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**THE ROLE OF LARGE INTEGRATED COMPANIES  
IN U.S. OIL AND GAS EXPLORATION**

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## HIGHLIGHTS

In 1984 the 19 "Major" integrated oil companies (see Appendix A) produced just over half of all U.S. oil and gas. The balance was produced primarily by several thousand "Independent" (non-integrated) companies, all of which are substantially smaller than the integrated Majors.

- At year-end 1984 these 19 large companies held 54% of U.S. oil and gas reserves. If the royalty volumes discovered and operated (but not owned) by the large companies are included, their share of total U.S. oil and gas reserves amounts to 63%. The large company share, while still dominant in 1984, has been declining steadily because their share of reserve additions has generally been lower than their share of existing reserves.

- Including royalties, the large companies accounted for 62% of all new oil reserves and 48% of all new gas reserves booked by the industry in 1984.

- The Majors' average reserve/production ratio (year-end reserves divided by the production volume for the year ended) was slightly above the industry's average of 9.5 for oil but slightly below the industry's average of 10.2 for gas (excluding currently unusable North Slope gas reserves).

- The large companies' expenditures for oil and gas producing activities reached the record high level of \$28 billion in 1984. While there are no directly comparable figures for the industry as a whole, it appears from other sources that the Independents' expenditures also reached a record in 1984. The Majors spent a substantially larger share of their expenditures on geological and geophysical work than did the Independents.

- The 19 large companies accounted for only 12% of all exploration wells and a slightly smaller share of development wells in 1984. However, their success ratio was much higher than that of the Independents. For the period 1982-84 45% of the Majors' exploration wells were successful, compared to 30% for the industry as a whole. For development wells the respective success ratios were 90% and 80%.

- During the 5-year period 1980-84 the large companies booked an average of 377,000 barrels of oil equivalent per well drilled (exploration and development), while the industry average was 75,000 barrels, or one-fifth that of the Majors.

This paper analyzes the exploration activities of a group of large integrated petroleum companies and examines their role in the domestic effort to find oil and gas. It updates what has become a series of reports by Petroleum Industry Research Foundation. In energy policy debates involving regulation or taxation of the petroleum producing industry, there is often a distinction drawn between the "Majors" and the "Independents." The latter operate entirely or primarily in the producing segment and are usually substantially smaller than the majors who have integrated upstream and downstream operations. However, while all majors are integrated, not all integrated companies are majors. Different criteria have been applied for differing policies and regulations. The Department of Energy's pre-1981 crude oil allocation program defined 15 companies as "majors" based on their level of integration and refinery capacity. By contrast, the Internal Revenue Service regulations implementing the Crude Oil Windfall Profits Tax Act have the effect of classifying companies with any downstream integration as non-independents, thus subjecting their oil production to higher tax rates. Similarly, percentage depletion is now available only to producing companies with no downstream integration.

The upstream sector of the petroleum industry consists of thousands of companies which drill for and produce oil and gas. Most of the wells--90%--are drilled by the relatively smaller non-integrated companies. The 19 large integrated companies which PIRINC has studied, on the other hand, while drilling about 10% of the wells, find a disproportionately large share of the new reserves booked -- more than 50% of the additions from

drilling and revisions over the period 1980-1984, including the royalty volumes attributable to their efforts.

While the large companies have achieved both a higher success rate (the share of productive wells) and a higher finding rate (the reserve additions per well) than the averages for the entire industry, the efforts of both types of companies remain crucial in maximizing the search for oil and gas. The smaller companies concentrate their activities in the lower-48 onshore regions, the bread-and-butter of U.S. oil supply where the finding rate has fallen substantially in the last decade, because of the declining resource base, and where drilling rates must remain high to maintain reserves. The large integrated companies, on the other hand, are the dominant players in the high risk (and potentially high reward) offshore and frontier areas. The role of the large companies cannot be fulfilled by the small companies, and likewise, the small companies serve a particular function.

We have compiled information from the annual reports and Form 10-K published by the large integrated companies to update the earlier information. We can readily identify the large companies and easily gather their data, unlike the task of compiling information for the many thousands of smaller companies. We therefore compare the data for the large integrated companies with the generally accepted sources of industry-wide information. The activities of the smaller companies are derived by difference. Each of our 19 large integrated companies owns extensive oil and gas reserves and oil

refining assets. A list of their names is attached in the Appendix.

The large companies hold just over half of the oil and gas reserves, and produce about half of the total U.S. volume. These companies' share of oil reserves and production is higher than their shares of the comparable gas figures; several of the most important gas producers are classified as pipeline companies and thus fall outside of our sample. As shown in Table 1, the large companies' share of U.S. total oil and gas reserves has been falling in recent years, because these companies do not find new reserves in proportion to their historical total reserve share. In the period since 1980, the companies have accounted for a relatively steady share of over 40% of new reserves (excluding the royalty volume, see page 4), while their share of total existing reserves has fallen from 58% to 54%.

At year-end 1984 their oil reserves (crude and NGL's) of 10.3 times their annual production were slightly larger than the industry's reserve/production ratio of 9.6. For natural gas the large companies' reserve/production was 13.4, compared to the industry's ratio of about 11.5. However, the gas reserves include some 26 TCF of natural gas in Northern Alaska, all of which are held by the large company group and none of which will have a market outlet in the foreseeable future. If we eliminate the Northern Alaskan gas reserves from both gas totals, the gas reserve/production ratios of the large companies falls to 9.9 and that of the industry to 10.0 years.

The large companies show 1984 reserve additions from drilling ("discoveries, extensions, and other additions") of 2

billion barrels, the highest level in the 1980-1984 period. Department of Energy's "revision" classification includes some entries treated as "additions" in the companies' reports. To compare the company information with DOE's industry-wide estimates, we combine net revisions (including improved recovery) with discoveries to arrive at what we call "new reserves booked." As pointed out, the large companies have accounted for more than 40% of total new reserves booked over the past five years (2.6 billion barrels of oil equivalent\* annually, compared to the U.S. total of 6 billion barrels annually). In the most recent years (1983 and 1984) their share has grown to about 50%. In part this was due to their ability to book substantial reserve volumes in 1984 on the North Slope of Alaska, an area where small companies are not active. Improved recovery was also a big factor for the large companies in 1984, accounting for more than 700 million barrels of their new reserves booked. Projects in Alaska (such as the Prudhoe Bay waterflood) and Chevron's San Joaquin steamflood project in California were particularly important. (See Table 1.)

These new reserves booked by the large companies do not include for the royalty volumes: when a company discovers oil or gas, it owes a portion of the volume to the owner of the property, and thus the company books only the portion of the oil or gas which belongs to it, about 86% of the total, to account for the common one-seventh royalty share. When crediting reserve

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\* Oil equivalent includes petroleum liquids and natural gas converted to oil barrels on a Btu-equivalent basis.

Table 1

SUMMARY OF RESERVES CHANGES, 1980-1984

	Large Companies			U. S. Total		
	Liquids	Gas	Total	Liquids	Gas	Total
1980						
Jan. 1 Reserves	22844	105961	41113	36425	200997	71080
Revisions	412	-715	289	1993	109	2012
Improved Recov.	434	93	450	*	*	*
Discoveries	589	5195	1485	1449	14473	3944
Purch/(sales)	150	649	262	0	0	0
Production	-2090	-8914	-3627	-3706	-18699	-6930
1981						
Jan. 1 Reserves	22339	102268	39971	36533	199021	70847
Revisions	340	1272	559	1357	2599	1805
Improved Recov.	355	102	373	*	*	*
Discoveries	669	5886	1684	1925	17220	4894
Purch/(sales)	14	196	48	0	0	0
Production	-2049	-8567	-3526	-3690	-18737	-6921
1982						
Jan. 1 Reserves	21664	101025	39082	36494	201730	71275
Revisions	267	1173	469	629	2883	1126
Improved Recov.	266	67	278	*	*	*
Discoveries	648	4816	1478	1627	14455	4119
Purch/(sales)	-15	-18	-18	0	0	0
Production	-2025	-7673	-3348	-3671	-17506	-6689
1983						
Jan. 1 Reserves	20805	99571	37972	35079	201512	69822
Revisions	462	1707	756	1577	-15	1574
Improved Recov.	597	62	608	*	*	*
Discoveries	569	4043	1266	1414	11448	3388
Purch/(sales)	70	317	125	0	0	0
Production	-2005	-6800	-3177	-3745	-15788	-6467
1984						
Jan. 1 Reserves	20499	98899	37551	35636	200247	70161
Revisions	539	792	676	2587	3129	3126
Improved Recov.	721	161	749	*	*	0
Discoveries	989	5974	2019	1643	13521	3974
Purch/(sales)	292	423	365	0	0	0
Production	-2035	-7395	-3310	-3813	-17193	-6777
Jan. 1, 1985	20986	98854	38030	36089	197463	70134

Notes: Units as follows: liquids in millions of barrels, gas in billions of cubic feet, total in billions of barrels of oil equivalent. Large Company data has been adjusted for Phillips adjustment in 1984 to its 1982 and 1983 gas and NGLs reserves, and for the addition of Tema Oil to Tenneco's figures in Jan. 1, 1984.

U.S. data include the balancing item, "net adjustment," only in the totals. Improved recovery is included in U.S. number for revisions.

Reserves figures the large companies exclude their royalty share.

additions or revisions to one set of companies, we appropriately account for the royalty share on the discoverer's side of the ledger. (These royalty volumes are, of course, included in U.S. totals.) Including their royalty, the large companies accounted for more than 62% of the new oil reserves booked and 48% of the new gas reserves booked in 1984. In 1983 the comparable figures were 63% and 59%.

The large companies' expenditures for oil and gas producing activities in 1984 were at a record level. The 19 companies reported \$28 billion in capitalized and expensed costs, slightly higher than the previous peak in 1981. Acquisition of both proved and unproved property was an important factor, but it should be noted that the two most well-publicized acquisitions are not included here. Texaco reports the acquisition of Getty as an extraordinary item and Chevron remained under its "hold separate" order from the Federal Trade Commission throughout 1984, so its acquisition of Gulf's properties was not yet consummated. Gulf's expenditures are included in the compilation. Exploration expenditures (other than property acquisition) were also at a new peak in 1984, and development expenditures, while not at their peak, rose \$2 billion between 1983 and 1984.

There are no comparable industry-wide data for expenditures. The American Petroleum Institute gathered data from a special questionnaire to producers and drillers in early 1985; PIRINC has used other pieces of the questionnaire's information in its report, "Trends in U.S. Oil and Gas Exploration and Production." The figures supplied by the 266 "non-major" companies (primarily



Table 2

**COSTS INCURRED BY 19 LARGE INTEGRATED COMPANIES  
RELATED TO OIL AND GAS PRODUCTION, 1980-1984**

(Millions of Dollars)

	<u>Exploration</u>	<u>Development</u>	<u>Property Acquisition</u>	<u>Total</u>
1980	5,874	8,261	7,440	21,575
1981	8,048	11,683	6,990	26,721
1982	8,365	13,120	4,777	26,262
1983	7,086	9,888	6,425	23,399
1984	8,528	11,053	8,471	28,052

Source: Company annual reports.

independent producers) for the API's questionnaire confirm a high level of industry expenditures in 1984, with an increase in the property acquisition component bringing the total costs incurred in producing activities in that year to the highest level of the 1982-84 period.

The API questionnaire responses also point out that the large companies devote a higher share of their exploration and development budgets than the non-majors to expenditures other than drilling and equipping wells, such as geological and geophysical work, for example. According to the questionnaire data, the major company respondents spent an average of 55% of their exploration and 67% of their development expenditures on drilling and equipping wells over the 1982-84 period. In contrast, the rest of the questionnaire respondents (the non-

majors) spent about 82% of both their exploration and development budgets on drilling and equipping wells.

Well completion figures show the large companies as a small share of the total, approximately 12% of the exploration wells and a slightly smaller share of total development wells. These companies, however, have a markedly higher success rate than the industry average. As shown in Table 3, 45% of the large companies' exploration wells completed between 1980 and 1984 hit oil or gas. For the industry as a whole, less than 30% of the exploratory wells were successful. For development wells, the large companies achieved a success rate in excess of 90%, at the same time the industry's average success rate was less than 80%. It is important to relate reserve additions to the drilling completions to assess the full contribution of the large companies. In Table 4, we show the large companies' reserve additions, adjusted for royalty volumes, and the reserve additions per well. Based on discoveries, extensions and other additions compared to exploratory well completions, reserve additions per well for the large companies averaged 1,000,000 barrels from 1981 to 1984.

There are no valid comparable data for the industry as a whole. Thus, in order to relate drilling activity to changes in reserves for the industry as a whole, we must use the data for new reserves booked, whether from discoveries or net revisions, compared to exploration and development well completions. The resulting index is therefore a broader measure of the success of exploration and development efforts. As shown in Table 5, the the large companies booked the equivalent of 377,000 barrels per

Table 3

DRILLING ACTIVITY OF LARGE PETROLEUM COMPANIES, 1980-1984

Number of Wells	Large Companies			Large Companies' Share of U. S. Total
	Prod.	Dry	Total	
Exploratory				
1980	883.4	906.5	1789.9	14
1981	982.7	1153.5	2136.2	12
1982	873.6	1020.4	1894.0	12
1983	687.0	895.8	1582.8	12
1984	774.3	1110.4	1884.7	13
Development				
1980	6085.9	404.2	6490.1	11
1981	7199.6	461.1	7660.7	11
1982	6361.5	541.7	6903.2	10
1983	6068.6	543.3	6611.9	11
1984	7675.6	599.4	8275.0	12
Total				
1980	6969.3	1310.7	7431.8	11
1981	8182.3	1614.6	8586.4	10
1982	7235.1	1562.1	7924.6	9
1983	6755.6	1439.1	7322.5	10
1984	8449.9	1709.8	9206.6	11

## Success Rates

	Large Co' s	U. S. Total
Exploratory		
1980	49	30
1981	46	30
1982	46	29
1983	43	27
1984	41	25
Avg.	45	28
Development		
1980	94	80
1981	94	79
1982	92	78
1983	92	78
1984	93	79
Avg.	93	79
Total		
1980	94	71
1981	95	70
1982	91	69
1983	92	69
1984	92	70
Avg.	93	70

Source: Company annual reports and American Petroleum Institute.

Table 4

**RESERVE ADDITIONS PER WELL FOR THE  
LARGE COMPANIES**

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	Exploratory Wells Completed		Reserve Additions (MM BOE)
	Successful (Number)	Total	
1980	883	1,790	1,727
81	983	2,136	1,958
82	874	1,894	1,719
83	687	1,583	1,472
84	774	1,884	2,348

Additions Per Well (Thousands of Barrels of Oil Equivalent)

	Successful	Total
1980	1,955	965
81	1,992	917
82	1,968	908
83	2,143	930
84	3,032	1,246

Note: Reserve additions of the large companies include the royalty share, estimated for this purpose at 1/7.

Sources: Company annual reports. Calculations made by PIRINC.

well from 1980-1984, five times more than the industry-wide figure of 75,000. The lower figure shown in Table 5 for the large companies versus that shown in Table 4 is due to the inclusion of all wells--exploration and development--in the divisor and the inclusion of net revisions in the numerator in Table 5.

Table 5

NEW RESERVES BOOKED PER WELL

(Thousands of Barrels of Oil Equivalent)

	<u>Large Companies</u>	<u>U.S. Total</u>
1980	348	86
1981	352	75
1982	326	62
1983	418	65
1984	435	87
5-yr Average	377	75

Note: Large company reserves include royalty share, estimated at 1/7. New reserves booked include additions from discoveries, improved recovery and net revisions. Well completions include exploratory and development wells.

Sources: Company annual reports, American Petroleum Institute, Department of Energy. Calculations by PIRINC.

Altogether then, it appears that the large integrated oil companies and the independents perform somewhat different but complementary functions in finding and developing U.S. oil and gas reserves. The large companies, while active in all areas, are increasingly moving into the less accessible, unexplored parts of the Outer Continental Shelf, in deeper and tighter reservoirs onshore in the lower 48 states and in the Arctic region. The capital and technical requirements to locate and develop these resources are generally beyond the capability of the Independents. The primary discovery function of the latter will remain the location of the remaining reservoirs in the historic

on-shore and off-shore areas and the extension of existing reserves by improving their recovery rates. To arrest our continuing resource depletion will undoubtedly require maximum efforts by both groups.

APPENDIX A

LARGE INTEGRATED COMPANIES INCLUDED IN DATA

Amerada Hess Corp.	Pennzoil Co.
Atlantic Richfield Co.	Shell Oil Company
Conoco Inc. (DuPont)	Standard Ohio Co. of California
Diamond Shamrock Corp.	Standard Oil Co. (Indiana)
Exxon Corp.	The Standard Oil Co. (Ohio)
Getty Oil Co.	Sun Company
Gulf Oil Corp.	Tenneco Inc.
Marathon Oil Co. (U.S. Steel)	Texaco Inc.
Mobil Corp.	Union Oil Co. of California
Phillips Petroleum Co.	