion, a 4.9 percent increase over FY 2001, but that figure remains well below the funding levels of the early 1990s. The bulk of the DOE research budget is dedicated to the nation's nuclear energy and nuclear clean-up areas.

**Table 6**  
**R&D by Federal Agency, 1997-2001**

(Budget Authority in Thousands of Dollars)

Agency	1997	1998	1999	2000	Prelim. 2001
Department of Defense	34,788,263	35,286,223	35,645,859	36,875,907	36,396,615
Department of Health & Human Services	12,785,262	13,901,663	15,915,736	18,140,350	19,234,564
Department of Energy	5,603,506	5,873,804	6,009,730	6,305,572	6,793,467
Department of Agriculture	1,388,619	1,441,046	1,614,133	1,752,045	1,779,318
National Aeronautics & Space Administration	9,327,300	9,568,029	9,525,693	9,568,073	9,602,367
Department of Interior	57,901	5,531,969	641,542	565,974	619,387

Source: U.S. National Science Foundation/Division of Science Resources Studies, Survey of Federal Funds for Research and Development





## Department of Energy Research and Development

The Department of Energy's R&D budget, and especially its non-defense R&D, decreased sharply in the early 1990s following the end of the Cold War, according to the American Association for the Advancement of Science. As evident in Table 7, non-defense R&D has begun to increase again over the last four years but falls behind inflation in FY 2002.

Within DOE's budget, energy R&D will see a small 1.6 percent increase and science R&D a 2.1 percent increase, while defense-related R&D will increase by 8.4 percent. About two-thirds of the DOE budget goes to defense-related activities involving the nation's nuclear weapons stockpile and related environmental clean-up costs, according to the AAAS.

Fossil Energy R&D increases 3.0 percent to \$408 million for FY 2002 – far from the Bush Administration's requested cut of more than 25 percent. The administration's request also would have reduced funding in several key areas, such as oil and gas, by as much as 50 percent, with a slightly increased emphasis on coal research, according to the AAAS. The final appropriations bill keeps funding for fossil fuels R&D close to FY 2001 levels.

**Table 7**  
**Department of Energy R&D**

	(in Millions of Dollars)				
	FY 1998	FY 1999	FY 2000	FY 2001 Estimate	FY 2002 Approved
Energy Supply R&D*	550	373	333	409	417
Fossil Energy R&D	276	295	290	396	408
Energy Conservation	356	400	410	441	454
Science**	2,228	2,651	2,662	2,955	3,018
Atomic Energy Defense Activities	2,979	3,234	3,201	3,499	3,794
Clean Coal Technology***	-101	-40	0	0	0
Radioactive Waste Management	No Data	61	60	45	31
<b>Total DOE R&amp;D</b>	<b>6,288</b>	<b>6,974</b>	<b>6,956</b>	<b>7,744</b>	<b>8,122</b>

\* Energy Supply R&D includes Solar and Renewables and Nuclear Energy R&D.

\*\* Science includes High Energy Physics, Nuclear Physics, Fusion Energy Sciences, Basic Energy Sciences (Spallation Neutron Source), Advance Scientific Computing Research, Biological and Environmental Research, Energy Research Analyses and Multiprogram Lab Support.

\*\*\* Does not reflect previously appropriated funds in this program, nor rescissions and deferrals. Negative for some years because of deferrals of previously appropriated funds.

Source: American Association for the Advancement of Science, AAAS R&D Funding Update - DOE R&D in FY 1999, 2000, 2001, 2002 Appropriations

## Research and Development Spending Outlook

Total R&D expenditures in the United States are expected to increase about 3.5 percent to \$285.6 billion in 2002, according to the annual Battelle Memorial Institute – R&D Magazine Research and Development Funding Forecast. Three factors fueling the expected growth include the change in presidential administration, the faltering economy and the events and aftermath of the Sept. 11, 2001, terrorist attacks.

Industry is expected to spend nearly \$195 billion in 2002, a 3.2 percent increase from 2001, according to the Funding Forecast. “While the total amount is significant, the rate of increase is somewhat less than has been experienced in recent years

and is a reflection of the economic factors that have emerged in the last year,” the Forecast states. Meanwhile, the federal government is expected to spend \$75.5 billion on R&D in 2002, a 4.7 percent increase, and academia and non-profits are expected to provide another \$15.4 billion in R&D funding, about 3 percent more than in 2001.

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**Forecasters agree that continued investment in research and implementation of new technologies are necessary to support the efficient operations of our nation’s economy.**

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“What had been so recently considered a necessity for long-term survival suddenly became a luxury that could be postponed,” the Funding Forecast states. However, the forecasters agree that continued investment in research and implementation of new technologies are necessary to support the efficient operations of our nation’s economy. “Efforts must continue on materials research, higher-efficiency transportation systems, food processing and distribution, energy production/distribution/conservation, and a host of other infrastructure technologies that play a most important role in economic stability.”

## Conclusion

It is evident from the survey that the major oil and gas industry players do not place as high a value on research and development as other industry sectors. The oil and gas industry spends less than average on R&D. In examining R&D expenditures as a percentage of sales, the petroleum refining industry ranked last among the 19 sectors included in the comparison, and the oil and gas field services industry ranked at only 17<sup>th</sup> place. This indicates that from 1997 to 2000 the oil and gas industry did not contribute to the overall growth in industrial R&D expenditures.

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**If the United States is to maintain its ability to produce its domestic supplies of oil and natural gas, federal expenditures on R&D must fill some of the void left by private industry.**

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It has become clear that independent oil and natural gas producers are far too small to take on the huge investments of research and development. And as more and more companies merge, R&D budgets often top the list of expenditures to consolidate, meaning fewer corporate dollars are spent on the research and development so critical to the future of the industry.

Corresponding cuts in federal spending on R&D have created a critical situation.

Government support for energy R&D, which has waived in the past, must be stepped up to meet ever-increasing oil and gas needs. Although energy policy was in the news before the Sept. 11 terrorist attacks, the on-going conflicts in the Middle East should bring a spotlight to our nation's dangerous dependence on foreign oil and the looming possibility of a disruption of the U.S. energy supply.

Programs that create technology to improve recovery rates and lower finding and production costs translate into reasonable energy costs for consumers. Without the technological advances of R&D, our country would be producing far less oil and natural gas resources than it is today. However, R&D cannot be turned on and off but is a cumulative process that if cut off could be setting the stage for a major energy crisis. Such R&D is an investment in the country's future and its energy security.

If the United States is to maintain its ability to produce its domestic supplies of oil and natural gas at a reasonable cost to consumers, federal expenditures on R&D must fill some of the void left by private industry. The key to protecting our nation in the new era of uncertainty in our energy security is strong federal funding for the research needed for enhanced recovery technologies that can increase domestic production.

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The organization's mission is to promote the conservation and efficient recovery of domestic oil and natural gas resources, while protecting health, safety and the environment.

Since its creation in 1935, the IOGCC has assisted states in balancing a multitude of interests — maximizing domestic oil and natural gas production, minimizing the waste of irreplaceable natural resources, and protecting human and environmental health — through sound regulatory practices. The IOGCC plays an active role in Washington, D.C., serving as the voice of the states on oil and natural gas issues and advocating states' rights to govern the resources found within their borders.

For more information about the IOGCC, please call 405/525-3556, visit the World Wide Web at [www.iogcc.state.ok.us](http://www.iogcc.state.ok.us), or send electronic mail to [iogcc@iogcc.state.ok.us](mailto:iogcc@iogcc.state.ok.us)

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