Attachment F.

An Analysis of the Department of the Interior's Proposed Acceleration of Development of Oil and Gas on the Outer Continental Shelf

84th Congress
1st Session } COMMITTEE PRINT

AN ANALYSIS OF THE DEPARTMENT OF THE INTERIOR'S PROPOSED ACCELERATION OF DEVELOPMENT OF OIL AND GAS ON THE OUTER CONTINENTAL SHELF

PREPAREED AT THE REQUEST OF

HON. WARREN G. MAGNUSON, *Chairman, Committee on Commerce*

AND

HON. ERNEST F. HOLLINGS, *Chairman, National Ocean Policy Study*

FOR THE USE OF THE

COMMITTEE ON COMMERCE

AND

MEMBERS OF THE NATIONAL OCEAN POLICY STUDY

PURSUAANT TO

S. **Res. 222**

NATIONAL OCEAN POLICY STUDY

MARCH 5. 1975

Printed for the use of the Committee on Commerce,
United States Senate

U.S. GOVERNMENT PRINTING OFFICE
47-857 0 WASHINGTON : 1975

COMMITTEE ON COMMERCE

WARREN G. MA NUSON, Washington, Chairman

JOHN O. PASTORE, **Rhode Island**
VANCE HARTKE, Indiana
PHILIP A. HART, **Michigan**
HOWARD W. CANNON, Nevada
RUSSELL B. LONG, Louisiana
FRANK E. MOSS, Utah
ERNEST F. HOLLINGS, South Carolina
DANIEL K. INOUYE, Hawaii
JOHN V. TUNNEY, California
ADLAI E. STEVENSON, Illinois
WENDELL II. FORD, Kentucky

JAMES B. PEARSON, Kansas
ROBERT P. GRIFFIN, Michigan
TED STEVENS, Alaska
J. GLENN BEALL, Jr., Maryland
LOWELL P. WEICKER, Jr.,Connectiaut
JAMES L. BUCKLEY, New York

FREDERICK J. LORDAN, *Staff Director*
MICHAEL PERTSCHUCK, Chief Counsel
8. LYNN SUTCLIFFE, General Counsel
ARTHUR PANKOPF, Jr., **Minortity Counsel and Staff** *Director*
MALCOLM M. B. STERRETT, *Staff Counsel*

NATIONAL OCEAN POLICY STUDY

FROM THE COMMITTEE ON COMMERCE

ERNEST F. HOLLINGS, South Carolina, *Chairman*

WARREN G. MAGNUSON, Washington
JOHN O. PASTORE, Rhode Island
VANCE HARTKE, Indiana
PHILIP A. HART, Michigan
HOWARD W. CANNON, Nevada
RUSSELL B. LONG, Louisiana
FRANK E. MOSS, Utah
DANIEL K. INOUYE, Hawaii
JOHN V. TUNNEY, California
ADLAI E. STEVENSON, Illinois
WENDELL H. FORD, Kentucky

JAMES B. PEARSON, Kansas
ROBERT P. GRIFFIN, Michigan
TED STEVENS, Alaska
J. GLENN BEALL, JR., Maryland
LOWELL P. WEICKER, Jr., Connecticut
JAMES L. BUCKLEY, Now York

FROM THE COMMITTEE ON PUBLIC WORKS

EDMUND S. MUSKIE, Maine — **JAMES L. BUCKLEY, New York**

FROM THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

LEE METCALF, Montana — **MARK O. HATFIELD, Oregon**

FROM THE COMMITTEE ON FOREIGN RELATIONS

CLAIBORNE PELL, Rhode Island — **CLIFFORD P. CASE, Now Jersey**

FROM THE COMMITTEE ON APPROPRIATIONS

LAWTON CHILES, Florida — **CHARLES McC. MATHIAS, Jr., Maryland**

FROM THE COMMITTEE ON GOVERNMENT O PERATIONS

ABRAHAM RIBICOFF,Connecticut — **CHARLES PERCY, Illinois**

FROM THE COMMITTEE ON LABOR AND PUBLIC WELFARE

HARRISON A. WILLIAMS, JR., New **Jersey** — **RICHARD S. SCHWEIKER, Pennsylvania**
EDWARD M. KENNEDY, Massachusetts
(Alternate)

FROM THE COMMITTEE ON ARMED SERVICES

STUART SYMINGTON, Missouri — **WILLIAM L. SCOTT, Virginia**

MEMBERS AT LARGE

HUBERT H. HUMPHREY, Minnesota — **JOHN TOWER, Texas**
LLOYD BENTSEN, Texas — **BOB PACKWOOD, Oregon**
J. BENNETT JOHNSTON, Jr., Louisiana — **WILLIAM V. ROTH, Jr., Delaware**

JOHN F. HUSSEY, Director, *NOPS*
JAMES P. WALSH, Staff Counsel
PAMELA L. BALDWIN, Professional Staff Member
ROBERT K. LANE, Professional Staff Member
GERALD J. KOVACH, Minority Staff Counsel

LETTER OF TRANSMITTAL

U.S. SENATE,
COMMITTEE ON COMMERCE,
Washington, D. C., March 5, 1975.

DEAR COLLEAGUE: I am pleased to forward this staff analysis of four major policy issues related to the Department of the Interior's proposal to significantly expand leasing of lands on the Outer Continental Shelf (OCS) in 1975 for the exploration and development of oil and gas rserves.

analysis was conducted by the staff of the National Ocean Policy Study. We wish to express our appreciation for significant portions. of this effort to the staff of the Ocean Project Group of the Congressional Office of Technology Assessment (OTA), including Robert W. Niblock, Thomas A. Cotton, and Lionel S. Johns. This work is an adjunct to the OTA assessment of the onshore impacts of three different energy--related technologies (OCS development, deep-water ports, and floating nuclear power plants) upon the coastal zone of New Jersey and Delaware, which was requested by the National Ocean Policy Study. It is also connected with the assessment by the Ocean Project Group of the feasibility of separation of exploration from development in current OCS lease procedure which was requested jointly by the Committee on Commerce and the Committee on Interior and Insular Affairs.

This preliminary analysis by the staff suggests that if in fact the entire 10 million acres were leased, it would overextend present and projected industry exploration capacity; that it is in the Nation's interest to quickly determine the extent and nature of OCS resources, but more caution should be exercised in their development; that the coastal States are almost unanimous in their opposition to the Department's present proposal but are willing to cooperate in a more orderly development of these resources; and that since accelerated leasing during the past two years has reduced competition and the return to the public, it is likely that the proposed acceleration will have even more adverse impacts.

I wish to emphasize that the conclusions incorporated into this staff report, which may rove to be controversial, have neither been approved, disapproved , nor considered by the Senate Committee on Commerce or the National Ocean Policy Study.

ERNEST F. HOLLINGS,
Chairman, National Ocean Policy Study.

CONTENTS

INTRODUCTION

In an address to the Nation on January 23, 1974, President Nixon directed the Secretary of the Interior to increase the acreage leased on the Outer Continental Shelf to 10 million acres beginning in 1975. This more than tripled the acreage the Department of the Interior originally @anneal to lease. The basic objective of the proposed acceleration in OCS development was to increase domestic production as rapidly as possible and reduce dependence on expensive and unstable foreign supplies of oil. The proposed plan would involve leasing in eve "frontier" area within the next four years.

A number of questions about the fusibility and desirability of the proposal have since been raised by the Congress and representatives of nearly every coastal state. This analysis addresses four recurring questions: 1. What are the longer term resource and energy implications of rapid development of OCS oil and gas? 2. What effect will this acceleration have on revenue returns from the sale of these public lands? 3. Does the industry have the capacity to explore the 10 million acres? 4. Can this development proceed without serious disruption of those adjacent coastal states which have no previous experience or supporting onshore infrastructure?

The analysis of these questions is brood on preliminary information and data developed for several ocean assessments that the Office of Technology Assessment has underway for the National Ocean Policy Study.

L SUMMARY

A. Long term implications of resource depletion

The accelerated leasing program is intended to replace expensive and **unstable** foreign **imports by domestic production as quickly as possible, but recent estimates of remaining recoverable oil resources in the U.S. made by the National Academy of Sciences and others suggest that accelerated development of domestic production could lead to serious depletion or exhaustion by the end of the century. If they are correct, substitution of domestic oil for imports in the short run may lead to a greater dependency on imports in the long run unless consumption can be reduced and acceptable alternative sources can be developed rapidly.**

Policy for the development of OCS oil and gas will be integral part of an overall U.S. energy strategy. A basic determinant of this strategy will be the amount of domestic recoverable oil and gas that is yet to 'be" discovered. Estimates of these amounts are the subject of considerable disagreement. At one extreme, the most estimate of the &. Geological Survey (400 billion barrels of undiscovered recoverable oil) implies that domestic production could exceed 20 million barrels a day by 1985 and remain there through 2020, declining below current levels of production only after the middle of the next century.[1] At the other extreme, estimates by the National Academy of Sciences (113 billion barrels), Mobil Oil Corporation (88 billion barrels), and others imply that domestic resources could be seriously depleted or exhausted by the end of this century even if consumption were held at current levels.[2]

The fact which has not been clearly recognized in discussions of an accelerated OCS leasing program is that the appropriate rate for the development of domestic resources is dependent upon which estimates are correct. If the optimistic figures are valid, then we plenty of time to develop alternatives in an deliberate manner, and could perhaps reasonably aim at effectively eliminating oil imports by 1985 or 1990. But if the pessimistic estimates are correct, it may be necessary not only to take very strong measures to curb demand and to accelerate the development of acceptable alternative sources of petroleum products, but also to limit production from domestic sources below the maximum efficient rate and to accept a relatively high level of imports, in order to avoid a period of extremely heavy dependence on imports toward the end of this century. In either case, reliance upon synthetics from oil shale and coal to replace declining domestic production will require the solution of major technical and enviromental problems associated with their production.

[1] Federal Energy Administration, *Project Independence Report*, November 1973, p. 430.
[2] All resource estimates are cited in table II-1. Estimates of timo until exhaustion are found in table II-2.

Despite the differences in resource estimates, all projections agree that a major fraction (from 32% to 61%) of the remaining undiscovered recoverable oil will be found on the Outer Continental Shelf. Thus a more coherent energy policy cannot evolve until the true extent of these resources is more precisely known. Every major decision on U.S. energy strategy may hinge on the extent of these resources and the rate at which they are developed. Under the present system for allocating and developing OCS oil and gas, decisions that are in effect irreversible are set in motion on a very limited factual basis. The critical question that now must be addressed is what is the best method for "modernizing" the existing system to ensure that these resources are developed in a manner that does not result in a catastrophic disruption—economic, environmental or social—in the short term or long term?

B. Effects on return to the public

Evidence from 1973 and 1974 lease sales shows that competition has declined as acreage offered has increased and suggests that the proposed accelerated leasing program may lead to a significant reduction in the return the public receives for its resources. Recent Department of the Interior efforts to increase competition in bidding and to reject unacceptably low bids appear inadequate to counteract the effects of greatly accelerated offerings.

The greatly accelerated OCS leasing program proposed by the Department of the Interior may significantly reduce the competition for OCS tracts, thereby failing to ensure that the public receives fair market value for its resources. This effect is already apparent in the five sales of new acreage in 1973 and 1974. During this period, while the area offered for bids nearly doubled, the average number of **bids** per tract receiving bids (a good measure of overall competition) declined sharply from 5.3 bids per tract in the first sale of 1973 to 2.2 bids per tract in the last sale of 1974.[3]

This decline was accompanied by a considerable increase in the proportion of tracts leased on the basis of only one or two bids, the level of competition identified by a Department of the Interior analysis as being low enough to jeopardize the receipt of fair market, value by the public.[4] In the first sale of 1973, 37.0% of the tracts leased, representing only 9.3% of the bonus money accepted, received no more than two bids. But the last sale of **1974, the** fraction leased on the basis of only one or two bids had risen to 66.9%; more importantly, these facts now represented **39.4%** of the bonus money accepted in

The Department of the Interior's system for estimating the resource value of tracts offered for lease may not be adequate to ensure a fair return to the public in the face of declining competition. The Department has recently improved its presale tract evaluation system, but in the last sale (February, 1975) the total of the high bids on tracts

[3] Unless otherwise noted, all data concerning lease sales are derived from U.S. Department of the Interior, Bureau of Land Management, New Orleans Office, "Outer Continental Shelf Statistical Summary, 1973-1975."

[4] U.S. Congress, House Permanent Select Committee on Small Business, Subcommittee on Activities of Regulatory Agencies, 1 Energy Data Requirements of the Federal Government, Part III—Federal Offshore Oil and Gas Leasing Policies," Hearings, 93d Cong., 2d sess., Mar. 26, 27; Apr. 9-11; May 7, 1974, (Washington D. C.: U.S. Government Printing Office, 1974), p. 244.

receiving bids was still nearly twice (1.93) the sum of the Department's evaluations of the tracts.[5] This ratio would lead to a cumulative undervaluation of **$7.2** billion if applied to the **sale** of **10** million acres for $15 billion in 1975. one likely cause of this difference is the fact that for recent sales the Department has based its presale evaluations on the assumption that the OPEC **cartel** would break and that world prices would decline substantially below current levels and would remain low in real terms throughout the productive life of the tracts.[6] In the February, **1975 sale** the Department assumed a mean oil price of **$7.67 in its** presale calculations; if the rice in fact remains at or above $11.00, this would lead to an undervaluation of over 30%.

C. Principal coastal state concerns related to accelerated OCS development

The proposed 10 million acre lease program and the Department of the Interior's implementation plans have been severely criticized by leading representatives of nearly all the coastal states. The coastal states have proposed major reforms in OCS leasing and management procedures, and new legislation which would provide for the Government to contract for a comprehensive program of exploration on the Continental Shelf has been introduced. Prolonged delays in the development of OCS resources may result unless the Department becomes more responsive to coastal state concerns.

The Department of the Interior's lack of awareness of the issues and concerns at the state level has served to unite the coastal states on the OCS issue. The state solidarity on the issue is substantival revealed in a major policy statement adopted by the National Governors' Conference **on** February 20, 1975.[7] The rune point Policy Position on OCS Energy Resources was adopted by a 30 to **1** margin. It calls for prompt exploration of the OCS; exploration of OCS resources prior to the decision to produce these resources; a phased production objective for OCS resources; new leasing schedules and procedures; administratative or legislative reform to provide for a more effective state role in resource management; Federal funding to assist the states in coping with planning needs and adverse impacts of OCS development; and strict liability and no-fault compensation measures.

Senator Ernest F. Hollings of South Carolina introduced legislation (S. 426) in the 94th Congress which would separate exploiration for oil and **gas on** the **OCS from development and production by having** the government contract for a comprehensive exploration program. Senator Henry M. Jackson of Washington has introduced legislation (S. 740) to create a National Energy Production Board, which would be authorized to carry out a Federal oil and gas exploration program. The Coastal **Zone** Environment Act of 1975 (S. 586) introduced by Senator Hollings on February 5, 1975, is intended to provide State and local governments with financial and technical assistance to adequately plan for, accommodate **and** anaticipate **growth problems** caused by OCS development. It provides a Coastal Impact Fund of up to $200 million per year and an additional $10 **million for short term research on specific problems.**

[5] Provided by the U.S. Department of the Interior.
[6] Assumptions provided by tho U.S. Department of the Interior.
[7] National Governors' Conference, "Policy Position on OCS Energy Resources," Feb. 20, 1976.

D. Industry's capacity to explore 10 million acres

Limited availability of mobile drilling platforms may restrict the total OCS area that could be explored in the next five years to no more than seven million acres. Offering Up to 19 million acres in 1975 to lease 10 million may thus fail to increase production faster than would a lower leasing rate.

Studies by the Federal Energy Administration (FEA) [8] and the National Petroleum Council (NPC)[9] of the availability of equipment, manpower, and capital for oil and gas exploration have agreed that the supply of mobile drilling rigs will be one of the major constraints on the ability to explore new OCS acreage. Our own calculations-based on data and analysis from FEA, NPC; and Offshore Rig Data Services,[10] an industry information service—show that the total number of rigs that could reasonably" be expected to be available in the U.S. between now and 1980 could support exploration of a maximum of seven million acres. Since about 2.7 million acres which were leased in 1973 and 1974 must be explored as well, an additional 10 million acres leased in 1975 would Almost certainly exceed the available rig capacity for the next five years (the current term of OCS leases) oven if no further leasing were to take place until 1980.

The National Petroleum Council's recommendations concerning OCS leasing support the conclusion that 10 million acres would exceed the area the industry can explore in five years. in 1972, the NPC, an advisory board to the Secretary of the Interior made up largely of oil industry representatives, recommended that the rate of OCS leasing increase from one million acres per year to 1.6 million acres per year by 1980, and to 2.3 million acres per year by 1985, with a goal of leasing 21 million new acres by 1985.[11] The Department of the Interior's proposal to lease **10** million acres in 1975 is over six times the rate that the NPC suggested should be reached in 1980.

---

[8] Federal Energy Administration, op. cit., pp. 238–249.
[9] National Petroleum Council, "Availability of Materials, Manpower and Equipment for the Exploration, Drilling and Production of Oil—1974–1976," September 1974.
[10] Offshore Rig Data Services, "The Offshore Rig Location Report," December 1974, Jan. 10, 1975.
[11] National Petroleum Council, "U.S. Energy Outlook," (Washington, D. C.: U.S. Government Printing Office, December 197'2.)

11. LONG RUN IMPLICATIONS OF RESOURCE DEPLETION

The purpose of the Department of the Interior's proposed 10 million acre leasing program is to accelerate production of OCS oil and gas as rapidly as possible by leasing the most attractive prospects in each frontier area. The basic rationale for this objective is the fact that the OCS can produce oil and gas at a far lower cost than either foreign sources or alternatives such as oil from shale or coal. Thus substitution of OCS oil for expensive imports can both reduce the real cost of energy to the U.S. economy, and at the same time reduce our vulnerability to restrictions in foreign sup lies.

While the case for expanding OCS oil an gas production in the short run has considerable merit, our subsequent analysis will show that. there remain a number of major questions about the appropriateness of the Department of the Interior's reposal for achieving this objective. Furthermore, there are potentialy serious long-run implications of rapid exploitation of depletable domestic oil and gas resources that have not been given adequate consideration in the analyses of accelerated development performed by either the Deparatment of the Interior or the F A. The problem is that the benefits obtained by substituting domestic OCS production for imports in the near future might be offset by the costs that could occur in the long run if domestic resources are substantially depleted before alternate sources, such as oil shale and coal synthetics, can be developed in sufficient quantities.

The magnitude of this potential problem depends crucially on the amount of remaining U.S. domestic petroleum resources, a question which will be considered in this section. To summarize the results of this analysis, while the most optimistic estimates of remaining resources imply ample supplies of petroleum well into the next century, the more **conservative estimates suggest that U.S. resources could be exhausted** by the end of this century even if consumption were held at current levels.

The fact which has not been clearly recognized in discussions of an accelerated OCS leasing program is that the apropriate rate for the development of domestic resources is dependent upon which estimnates are correct. If the optimistic figures are valid, then we have plenty of time to develop alternatives in a deliberate manner, and can perhaps reasonably aim at effectively eliminating oil imports by 1985 or 1990. But if the pessimistic estimates are correct, it may be necessary not only to take very strong measures to curb demand and to accelerate the development of alternative sources of petroleum products, but also to limit production from domestic sources below the maximum efficient rate and to accept a relatively high level of imports, in order to avoid a period of extremely heavy dependence on imports toward the end of this century. This problem will examined in more detail in the remainder of this section.

In 1973, the U.S. consumed petroleum liquids at a rate of 17.3 million barrels per day, or 6.3 billion barrels per year. Of this amount, 11.1 million barrels were produced in the U.S. and 6.2 million (35.9%)

were imported. According to 1974 estimates of the American Petroleum Institute (API) and the American Gas Association (AGA), the U.S. has 46.9 billion barrels of roved and indicated reserves of oil and natural gas liquids (NGL).[1] This amount represents only 11.6 years of reduction at the 1973 rate of production of 11.1 million barrels per day, or 7.4 years of production at the 1973 rate of consumption.

Of course, existing reserves cannot produce ae a constant rate; instead, the rate of production declines continuously over the lifetime of a reserve. For, this reason, while the average production per well of the 500,000 producing wells **in the U.S. in** 1972 **was 22 barrels per** day, over 359,000 of those were producing 10 barrels per day or less.[2] For example, total U.S. production of oil and natural gas liquids declined about 4% in 1974 in spite of the increase of the price of new oil to over $10 per barrel.[3] If this rate of decline continues, the output of existing U.S. wells may drop to 60% of the present level by 1985, thereby reducing a shortfall of **4.4 million barrels per day in 1985 even if U.S. consumption does not grow at all during the next 10 yeara. (Several indications from BLM and industry sources suggest that in fact a 40% decline in 10 years** may be **an optimistic assump**tion, **and that production from existing wells may instead drop at a** rate as high as 7% per year in the next several years.)

If we are simply to replace both the projected decline of 4.4 million barrels per day of domestic production and the 1973 import, level of 6.2 million barrels per day by 1985, without taking into account any growth in domestic consumption, we would have to provide an additional 10.6 million barrels per day of new production by 1985.

The magnitude of the oil supply problem becomes more evident if we take into account the effects of an annual rate of growth of demand for petroleum liquids of a conservative 2% per year. This is well below the 5.6% growth rate in the US between 1970 and 1973[4] and below the USGS 1972 projection of a 3.6% annual growth rate from 1972 to 1985, which was the figure used by the Department, of the Interior in its impact statement to justify the 10 million acre lease sales Over 10 years, a 2% annual growth rate represents an additional demand of 3.8 million barrels per day in 1985. When added to the 10.6 million barrels per day that would be needed to replace current imports and projected declines in current output, this implies a need for 14.4 million barrels per day of new production in 1985, or additional imports of 8.2 million barrels per day.

The purpose of the accelerated OCS leasing program is to provide the new production that is needed to replace declines from old wells and to reduce or eliminate the need for imports, However, the complete replacement of imports by new domestic production could create a need for greater imports by the end of this century. This can be seen by examining current estimates of remaining U.S. oil resources. The following table compares some of the most important recent estimates.

---

[1] American Gas Association, American Petroleum Institute, Canadian Petroleum Association, "Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas in the United States and Canada nnd United States Productive Capacity as of Dec. 31, 1973," vol. 28, June, 1974.

[2] National Petroleum Council, "Availability of Materials, Manpower and Equipment for the Exploration, Drilling nnd Production of Oil—1974-1976," September, 1974.

[3] Estimated from IT. S. Department of the nterior, Bureau of Mines, "Crude Petroleum, Petroleum Products, and Natural Gas Liquids," October 1974.

[4] FEA, "Oil: Possible Levels of F uture Production," a Project Independence Task Force Report, p. II-7 exhibit II-4.

[5] "Proposed Increase i. Acreage t. be Offered for Oil and Gas Leasing on the Outer Continental Shelf: Draft Environmental Impact Statement," DES 74-90, U.S. Department of Interior Bureau of Land Management, October 1974.

51-542 O -75- 18

TABLE II-1.—ESTIMATES OF UNDISCOVERED RECOVERABLE OIL RESOURCES OF THE UNITED STATES

source	Oil and natural *gas* liquids (billions of barrels) Onshore	Offshore	Total
1. National Petroleum Council (1972) [1]	90	64	154
2. Mobil Oil Corp.(1974) [2]			
3. National Academy of Sciences(1975)[3]	(4)	(4)	113
4. Hubbert(1974) [5]	27	45	72
5. U.S. Geological Survey(1974)[7]	136-272	64-128	200-400

[1] The National Petroleum Council estimates ware for undiscovered oil-in-place, rather than for recoverable oil. The figures in the table were obtained by applying an average recovery factor of 40 percent to the oil-in-place estimates. National Petroleum Council, "U.S. Energy Outlook."
[2] Robart Gillette, "Oil and Gas Resources: Did USGS Gush Too High?", Science, July 12,1974, p. 128, table 1.
[3] National Academy of Sciences, "'Mineral Resources and the Environment," February 1975, p. 8.
[4] No breakdown given.
[5] National Academy of Sciences, op. cit., p. 89, table 2.
[6] The breakdown between onshore and offshore resources is based on rough estimates provided by Dr. Hubbert in a personal communication.
[7] National Academy of Sciences, op. cit., p. 89, table 2.

The 113 billion barrel figure estimated by the National Academy of Sciences (NAS) was based on a careful analysis of a wide range of industry and USGS estimates, including the others cited in the table above (with the exception of the NPC estimates). This analysis revealed two major points of interest:

1. The USGS estimates are far higher than any of the others considered by the NAS. Even their lowest figure of 200 billion barrels is well above even the highest of the other estimates. If the USGS figures, which were used in the justification for the accelerated leasing program, prove to be substantially overoptimistic, their use as a basis for U.S. energy policy could lead to too-rapid development and exploitation of domestic oil resources, and inadequate emphasis on demand reduction.

2. All of the **estimates examined indicated** that the bulk of the remaining discoverable resources will be found offshore and in Alaska. As the above table shows, a large fraction (30% or more) of the total will be found on the OCS. Thus a major portion of the remaining U.S. oil resources are under federal jurisdiction, to be managed in the public interest.

The implications of the differences in resource estimates are substantial. The Federal Energy Administration's projections of long-term oil production that are based on an estimate of about **200 billion barrels of undiscovered recoverable resources,** the same as the lower limit of the USGS estimate, indicate that production will peak in the mid-to-late 1980's and will decline below current levels around 2030.[8] In contrast, Hubbert's estimate of 72 billion barrels implies that the peak has already occurred. In fact, there has been a consistent decline in domestic production since November, **1970.**[7] **If Hubbert is correct, it may be that even the most rapid offshore development will** not be **able to offset the decline in onshore production.**

Supporting this view, a Mobil Oil Corporation vice president, quote in a recent issue of Science magazine,[8] **said that Mobil** scientists

[6] FEA, *Project Independence Report*, p. 43S, figure IX-2.
[7] *Science*, op. cit., p. 129.
[8] Ibid., p. 127.

had calculated national oil and gas resources by" three different methods—all of which concluded that the Geological Survey's estimates arc far too high. Based on these analyses he argued that domestic reserves have been so thoroughly exhausted that the industry would be lucky to maintain production at the present level. If this expectation is accurate, then there is a far greater need for immediate action to reduce consumption of oil and to develop alternative sources of supply than would be the case if the most optimistic USGS estimate of 400 billion barrels were correct.

Another way of looking at the long-term implications of the differences in resource estimates is to caculate the number of years of supply that the estimates represent in terms of specified rates of consumption. Table II–2 shows the results of such calculations, and the dates of exhaustion they imply, based on both the 1973 rate of consumption of 6.3 billion barrels per year and the lower rate of 4.1 billion barrels a year that would result if imports are allowed to continue at 35% of the 1973 total. In both cases we have incorporated a rejected production of 63 billion barrels from roved reserves in known fields. This figure was obtained from the API and AGA estimate of 41.8 billion barrels of proved reserves of oil and natural gas liquids, augmented by the additional 50% (20.9 billion barrels) that the NAS study predicted would be forthcoming from proved reserves.[9]

The calculations presented in Table II-2 are of course only rough indicators of the implications of the various resource estimates, since it is not in fact possible to produce reserves at a constant or increasing rate until exhaustion. Nonetheless, the table does give an appreciation of the relative differences involved. Three major points are highlighted by these figures. First, the range between the most pessimistic and most optimistic estimates is considerable—33 years to exhaustion compared to **113 years, if there is no growth in consumption and imports continue to supply 35% of domestic needs. The energy policies implied by these two extremes differ enormously in terms of the need for immediate remedial actions. Second, even a relatively low 2.5% annual growth rate of consumption will substantially reduce the time to exhaustion; for example, the time implied by the NAS estimate if imports continue at present levels would be reduced from 43 years with no growth to 29 years at the 2.5% growth rate. Third, the goal of the elimination of dependence upon imported oil may be quite costly if the lower estimates fire correct, since its attainment could reduce by at decade** or more the already limited time available to develop acceptable ways of producing alternatives such **shale oil** and coal **synthetics.**

Even if the actual undiscovered recoverable resources approach the lower end of the relatively optimistic **USGS rangc** of estimates, accelerated development to **reduce or eliminate imports in the short run could lead to a serious problem early in the next,** century. The FEA *Project Independence Report* observes:

> If we accelerate oil and gas production in the next decade wc could reduce imports quickly. However, unless accelerated exploration reveals a largcr resource base than the one used in the long-term model, this benefit will **come at the** expense of a **greater oil and gas shortfall in the early 21st century.'"**

[9] NAS, op cit., p. 80.
[10] FEA, *Project Independence Report*, p. 435.

TABLE II-2.–YEARS OF REMAINING DOMESTIC PRODUCTION OF OIL AND NATURAL GAS LIQUIDS

Estimate	Undiscovered oil and NGL (billions of barrels)	Total remaining production of oil and NGL (billions of barrels)[1]	No growth in consumption (6.3 billion barrels/year)				2.5 percent annual growth			
			No imports		35 percent imports		No imports		35 percent imports	
			Years of production	Year of exhaustion	Years of production	Year of exhaustion	Years of production	Year of exhaustion	Years of production	Year of exhaustion
1. National Petroleum Council	154	217	34	2009	53	2028	25	2000	34	2009
2. Mobil Oil		151		1999		2012		1984	26	2001
3. National Academy of Sciences	113	176	28	2003	43	2018	21	1996	29	2004
4. Hubbert		135				2008		1992		
5. USGS	200-400	263-463	42-73	2017-2048	64-if;	2039-2088	28-42	2003-2117	38-54	2013-2029

[1] This is the sum of undiscovered recoverable oil and NGL plus an additional 63 billion barrels of oil and NGL estimated to be producible from known fields.

FIGURE II

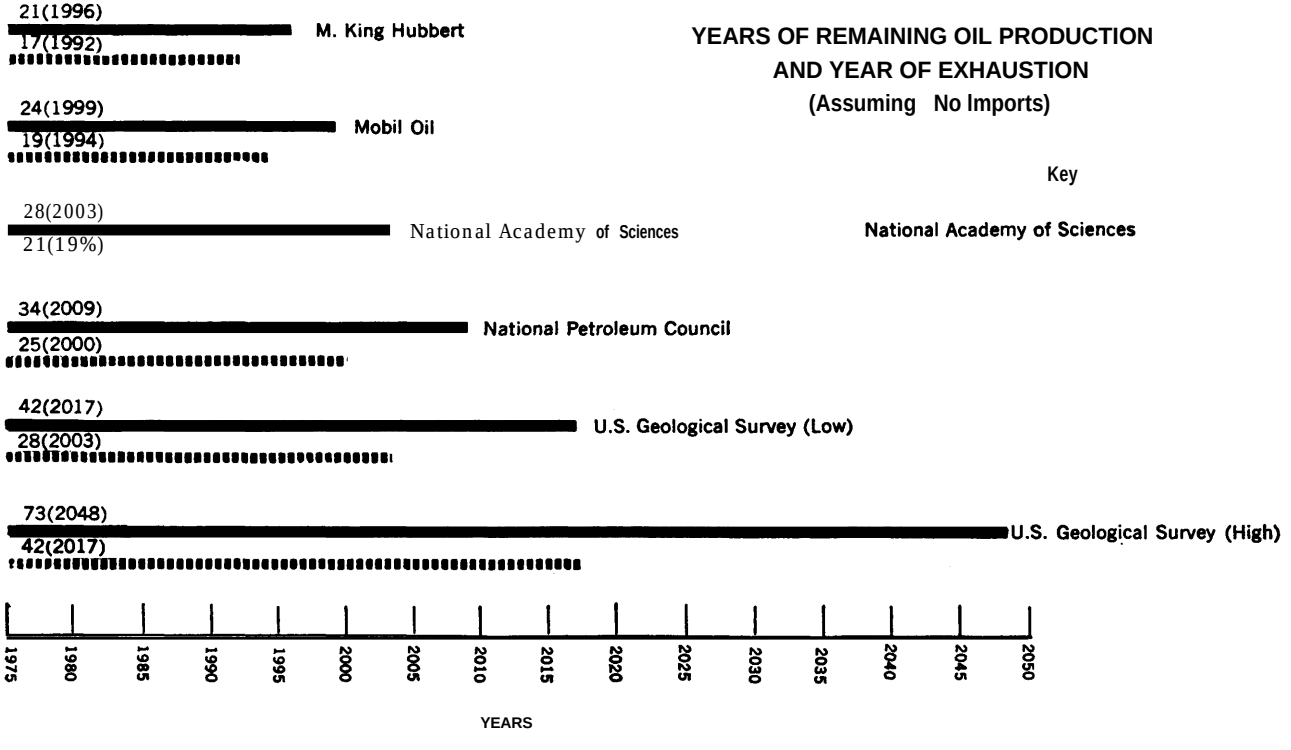
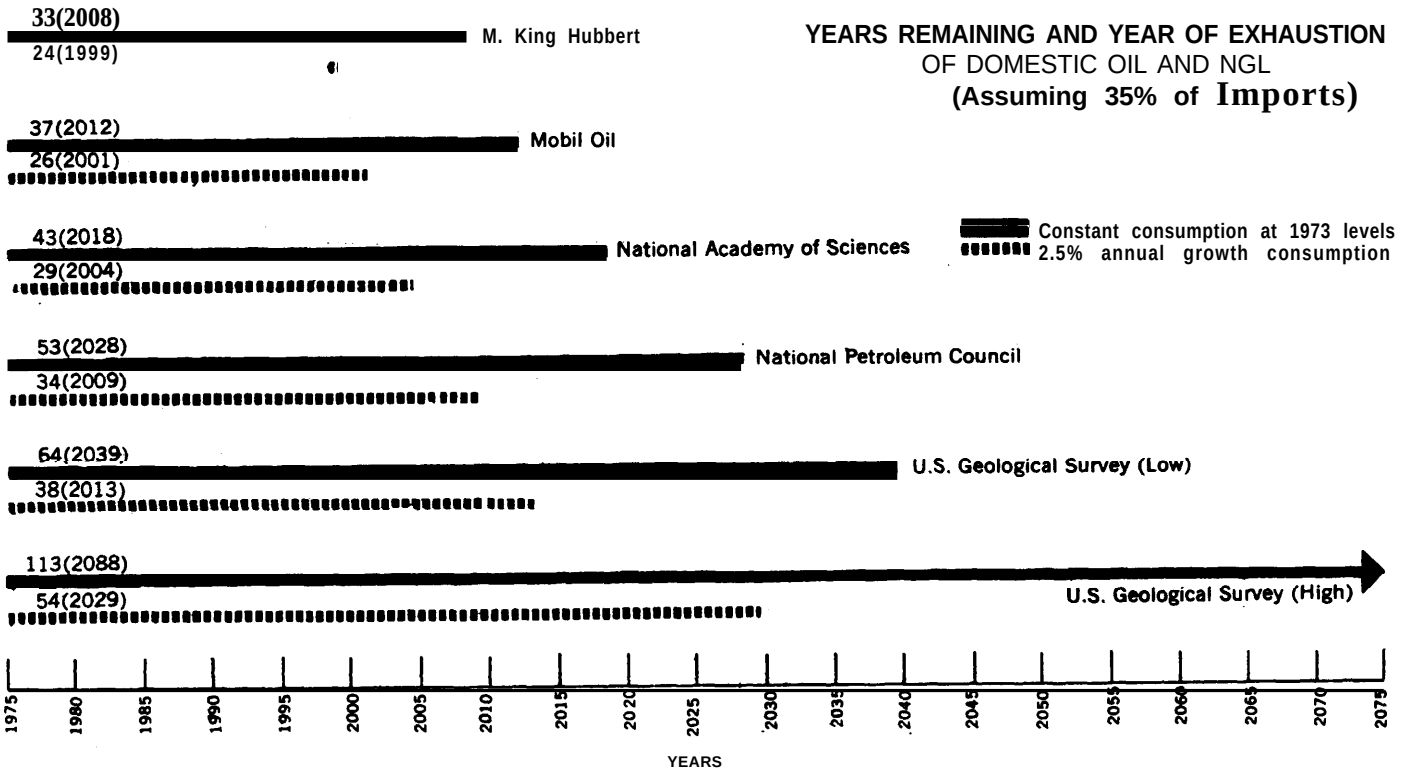

YEARS OF REMAINING OIL PRODUCTION
AND YEAR OF EXHAUSTION
(Assuming No Imports)
Key
National Academy of Sciences
21(1996)
17(1992)
M. King Hubbert
24(1999)
19(1994)
Mobil Oil
28(2003)
21(19%)
National Academy of Sciences
34(2009)
25(2000)
National Petroleum Council
42(2017)
28(2003)
U.S. Geological Survey (Low)
73(2048)
42(2017)
U.S. Geological Survey (High)
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
YEARS

FIGURE II-2



YEARS REMAINING AND YEAR OF EXHAUSTION
OF DOMESTIC OIL AND NGL
(Assuming 35% of Imports)

Constant consumption at 1973 levels
2.5% annual growth consumption

The resource base referred to implies about 200 billion barrels of undiscovered recoverable oil. With this base and a 2.5% annual growth in overall energy <consumption between 1985 and 2020, the FEA projection implies a peak shortfall of oil of 12 million barrels a day in 2000.[11] Of course, a major shortfall would be expected to occur considerably sooner if the lower estimates of Hubbert or Mobil arc correct.

The FEA rejections show that even with a relatively high resource base, rapid development of oil shale and coal synthetics will be necessary to avoid heavy dependence on imports early in the next century unless growth in energy demand is reduced considerably below the relatively modest annual growth rate of 2.5% assumed in the projections. Analyzing the implications of a business-as-usual approach to meeting energy demands, the FEA study reports:

> The conventional approach to supplying future energy demand, even at lower growth rates than have been experienced recently, places a great strain on synthetic fossil fuel production. By the year **2010** the equivalent of **25 million barrels** r da-y of liquids and gas from coal and shale are projected. Even then, imports are estimated to be nearly 10 million barrels of oil equivalent per day. This shortfall could eventually-be limited if coal and synthetic fuel production were to grow at 6% per year, but by 2010 about 3.5 billion tons of con] would have to be mined each year. This would **rapidly deplete** our coal resources, and exhaust available watcr supplies in the shale areas as well as phlace very serious burdens on the environment unless there were some technological breakthroughs.[12]

The FEA analysis shows that conservation and a major shift to electricity would put off development of shale and coal synthetics until after 2000, at which time the major technical and environmental problems they involve might have been solved. However, if the lower NAS estimate of 113 billion barrels of undiscovered recoverable petroleum resources is correct, then the ultimate decline in total domestic production of oil could occur in the latter part of this century, before oil shale and synthetics could be brought on line in an environmentally acceptable way. In this case, a major emphasis on conservation and a shift of demand to electricity may be necessary simply to avoid a drastic increase in imports as domestic production declines.

A recent *Fortune* magazine editorial[13] criticized the more conservative estimates of remaining ultimately recoverable oil by arguing that the API estimate of 35.3 billion barrels of proved reserves is far too low. This contention is based on the fact that the API figure for proved reserves includes only those that are "recoverable under existing economic conditions," while the price of oil has increased four times since the estimates in question were made. Taking this price increase into account, *Fortune's* consultants estimated reserves of 165 billion barrels in existing producing areas, an amount that would certainly mitigate the need for a "crash" sale of OCS lands.

[11] ibid., p. 490.
[12] Ibid.,p. 432.
[13] *Fortune*, December 1974, pp. 10J-11O.

The *Fortune* estimate appears to imply secondary and tertiary recovery rates that are substantially above those that are feasible at present. Of the 437.8 billion barrels of oil-in-place that had been discovered through 1973, 103.1 billion had been produced by the end of 1973, leaving 334.8 billion barrels in place. For proved reserves to equal 165 billion barrels, as *Fortune* suggests, nearly half of the remaining oil would have to be recovered. However, recovery of 165 billion barrels in addition to the 103.1 billion already produced would mean that 268.9 billion of the 437.8 billion barrels of discovered oil-in-place would ultimately be recovered. This implies an average recovery rate of 61.4 percent, almost double the API forecast of 31.6 percent for primary production; this in turn implies ultimate combined secondary and tertiary recovery rates of about 30 percent on the average. In contrast, the November, 1974, report of the FEA Oil Task Force assumed that the maximum combined secondary plus tertiary recovery rates would be below 30% in every region, even taking into account the effects of an oil price of $11.[14] This suggests that the *Fortune* estimate may be considerably overoptimistic. This position is supported by the NAS study, which implied that a total of about 63 billion barrels of oil and natural gas liquids could ultimately be recovered from known fields.

In any case the FEA projections cited above do take into account the effects of high oil prices on the economic viability of more extensive secondary and tertiary recovery. These long-run projections show that with approximately 200 billion barrels of remaining recoverable resources and an $11 oil price, at current rates of development domestic oil production will peak in the late 1980's and will decline below current levels around 2030. Accelerated development of domestic oil resources will hasten this ultimate decline.

The long-term implications of accelerated development of domestic resources were given relatively little attention in the FEA *Project Independence Report* which focused almost entirely on the U.S. position in 1985, and were not considered at all in the Department of the Interior's justification for the proposed 10 million acre OCS leasing program. However, such considerations appear to be of particular importance to any determination to produce OCS oil and gas resources as quickly as possible since the estimates discussed above indicate that the OCS represents a major fraction of our total remaining oil and gas resources.

The Mobil estimates indicate that 54 billion of 88 billion barrels (or 61.4%) of remaining discoverable and recoverable resources will be found on the continental margin extending to a depth of 6000 feet. Some 34 billion barrels (or 38.6% of the total) are expected to be found offshore of the lower 48 states. The 1970 National Petroleum Council estimates of remaining discoverable oil-in-place predicted that 41.5% of the total would be found offshore. The most recent USGS resource estimates are more conservative, showing only 32.5% offshore. However, the major cause for this difference between the USGS estimates and those of Mobil and others lies in the assumptions concerning the amount of remaining undiscovered recoverable oil onshore in the

[14] FEA, "Oil: Possible Levels Of Future Production," exhibits III-8 and III-9, pp. III-15 and 111-16

lower 48 states. The USGS estimates a value between 110 and 220 billion barrels, while Mobil's estimate for the same area is 13 billion barrels (compared to Hubbert's 9 billion barrels), a number supported by the declining discovery rate in the U.S. It has been reported that in the spring the USGS will revise its figures for onshore oil downward by as much as 80%, which should bring the proportion offshore into line with the higher estimates shown in table II-1.

Since the oil and gas on the OCS belongs to the public, the Federal government has a major responsibility to develop these vital public resources wisely, taking into consideration the long-run implications of its development policy. These implications do not appear to have been considered in the discussions of the Department of the Interior's proposed leasing program.

Wise resource planning and management will require a more precise determination of the actual levels of potential **oil and gas** reserves, so that major decisions with far-reaching implications can be based on fact rather than conjecture. One possible justification for an accelerated leasing program would be to promote exploratory drilling or a reasonable alternative in each unexplored frontier area as rapidly as possible in order to identify new reserves. However, the current leasing system places a substantial pressure on oil and gas companies to begin production of reserves at the maximum efficient rate as soon as they have been discovered, even though this may not be in the long-term national interest. It may therefore be desirable to explore alternative leasing systems that would separate exploration to locate reserves from the decision to produce them, since determination of an optimum rate of production is dependent upon a knowledge of the ultimately recoverable amount of oil.

111. EFFECTS ON RETURNS TO THE PUBLIC

The accelerated leasing program proposed by the Department of the Interior will probably create a buyer's market by offering far more acreage than can be absorbed by the oil and gas industry. This in turn may significantly reduce competition and thereby reduce the return the public receives for its resources. The likelihood of flooding the market is high, since the target of 10 million acres that the Department of the Interior seeks to lease in 1975 is over five times the amount that has been leased in any previous year and is about equal to the total acreage that has been leased since 1954.

The possible effects of the accelerated leasing proposal can be inferred from the trends evident in the sales of 1973 and 1974, during which time the amount of new acreage offered increased 96%, from about 698 thousand acres on June 19, 1973 to 1.4 million acres on October 16,]974. Tables III–1 and HI-2 display data from the five sales of new acreage in this period.[1] These tables also show the data aggregated to show the effects of the major acceleration in leasing that took place between the sales of March and May of 1974, when the acreage offered increased about 46% from 931 thousand acres to 1.4 million acres. Lines 4 and 7 of each table show the relevant statistics calculated for the three pre-acceleration sales and the two post-acceleration sales, respectively. By comparing the data for the two sets of sales we can get an insight into the likely consequences of the further acceleration of OCS leasing proposed by the Department of the Interior.

TABLE III-1.—EFFECTS OF INCREASED OCS OFFERINGS ON AGGREGATE MEASURES OF COMPETITION

Date of sale	Number of tracts	Acres (thousands)	Percent of tracts bid on	Percent of tracts leased	Average bonus per acre leased (current dollars)	Average number of bids r tract bid on
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. June 19, 1973		698	80.6	77.5	$2,908	
2. Dec. 20, 1973	147		60.5	59.2		4.2
3. Mar. 28, 1974	2 a	931	55.3	44.2	4,968	3.5
4. Aggregate-Sales 1,2,31	161	815	63.7	57.7	3,560	4.3
5. May 29, 1974	245	1,356	56.2	41.6	2,605	2.9
6. Oct. 16, 1974[2]	287	1,370	51.9	47.4	2,248	2.2
7. Aggregate-Sales 5,6 I	266	1,363	51.1	44.7	2,416	2.5

[1] Columns 2 and 3 in rows 4 and 7 represent per sale averages. Columns 4-7 in rows 4 and 7 are calculated from the relevant data aggregated for the indicated sales.
[2] Data for Oct. 16, 1974 exclude the 10 tracts involved in a royalty bidding experiment.

Source: "Outer Continental Shelf Statistical Summary 1973-75", U.S. Department of the Interior Bureau of Land Management, New Orleans office

[1] U.S. Department of the Interior, Bureau of Land Management, op. cit. In all of the analysis of this chapter we have omitted the data from the royalty bid experiment of the Oct. 16, 1974 sale, as well as the data from the entire July 30, 1974 sale which involved only tracts that had been previously offered, rather than new acreage.

TABLE III-2.–TRENDS IN" THE PROPORTION OF TRACTS LEASED ON THE BASIS OF 1 OR 2 BIDS

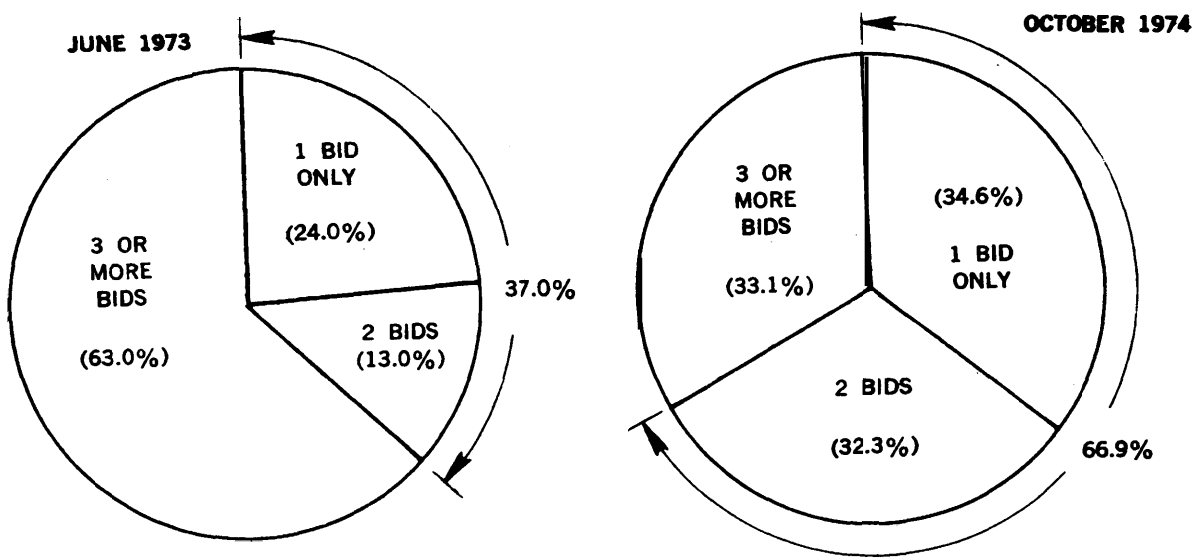
Date of sale	Number of tracts leased	Number leased 1 bid	(3) as percent tracts leased	Bonus accepted on tracts with 1 bid (In millions)	(5) as percent bonus accepted	Number leased with 1 or 2 bids	(7) as percent tracts leased	Bonus accepted on tracts with 1 or 2 bids (In millions)	(9) as percent of total bonus accepted	Percent of tracts bid on receiving 6 or more
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(lo)	(11)
1. June 19, 1973	100	24	24.0	$59.8	3.8	37	37.0	$147.2	9.3	38.5
2. Dec. 20, 1973	87	20	23.0		1.8	31	35.6	95.3		31.5
3. Mar. 28, 1974	91	19	20.9	120.0	5.7	35	38.5	323.6	15.5	22.7
4. Aggregate—Sales, 1 , 2, 3[1]	93	21	22.7	205.9	4.0	103	37.1	566.1	10.9	33.5
5. May 29, 1974	102	41	40.2	262.3	17.8			429.3	29.2	14.6
6. Oct. 16, 1974 ?[2]	136	47	34.6		17.0			562.9	39.4	
7. Aggregate—Sales, 5,61	119	44	37.0	505.3	17.4	149	62.6	992.2	34.2	11.8

[1] Columns 2 and 3 in rows 4 and 7 represent per sale averages. Columns 4-11 in rows 4 and 7 are calculated from the relevant data aggregated for the indicated sales.
[2] Data for Oct. 16, 1974 exclude the 10 tracts involved ina royalty bidding experiment.

Source: "OuterContinental Shelf Statistical Summary 1973-75," U.S. Department of the interior Bureau of Land Management, New Orleans office.

FIGURE III-1

COMPETITION IN OCS BIDDING



Tracts receiving 1 bid, 2 bids, 3 or more bids as a percentage of tracts leased

One important measure **of the** level of **competition in a sale is the** average number of bids on each tract receiving a bid. A Department of the Interior memo justifying the accelerated program recognizes that increased offerings ma-y reduce this average:

> If OCS leasing is accelerated merely by offering more tracts under the existing system, there will probably be a decrease in the average number of bids received on each tract. Furthermore there are strong indications that the lower the number of firms bidding on a **tract, the lower the** level of the winning bid . . . Thus, the government may not be receiving fair market value for those tracts receiving only one or two bids.[2]

As predicted, the sales of 1973 and 1974 revealed a steady decline *in* the average number of bids per tract receiving bids (Table 111-], col. **7) as** the acreage **offered increased. This value** fell from 5.3 bids per tract on June 19, 1973, to **2.2** bids per tract on October 16, 1974, as the acreage offered about doubled.

This decline was accompanied by a considerable increase in the proportion of tracts leased on the basis of only one or two bids (Table III-2, co]. 3-10), the number identified above by the Department of the Interior as being low enough to jeopardize the receipt of fair market value by the public. In the three pre-acceleration sales, 22.7% of the tracts leased received only one bid; these tracts represented only 4.0% of the total bonus money accepted in the sales. In the two post-acceleration sales, 37.0% of the tracts leased received only one id; more importantly, the fraction of the total accepted bonus money represented by these tracts had risen to 17.4%.

The decline in competition is even more appn.rent if we include the tracts that received only two bids. In the pre-acceleration sales, 37.1% of the **tracts leased received only one or two bids, and these tracts represented only 10.9% of the bonus money accepted. But in the post-acceleration sales, 63.0% of the tracts leased, representing 34.1% of the money accepted, received** only one **or two bids. For the most recent completed sale (October 16, 1974) a total of 39.4% of the accepted bonuses came from the 66.9%** of the **tracts that were leased on** the basis of one or two bids.

Another measure of competition in lease sales is the proportion of the tracts bid on that receive a high number of bids. Our analysis shows (Table III-2, col. 11) that the fraction of tracts bid on that received six or more bids has declined rapidly and consistently from 38.5% in the June **19, 1973 sale to 9.6% in the October 16, 1974 sale.**

If the level of the winning bid is in fact directy related to the number of bids on a tract, as the memo cited above suggests, then the data we have presented imply that the increase in offerings in the last two completed sales of new acreaage have probably reduced the return to the public below fair market value. Examination of the average bonus per acre received in the sales of the last two years (Table III-1, col. **6) supports this conclusion. For the three pre-acceleration sales, the accepted bonuses (in current dollars) averaged $3,560, while in the two post-accceleration sales this average to $2,416.** The Department of the Interior apparently expects this decline to continue if the accelerated leasing schedule is implemented; testimony by an

[2] U.S. Congress Federal Offshore Oil and Gas Leasing Policies Hearings, op. cit., p. ? 14.

official of the Department indicates that only $1,500 to $2,000 would be received per acre if 10 million acres are leased in 1975.[3]

To counteract a possible decline in competition resulting from an accelerated leasing program, the Department of the Interior memo the program suggested three actions: (1) banning joint bidding by major producers; (2) speeding up publication of basic geological and geophysical information in order to facilitate participation by smaller oil and gas companies; and (3) improving the bid rejection system.[4]

The first two, which have been incorporated in regulations reposed by the Department of the Interior for future lease sales, should increase competition as anticipated; however, it is not clear that this increase will be adequate to o set the effects of a more than fivefold increase in the amount of acreage to be leased in 1975. A continued decline in competition in general, and in the average number of bids per tract in particular, would give increasing importance to the third item, the Department of the Interior's bid rejection system.

The heart of this system is a discounted cash flow model used to estimate a cash value for the resources expected to be found in each tract offered for leases This model incorporates USGS estimates concerning such variables as the number of productive acres in a tract, the ratio of oil acre feet to total acre feet, the productive life of oil and gas reservoirs, the discount rate, the tax rate, and so on. This estimate, or presale value, is used as a standard against which to measure bids; if the high bid on a tract is below this presale value, the bid may be rejected.

As long as competition for a tract is high, the accuracy of the presale value as an estimate of the true resource value is relatlively unimportant, since competitive forces can be assumed to keep the high bids fairly close to this true value. However, as the number of tracts receiving only one or two bids increases, the presale value becomes a major factor for assuring that faiar market vlaue is received for each tract.

The tract evaluation system has come under sharp criticism in the last year, on the grounds that it may seriously underestimate the true value of the public resources being offered for sale. One analysis of the relation o bids to presale values in the December, 1973 lease sale showed that the total of the high bids on the 89 tracts receiving **bids was** over ten times higher then the total of the presale values on those same tracts.[6] In dollar terms, this difference represented an undervaluation by the Department of the Interior of some $1.3 billion.

Since that sale the Department of the Interior has adopted a major improvement in the tract evaluation system by combining a Monte Carlo simulation procedure with the old discounted cash flow model to produce the **current Range of Values (ROV) model. This new procedure takes much better account of the uncertainties that are inherent in each of the variables used in the model. In the old procedure, a single estimate was used for each variable, and a single value was calculated for each tract using these estimates. With the Monte Carlo technique, each uncertain variable is given a range of probable values.**

[3] Ibid, p. 250.
[4] Ibid., pp. 244-24:1.
[5] U. S. Department of Interior, "Acceleration of Outer Continental Shelf Leasing," Technical paper Oct. 4, 1974, Exhibits 1 and 11.
[6] U.S. Congress Federal Offshore Oil and Gas Leasing Policies Hearings, p. 192.

A random sample value is taken from the range of values for each variable, and a tract value is calculated. This process is repeated some 500 times, with different sample values for each variable each time, and the average of the resulting calculated values is taken as the presale value for the **tract. The advantage of this more complex procedure is that it reveals effects of wide ranges of uncertainty about highly conjectural variables that would be obscured in the older model.**

Implementation of the new system has brought about n significant improvement in the reliability' of presale tract evaluations. While the ratio of total high bids to total presale values calculated with the old system was 10.2 in the December, 1973 sale, the ratio using presale values produced by the new system for the same sale was only 1.85.[7] **However, in more recent sales the ratio has been incensing, indicating a widening gap between presale values and high bids.**

TABLE III-3.–RESULTS OF THE DEPARTMENT OF THE INTERIOR'S PRESALE TRACT EVALUATION SYSTEM

Date of sale	Acres (thousands)	Rejection rate percent of bid on tracts not leased)	Ratio of high bids to assessed value
(1)	(2)	(3)	(4)
June 19, 1973	698		(1)
December 20, 1973	817		10.21 (1.85)
March 28, 1974			4.24
May 29, 1974			5.02
October 16, 1974	1: 370	8.7	1.93
February 5, 1975	2,870	(a)	(4.7)

[1] This ratio was not available for this sale.
[2] The figure in parentheses was calculated using the range of values system that was implemented in the March 28 1974 sale. The higher ratio is based on the presale values actually used in the sale.
[3] Data for this sale were not available at time of writing.
[4] New economic assumptions were used in this sale. The number in parentheses represents the value obtained using the old assumptions.

Source: Data provided by the Department of the Interior.

The figures for the three sales in 1974 (Table III-3, col. 4) show a steady rise, up to a ratio of 5.02 in the October, 1974 sale. This represents a cumulative undervauation of about $1.1 billion for that sale. Furthermore, our analysis shows (Table III–3, col.3) that while the rate of rejection of bids increased sharply to 20.2% when the new system was implemented in the March 28, 1974 sale, it began falling again as the offerings increased in subsequent sales, declining to 8.7% in October. This suggests that while the new Range of Values model is a considerable improvement over the old system, there remain major problems in the model related **to the basic assumptions about geological and economic variables, rather than to the way in which these assumptions are allowed to interact in** the **calculations.**

One major source of the consistent undervaluation by the Department of the Interior may be a relative advantage on the parat of the oil and gas companies in their ability to evaluate and nterpret geological and seismic data. For example, the U.S. Geological Survey,, which provides the estimates of resources for the tract evaluation

[7] **Data provided by the Department of the Interior.**

model, is not adequately staffed even to calculate precisely the actual proved reserves on currently producing OCS tracts.[8] rider these circumstances USGS is clearly not able to evaluate all of the tracts offered in any lease sale in as much detail as the bidders are able to evaluate the relatively smaller number of tracts in which they are most interested.

In view of the importance of OCS resources to the U.S. energy position, it may be desirable to improve the Federal government's ability to estimate the actual levels of resources being offered to private companies for development and production, both to ensure that the public receives a fair return for these resources and to provide the government with the information needed to make wise long-range energy policy decisions. This could involve a change in the current leasing system, as well as an expansion of staff capability. Possible alternatives range from exploration leases prior to production leasing, to direct government sponsorship of an OCS exploratory drilling program.

The second major cause for the underestimation of the value of OCS resources offered for lease appears to be the economic assumptions used in the tract evaluation model. Those that appear most questionable concern the discount rate and the projected prices for the resources, particularly oil.

In the sales held in 1974, the discount rate used was assumed to fall "in the range of 11 to 15%, with a mean of 13%.[9] This is a very high value, in view of the fact that all calculations were done using constant, rather than current, dollars, so that inflationary effects were eliminated. The effect of such a high rate is to discount sharply the benefits received from oil and gas produced in the latter part of the productive life of a lease relative to the heavy capital expenses that occur in the early years of the lease; for example, with a 13% discount rate, benefits received twenty years in the future are deflated by over 90%.

The second area of economic assumptions that appear to bias the presale tract evaluations downward concerns the price for oil that is used to calculate the vlaue of the resources contained in a tract. Specifically, in calculating the preside tract values for the three sales in 1974, the Department of the interior used a price range for oil of from $5.50 to $7.50, with a mean of $6.50; for the sale in February, 1975, a range of $5.00 to $11.00, with a mean of $7.67, was used. These values are based on the assumption that by the time there is production from **the tracts in question the OPEC cartel will have been broken amd the world oil price will have declined enough to bring domestic oil prices to the lower levels.**[10]

There are two difficulties with this assumption. First, it is at least debatable whether the cartel will be broken and whether world prices will ever decline much below the current level of $11 per barrel. This sanguine assumption is not universally accepted in the oil industry; one source informed us that his company saw no more than a 25% chance that the OPEC countries would reduce oil prices below $11. If they are right, then use of an average of $7.67 would undervalue public resources by nerly 33%.

[8] U.S. Congress Federal Offshore Oil and Gas Leasing Policies Hearings, P. 255.
[9] Assumptions provided by the Department of the Interim.
[10] Assumptions provided by the Department of the Interior.

The second difficulty with the use of an average price of $7.67 per barrel is the fact that the President's recent energy message stated the intention to use taxes, duties, and so on to maintain domestic oil prices high enough to encourage conservation of energy and the development of alternative sources of oil, such as oil shale and synthetics from coal.[11] Since FEA's studies of these sources suggest that little supply would be produced at prices much below $10 per barrel,[12] fulfillment of the President's intention would require maintenance of domestic prices near that level even if the world oil rice dropped to $7.00 per barrel or below; indeed, the intention of the President's proposal is precisely to insulate alternative domestic sources from price undercutting by the cartel. But if domestic prices are above world prices, then publicly owned domestic oil resources should be valued at the domestic price. If this is not allowed to **drop much below $10 per barrel, the usc of the $7.67 figure by the Department of the Interior would represent a 25% undervaluation of public resources.**

A second, related issue concerning the prices used by the Department of the Interior in estimating the value of OCS tracts is the assumption that the price of petroleum products remains constant relative to the costs of production throughout the entire productive life of a tract. This life may be as great as thirty years, which would extend well into the period in which total U.S. domestic production is **expected to be declining, and in which the deficit between domestic production and demand will be much greater than the current level. It therefore seems highly questionable to assume that the prices of oil and gas will remain constant relative to production costs over this entire period.**

A **more reasonable assumption seems to be that all relative energy prices will rise as easily accessible resources are exhausted. This latter assumption was supported by one industry source involved in OCS bidding who told us that his company used n "steeply rising" oil price projection in determining the expected value of tracts under consideration. If the assumption that in the long run the relative prices of oil and gas will rise is correct, then tile Department of the Interior's assumption of constant relative** prices will lead to a **consistent undervaluation of offshore resources.**

The net effect of the economic resumptions we have examined is to introduce a significant downward bias in the Department of the Interior's estimates of the value of OCS tracts. In the most recent sale (February, 1975), the Department in fact revised several of these assumptions in a direction that would increase the presale values: the discount rate was lowered to a range of 8% to 12%, with a mean of 10%; while the price range was extended upward to $11.00 at the top end, with a mean of $7.67. **The effect of these changes was to lower the ratio of aggregate high bids to aggregate presale values to 1.93, compared to the value of 4.87** that would have resulted if the old assumptions had been used.[13]

These changes **in economic assumptions, combined with the introduction of the Monte Carlo simulation technique, clearly have produced** a great improvement in the **Department of** Interior's presale

[11] This intention is embodied in the proposed Energy Development Security Act of 1975, title IX of the Administration's proposed Energy Independence Act of 1975, H. R. 2650, 94th Cong., 1st so.%.
[12] FEA, *Project Independence Report*, pp. 132 and 139.
[13] Data provided by the Department of the Interior.

51-542 O - 75 - 19

tract evaluation system. However, the assumption of a constant relative price of oil well below the current world market level remains in effect. If this is invalid, it would lead to a significant. undervaluation of OCS resources. It should be noted that even the ratio of 1.93 (high bids compared to presale values) achieved in the last sale would lead to a cumulative undervaluation of $7.2 billion if applied to a sale of 10 million acres for $15 billion in 1975.

While the problems of undervaluation may have been relatively insignificant when competition was high and single bidding low, the decline in competition that can be anticipated with the offering of 19 million acres for lease in 1975 will make it much more important to reduce or eliminate the remaining inadequacies in the bid rejection system in order to ensure that the public receives a fair value for its resources. It appears that the major remaining problems relate to the assumptions concerning long-run resource prices, and the ability of the U.S. Geophysical Survey to estimate the actual amounts of resources being offered for sale. I he former **can** be remedied relatively easily; the latter could require a substantial addition to USGS's staff capabilities, and perhaps even a change in the process with which the OCS is explored and developed.

IV. PRINCIPAL COASTAL STATE CONCERNS RELATED TO ACCELERATED OCS DEVELOPMENT

The Federal Government's objective to rapidly accelerate development of oil and gas on the Outer Continental Shelf requires that new lands be leased off of or adjacent to the coasts of 16 states that have not had previous experience with this type of developmental Differences between the states and the Government have become more sharply defined in Congessional hearings and recent public hearings on the Department of the Interior's draft environmental impact statement for the proposed 10 million acre sale.

Criticism of the **10** million acre plan and the Department of the Interior's implementation program have been leveled by leading representatives of nearly every coastal state. Even a cursory analysis of the written testimony by Department officials reveal a genuine lack of awareness of the issues and concerns at the State level. The Department's lack of responsiveness has served to unite the coastal states on this issue. While none of the States. have indicated that they will block development of offshore resources at all c osts, they clearly want major changes in the present system for developing these resources. And unless the Department moves quickly in response to some of their demands, it is likely that the States will employ all delaying tactics at their disposal.

Growing coastal state solidarity on the OCS issue is substantively revealed in a major policy statement adopted by the National Governors' Conference on February **20, 1975. The** nine point Policy Position on OCS Energy Resources, which was adopted by a **30 to 1** marg n, reflects in part questions raised in the preceding analysis and by new initiatives in the 94th Congress.[2]

The Governors say that the development of OCS resources should be an integral part **of a** national energy policy, taking into consideration the longer term implications:

> The energy policy developed should reflect not merely the proposed uses or offshore oil and gas, but also a consideration of whether such offshore development is necessary in light of prudent conservation measures and alternative sources of energy.

Recognizing that the OCS "is a great public resource," the Governors' position is that it "should be managed with scrupulous care to insure the long-term productivity of all its resources and a fair economic return to the public."

The Posit on Paper also calls for the separation of the decision to explore for OCS resources from the one to develop and commercially produce the resources.

[1] South Carolina, North Carolina, Georgia, Florida, Rhode Island, New York, Maryland, Delaware, Virginia, Massachusetts, New Jersey, New Hampshire, Oregon, Washington, Maine, Connecticut.
[2] National Governors' Conference, "Policy Position on OCS Energy Resources," Feb. 20, 1975.

One of the purposes of this separation would be to provide the states with detailed resource information needed for planning purposes. Under the present system, the states must plan in a vacuum, relying principally on unconfirmed estimates of offshore reserves. If actual reserves prove much smaller than estimates, the states would then have made unnecessary expenditures on a major planning effort. Conversely, an unexpected major find could cause disruptions beyond state management capacity.

A second purpose is to create a "phased and measured" development program by providing a separate decision point on production and commercial development. Such a program would be established in cooperation with the states and would thus serve as a vehicle for encouraging a rate of development consistent with **each state's ability to manage offshore and onshore impacts and with the long-term energy needs of the Nation. A key element is to provide time for the potentially impacted states to** complete coastal zone management palans authorized under the Coastal Zone Management Act of **1972.** In this way, the states can insure that OCS production plans are consistent with coastal zone management plans and other applicable statutes and regulations.

The Congress already has taken action aimed at accomplishing this separation. Senator Ernest F. Hollings of South Carolina introduced legislation (S. 426) in the 94th Congress which would separate exploration for oil and gas on the OCS from development and production by directing the Secretary of the Interior to conduct by government contract a comprehensive program of exploration on the OCS to determine the existence, extent and location of oil and gas in commercial quantities.

In their Policy Position, the Governors also note that "it is in the public interest to promptly explore the OCS to determine the extent of energy resources that exist." The urgency to determine resources is reflected both in S. **426** and in a bill introduced by Senator Henry M. Jackson of Washington. Senator Jackson's bill (S. 740) calls for the establishment of a National Energy Production Board "to assure early development of energy resources on the public domain and other Federal lands and on the Outer Continental Shelf. . ." The bill would authorize the Energy Board to prepare and carry out a Federal oil and gas exploration program.

The Governors also call for new Federal financial assistance for the required planning to mitigate onshore impacts and to recover costs for developments, particularly new public facilities required by these developments:

> **Since the OCS program is a national one, we believe there** is a clear federal responsibility to assume the necessary related costs of the development. Adequate federal funds should be made available now to States to enable them to stay ahead of the program and plan for onshore impacts. Once the program commences, provision should be made for **federal assistance such as the application of federal compensation for any net adverse budgetary impacts and for the costs of fulfilling State responsibilitiess in the regulation of off- and onshore development**

A spokesman for the National Governor's Conference said that the states do not seek revenue sharing or a "cut in the profits" from the oil and gas revenues, but that they do want to be assured that they will be "made whole" for any losses that may be incurred because of these developments.

The Coastal Zone Environment Act of 1975 (S. 586) introduced by Senator Hollings on February 5, 1975, is intended to provide State and local governments with financial and technical assistance to adequately plan for, accommodate and anticipate growth problems caused by OCS development. It provides a Coastal Impact Fund up to **$200 million per -year, which would be allocated by the National Oceanic and Atmospheric Administration. It also provides up to $10 million for short-term research on specific problems which arise and for interstate planning and coordination; and for consistency between Federal OCS plans and State programs now being developed under the Coastal Zone Management Act.**

In the 93rd Congress, the Senate affirmed its intent to assure that coastal states are fairly compensated for onshore impacts of offshore oil and as production by passage of the Jackson-sponsored "Energy Supply Act of 1974." The Act provided for a special fund, not to exceed $200 million annually and derived from OCS revenues, for grants to impacted coastal zones. Since the House did not act on the measure, Senator Jackson introduced S. 521, which IN-wan identical provision for a special impact fund, in the 94th Congress.

Other legislation introduced in both the House and the Senate **include provisions for compensating states for oil and gas activities off their coasts. Senate bill 130, introdced by Senator Ted Stevens of** Alaska, would establish new provisions for disposition of Outer Continental Shelf **revenues, which under existing public law are deposited in the Treasury of the United States. This bill provides for 25% of the funds be paid to the adjacent coastal state, 25% in equal amounts to "each of the several States other than such adjacent State," and 50% deposited in the Treasury.**

Senator Clifford P. Case of New Jersey introduced S. 826, amending the Coastal Zone Management Act of 1972, which provides for an Affected Coastal States Fund **of $100 million annually in fiscal years 1976 and 1977, and such sums as may be appropriate in subsequent fiscal years. The fund would be established appropriation and no single state would be entitled to more than 15~0 of the total fund annually.**

Congressman Robert E. Bauman of Maryland has introduced a bill (H.R. 1776) amending the Coastal Zone Management Act of 1972, to provide for a $200 million fund derived from a percentage of OCS revenues for fiscal years 1976 and 1977 to compensate impacted coastal states. A perentabe of the revenues from off shore oil and gas would be designated for the fund.

Congressman Bauman also has introduced legislation (H.R. 1777), to suspend Federal oil and gas leasing in areas seaward to State coastal zones until no later than **,June 30, 1976, to allow the coastal states adequate time to complete coastal zone management programs. In H.R. 1236, introduced by Congressman Glenn M. Anderson of California, there are provisions that require delay of all offshore oil**

and gas activities until at least three years after the **award of the coastal zone management program development** grant **to an affected** state.

Senator Charles McC. Maths, Jr., of Maryland introduced S. 81, a **bill to empower the Governors of coastal states to postpone OCS lease sales up to three** years **by filing a request with the** Secretary of the Interior, who may grant the postponement, shorten the postponement, or deny it. A National Coastal Resources Appeal Board would be established for the principal purpose of allowing an grieved **State a second level of appeal in the event that the request or postponement is denied or the time period allowed is shorter than requested.**

V. INDUSTRY'S CAPACITY TO EXPLORE 10 MILLION ACRES

There are serious questions about the ability of the oil and gas industry to explore 10 million acres of new OCS territory between 1975 and 1980, the five year period within which exploration must take lace under the terms of current OCS leases. Extensive analyses by FEA[1] and NPC[2] of the availability of equipment, manpower, and capital for oil and gas exploration and development have agreed that the current supply of mobile drilling rigs, and the worldwide capacity for building new rigs, will be major constraints on exploration for offshore petroleum.

4 The problem can easily be seen by examining the current situation in the U.S. In 1973 and 1974 the Department of the Interior leased a total of 543 OCS tracts with an average size of about 5,000 acres. According to USGS, on the average two exploratory dry holes are needed to eliminate a tract as a t et, while three exploratory wells are needed to justify production.[3] These figures imply that between 1,086 and 1,629 exploratory holes would have to be drilled to completely explore the OCS acreage leased in 1973 and 1974.

As of December, 1974, there were 87 mobile rigs in U.S. waters, of which perhaps 60 would be able to drill in some or all of the water depths of the 1973 and 1974 lease areas.[4] Using an accepted average of four holes per year per mobile rig, it would take these 60 rigs from 4.5 to 6.8 years to explore these 543 tracts. Thus the current rig fleet in U.S. waters could be kept busy for at least the next three or four years simply exploring the tracts that were leased in 1973 and 1974.

If the proposed 1975 leasing program is pursued, about 1,736 additional tracts of 5,760 acres would be leased in 1975. Since the large majority of these will be in water depths exceeding 100 feet, one can understand the problem this sale would create by considering the present and projected availability of mobile rigs with the corresponding depth capacity.

Of the 60 rigs in U.S. waters capable of exploring the 1973 and 1974 lease areas, 44 were capable of drilling in over **100** feet water depth, according to Offshore Rig Data Services.[5] According to an NPC interim report of September, **1974, 11 new mobile rigs then under construction were expected to remain in the U. S., with 15 added in 1975 and 18 in 1976, allowing for attrition in the current fleet.**[6]

4 Assuming that 20 rigs (about one half of annual worldwide construction capacity) would be added each year thereafter to 1980, the total capac-

[1] See footnote 7, ch. 1.
[2] See footnote 8, ch. 1.
[3] U.S. Department of the Interior, Environmental Impact Statement, "Mafia Oil Transportation and Processing," October 1973.
4 offshore Rig Data Services, "The Offshore Rig Location Report," December 1974 and January 1975.
[5] Ibid.
[6] National Petroleum Council, "Availability of Materials, Manpower and Equipment for the Exploration, Drilling and Production of 011—1'974-1976," September 1974, PP. 34-35.

ity for exploration in the next five years can be calculated. The results are shown in the following table:

TABLE V-1.–EXPLORATORY CAPACITY OF THE PROJECTED AVAILABLE FLEET OF MOBILE RIGS

You	Existing rigs plus new annual construction capable of water depths or more	Drilling capacity in walls per year	Capacity in per year (2 wells)	Capacity in production tracts per year (3 wells)
1975	44+11= 55	220	110	73
1976	55+15= 70	280	140	
1977	70+18= 86	352	176	117
1978	88+20=108	432	216	
1979	108+20=128	512		171
Ire	128+20=148	592	296	197
Total			1,194	795

This table suggests that 1200 tracts (about 7 million acres) is a reasonable upper limit to the total number of tracts (over 100 feet water depth) that could reexplored from 1975 through 1980, the year by which tracts leased in 1975 would have to be explored under the present leasing terms. Yet the proposed 10 million acre leasing program would involve over 1700 new tracts. This would exceed the projected exploratory capacity of the industry by about 46 percent, without even considering the requirements for the 543 tracts leased in the last two years or for any tracts leased after 1975. It therefore appears that even if the Department of the Interior were able to lease the entire 10 million acres in 1975, it would be impossible for the industry to explore it thoroughly within the required five year limit. In other words, rig availability rather than acreage under lease appears to be the primary constraint on the development of OCS oil and gas.

This conclusion is supported by the Project *Independence Report* of the FEA. Their analysis **of the availibility from 1972 to 1984 of mobile platforms for exploration and fixed platforms for production led to the following finding:**

> The potential shortage of fixed and mobile drilling platforms is more acute than for any other material and equipment items. Even with optimistic assumptions on mobile platform production, and world fleet movement to U.S. waters, requirements under an accelerated development strategy exceed projected availability by approximately 38 percent; the corresponding shortage for fixed platforms is 36 percent.[7]

The accelerated development scenario referred to above projects a rate of production of about 4.5 million barrels per day from the OCS in 1985, assuming that the world price of oil remains at $11. According to the FEA projection model, which **is** based on an earlier NPC model, to reach this maximum production level would require the leasing of no more than about 25 million acres on **the OCS by 1988, a level considerably lower than that which would be reached if the trend in OCS leasing projected by the Department is continued.** [8]

[7] FEA. *Project Independence Report*, p. 248.
[8] Information provided by FEA staff.

The FEA analysis therefore implies that even the lower leasing level that would be required to reach **25 million acres by 1988 would generate an excess demand for mobile rigs of some 38 percent.**

While recognizing that rig availability will be a constraint in the short run, the Department of the Interior does not view this as an adequate reason for limiting the amount of OCS acreage offered for lease. Instead, they argue that their proposed leasing program would generate market forces that would bring forth the needed supply of equipment to drill the target acreage. A "Technical Paper" in support of the accelerated leasing program published by the Department of the Interior in October, 1974, stated this position:

> Industry representatives indicate that with a dependable, accelerated leasing program, including attractive prospects in new frontier areas, they will either keep newly constructed rigs here or return U.S. registered rigs from overseas. It is their best guess, based upon historical patterns of rig movement to better prospects, that 10 percent or more of the rigs estimated for foreign operations could be available for OCS drilling.[9]

While it is certainly true that leasing in promising frontier areas of the OCS will attract rigs to U.S. waters, the question remains whether enough additional rigs will materialize to be able to explore the acreage that the Department of the Interior proposes to lease. If the above prediction that 10% of the world rig fleet would be made available for U.S. drilling is accurate, then some 26 rigs could be added to the U.S. fleet by the end of 1975.[10] However, even if these operated from 1976 through 1980 at the rate of four wells per rig per year, they would only be able to explore from 173 to 260 tracts. Adding these to our earlier projections gives a total capacity of some 1500 tracts that could be explored by the projected U.S. rig fleet from 1975 through 1980. This still falls short of the 1700 tracts that would be included in the 10 million acres proposed to be leased in 1975, without taking into account either the acreage that remains to be explored from the 1973 and 1974 sales or any additional acreagc lease after 1975.

This apparent problem of long-term excess demand for mobile rigs in the U.S. should be viewed in the context of the worldwide supply of and demand for such rigs. A recent analysis in Offshore magazine of worldwide rig availability over the next 50 years predieted "a rig demand well beyond the capacities of worldwide ship - yards at least through 1982."[11] Thus the predicted shortage of rigs m the U.S. would simply be a part of a worldwide phenomenon. The supply limitations are readily apparent: slippages in delivery are increasing-of 61 mobile rigs scheduled for completion in 1974 worldwide, only 40 were delivered on time; the backlog for new orders is as long as three years; and most of the rigs under order are for foreign use.

This projection of a long-term shortage of mobile rigs is supported b recent analysis of the current mobile rig situation performed by Of -

[9] U.S. Department of tho Interior, "Acceleration of Outer Continental Shelf Leasing," Technical paper, p. 10.
[10] Ibid., p. 11.
[11] *Offshore* Magazine, January 1975.

shore Rig Data Services,[12] which concluded that there would be no significant swing to mobile " construction on the part of world shipyards because of the major difficulties involved in shifting from building ships to building rigs. Thus, any significant increase in U.S. rig construction capablity may require governmental action to allocate shipyard space to mobile rigs.

U.S. will apparently be competing for rigs in a situation of worldwide excess demand, optimistic rejections of large-scale shifts of rigs to U.S. waters as a result of OCS leasing must be viewed with some caution. Experience with recent sales supports this conclusion. For example, the Department of the Interiors Environmental Impact Statement for the December, 1973 MAFLA sale which brought the highest per acre bids ever received) predicted that by the end of 1974 about 26 rigs would be exploring the leased area. In fact, on] six rigs were in the area as of January, 1975.

This analysis implies that 10 million acres is more than the industry can absorb in five ears much less in one year. The industry's own recommendations for OCS leasing support this conclusion. For example, in 1972 the National Petroleum Council, which advises the Secret of the Interior, recommended that the rate of OCS leasing be increase from one million acres per year to 1.6 million acres per year by 1980, and to 2.3 million acres per year by 1985, with a goal of leasing a total of 21 million new acres by 1985.[13] These figures are comparable to those implied in the accelerated development case used by FEA. The Department of the Interior proposal of 10 million acres in 1975 is over six times the rata that the NPC suggested should be reached in 1980.

If the Department of the Interior offers for lease an area that far exceeds the industry's capacity for exploration, it can be expected that only an amount that the industry believes can in fact be explored in five years would receive bids and that an even smaller amount would be leased. This tendency can already be seen in the lease sales over the last two years during which time the Department of the Interior has substantially accelerated the rate of leasing. In 19731.5 million new acres were offered for lease, of which 1.0 million acres (68%) were ultimately leased. In 1974, the Department offered 3.7 million new acres (over 2.4 times the 1973 amount), of which only 1.7 million acres (46 percent) were leased. Considering the limitations on rig availability it is reasonable to asssume that an offering of 19 milion acres may result no more than 3 to 5 million acres being leased.

To conclude, while there is merit to the Department of the Interior argument that substantial and regular offerings of OCS resources would be needed to attract many rigs from overseas and to stimulate new production, there is reason to doubt that the proposed greatly accelerated rate of leasing could stimulate an increased supply of rigs significantly faster than would the more deliberate rata recommended by the oil and gas industry. Furthermore, offering acreage that far exceeds the amount that could be absorbed by the industry would create a buyer's market, which would probably decrease competition significantly and reduce the return the public receives for its resources.

[12] Offshore Rig Data Services, "The Offshore Rig Newsletter," December 1974, p. 3.
[13] See footnote 10, Chapter I.