

OUTER CONTINENTAL SHELF OIL AND GAS
DEVELOPMENT AND THE COASTAL ZONE

PREPARED AT THE REQUEST OF
HON. WARREN G. MAGNUSON, *Chairman*
FOR THE USE OF THE
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LETTER OF TRANSMITTAL

U.S. SENATE,
COMMITTEE ON COMMERCE,
Washington, D.C.

DEAR COLLEAGUE: The end of the Arab oil embargo brought about new appraisals of United States energy policies. Over the past year, it has become increasingly apparent that the United States will have to expand domestic energy production to decrease its reliance on foreign energy sources. This step will be necessary not only to meet future energy needs, but to improve our deepening balance of payments problems and insure that another embargo would not severely impair our nations energy supplies.

One area which is expected to contribute greatly to expanded domestic production is the outer continental shelf (OCS). For over twenty years, the United States has developed the oil and gas resources of the OCS. At present, they contribute 18 percent of domestic petroleum and 15 percent of domestic natural gas production.

Expanding OCS oil and gas production will not be easy, however. Since the blowout and subsequent oil spill at Santa Barbara, Calif., in 1969, increased concern for the environment impact of offshore development has emerged. This criticism has increased as the Federal Government has considered holding lease sales in "frontier areas" such as the Atlantic Ocean. In addition, several legal and jurisdictional issues still plague development of OCS resources. Several States have contested the limits of Federal jurisdiction over ocean resources. The international jurisdiction over resources of the continental shelf and margin could affect future development plans. Finally, in recent years, it has become apparent that OCS development is associated with important on-shore impacts, including land use and energy facility siting controversies.

The impact these problems could have on future energy production from the outer continental shelf will be important. It is essential that existing public policies be able to offset any negative impacts associated with future energy production so that we can continue to pursue other important national goals such as environmental quality and effective land use.

For these reasons, the National Ocean Policy Study selected as one of its first areas of investigations the development of oil and gas resources on the outer continental shelf. The Study was authorized to undertake a comprehensive analysis of national ocean policy and Federal ocean programs to insure effective public policies to guide the use of ocean resources. It was felt critical to start the investigation with the subject of OCS oil and gas development because it will be a major focus of ocean policy activity over the next two decades.

Hearings were held by the Study on April 23, 24, and 25, and May 2 and 22, 1974 on Federal OCS leasing policy in Washington, D.C. An additional field hearing was held August 5, 1974 in Boston to focus on the anticipated impacts of the proposed development of the Georges Bank off Massachusetts. In the attached report, the Study staff has combined information obtained at these hearings with those held by the Senate Committee on Interior and Insular Affairs on amendments to the Outer Continental Shelf Lands Act on May 6, 7, 8, and 10, 1974. A list of witnesses who appeared at these hearings is included in this report as Appendix C. In addition, the staff has integrated information on various alternative policy issues contained in several background documents recently published.

The findings of the Study's investigation and the recommendations based upon those findings are set forth in the attached report.

The Study's investigations have established that expanded development of the oil and gas resources of the OCS will take place. But the report also highlights the tremendous uncertainties clouding the orderly development of these resources.

A primary problem is that available information about the character and magnitude of environmental, social and economic impacts associated with OCS development are not adequate. Furthermore, data on biological impacts of oil spills is sparse, especially regarding the long-range impact of small, continuous discharges. There is also inadequate information about the reserves of oil and gas on the OCS.

The "information vacuum" also extends to onshore impacts. The study points out that environmental, social and economic impacts can be expected in states adjacent to leasing. However, the exact nature of these impacts and their magnitude and location cannot be determined from the information available. While it appears the Coastal Zone Management Act will provide an effective framework for dealing with these onshore impacts, more effective coordination of Federal lease sales and State coastal zone management planning will have to take place to prevent significant adverse impacts.

An important finding was that adjacent coastal states are required to incur significant costs in connection with OCS development for which they do not receive any financial or technical assistance. The report recommends that the States receive some form of financial and technical assistance to aid them, such as is provided by the Senate-passed S. 3221 amending the Outer Continental Shelf Lands Act.

Finally, the report found that manpower and material shortages could be important factors limiting the future production of OCS oil and gas resources.

The Study offers the findings and recommendations of its investigation set forth in the attached report.

The Study wishes to express its appreciation to the Congressional Research Service for its assistance in the analysis of the hearings and the preparation of the report.

The National Ocean Policy Study plans to continue its assessment of OCS operations as part of a study now being commissioned by the Office of Technology Assessment (OTA). The product of the OTA study will be an analysis of primary and secondary impacts of three technologies that may be introduced in the New Jersey and Delaware coastal areas. In addition to offshore oil and gas, the technologies to

be considered include deepwater ports and offshore floating nuclear power plants. The potential separate and combined effects of these three technologies on the fragile coastal environment underscore the need for comprehensive coastal zone planning and management, and research efforts like the OTA study promise to be an important first step.

I wish to emphasize that the conclusions and recommendations incorporated into this staff report, and which may prove to be controversial, represent the views of the members of the special staff and have neither been approved, disapproved, nor considered by the Senate Committee on Commerce or the National Oceans Policy Study.

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

I. DISCUSSION AND RECOMMENDATIONS

This report will set forth some of the major issues involved in OCS leasing and recommend improvements in current procedures and practices. It draws upon the hearings held by the National Ocean Policy Study of the Committee on Commerce and additional hearings before by the Committee on Interior and Insular Affairs. It also benefits from several recent studies, including those conducted by the Council on Environmental Quality (Summary, Appendix F.), the University of Oklahoma (Summary, Appendix G.), and the National Academies of Science and Engineering (Appendixes H and I, respectively).

A. DISCUSSION

Approximately six million acres of federally-owned lands on the Outer Continental Shelf are currently under lease for oil and gas development, and that number may increase substantially in the near future.

The Department of the Interior, at the direction of Presidents Nixon and Ford, has disclosed its intention to lease 10 million acres of OCS lands for oil and gas development in 1975. To achieve this goal, the Department may offer as much as 19.1 million acres in the Atlantic, the Gulf of Alaska, the Gulf of Mexico and the Pacific off California. If successful, this sudden acceleration of OCS leasing would double in a single year the total acreage leased during the previous 21 years of Federal OCS leasing, and would open up hitherto untapped areas to exploration.

Recent energy shortages and interruptions of imported oil supplies are the motivating force behind the planned expansion of OCS oil and gas development. Additionally, the quadrupling of world oil prices following the 1973 Middle East war has been a major contributor to inflation and has strained the balance of payments position of the United States, making domestic oil development even more attractive. However, offshore leasing would not immediately relieve shortages, interruptions or foreign price pressures, since it takes about five years from the time of a lease sale before oil and gas can be produced on an offshore tract in commercial quantities. In the short term, energy conservation offers the only real possibility for reducing oil imports.

Public disclosure of the 1975 leasing program has aroused concern in many quarters, including the Congress and the coastal States. While few quarrel with the general goal of expanding OCS oil and gas development, many are concerned lest the precipitous leasing of so many acres in a single year cause coastal states and communities environmental harm and create administrative, financial and technical problems beyond the capability of the Federal government and the oil industry to handle.

* * * * *

¹ The Washington Post, October 9, 1974.

There is very little coordination or communication between the Interior Department and the coastal States prior to OCS lease sales, despite the significant impact that OCS operations have on State coastal zones.

The only major role played by States prior to OCS leasing is to exercise their right to comment on environmental impact statements which the Bureau of Land Management prepares before each lease sale, in compliance with the National Environmental Policy Act of 1969. This means that State participation does not begin until after the Interior Department has decided when, where and how much OCS acreage will be offered.

States and communities adjacent to past and present offshore oil developments have incurred significant environmental, economic and social costs. Direct costs include environmental degradation from the siting of refineries, pipeline terminals, tank storage farms, supply bases, petrochemical plants and other hydrocarbon-related facilities in the coastal zone. Substantial risks of large-scale accidental pollution from oil spills also face coastal States, as do the largely unknown effects of chronic low-level discharges of oil into the marine environment. Indirect effects include changes in land use (including loss of valuable wetlands), shifting populations and employment patterns, housing demand, and the required expansion of public facilities such as schools, roads, police and fire protection. A recent study found that the negative economic impact of Federal offshore development on the State government of Louisiana in 1972 equalled \$38 million.²

When Federally-owned mineral resources are produced onshore, affected States receive royalties of 37½ percent and, in many cases, additional reclamation funds which bring the State share to 90 percent of revenues. With offshore oil, on the other hand, States receive no royalties or severance taxes on resources produced. While costs and benefits should also be examined on a national basis, coastal States would clearly realize a more equitable share of costs and benefits if they received financial assistance in coping with the onshore impacts of offshore oil.

.

If the 1975 leasing program goes forward as presently planned, without policy changes, it could exacerbate serious problems which are evident in current leasing and management practices for the Outer Continental Shelf.

There is evidence that regulation of environmental and safety practices in OCS oil and gas operations is inadequate. The U.S. Geological Survey of the Department of the Interior has primary responsibility for issuing and enforcing orders which govern oil company practices. Two recent studies found that the USGS did not enforce its orders to the fullest extent, but often issued only oral warnings about violations when written notices or fines were called for.³ In addition, the

² Offshore Revenue Sharing: An Analysis of Offshore Operations on Coastal States, prepared for the Governor's Offshore Revenue Sharing Committee, by Dr. Jan W. Duggar, Gulf South Research Institute, Baton Rouge, Louisiana, 1973.

³ Outer Continental Shelf Resource Development Safety: A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering Marine Board, December 1972. Improved Inspection and Regulation Could Reduce the Possibility of Oil Spills on the Outer Continental Shelf, Report to the Conservation and Natural Resources Subcommittee, Committee on Government Operations, House of Representatives, by the Comptroller General, June 1973.

orders themselves appear to need strengthening. The USGS has permitted the industry being regulated to comment on proposed regulations prior to their publication in the *Federal Register* for public comment. The Subcommittee on Conservation and Natural Resources of the House of Representatives' Government Operations Committee has contended that the practice of circulating proposed orders to the industry's Offshore Operators Committee is a violation of the Administrative Procedures Act and is "not in the public interest", since the strength of the orders may be compromised.⁴

In view of these shortcomings, there is cause for concern about the ability of the U.S. Geological Survey to effectively regulate the vast acreage contemplated for leasing in 1975.

A serious defect in the current OCS leasing and management program is the inadequacy of information about resources and reserves. While the USGS collects a substantial amount of raw data—including maps of productive formations, core samples, and well logs indicating drilling success or failure, the agency lacks sufficient manpower or funds to analyse, interpret or translate these data into useful information comprehensible to coastal planners, energy policy-makers and other members of the interested public. Instead, the Survey relies on data compilations prepared by industry trade associations—the American Gas Association and the American Association of Petroleum Geologists. Different estimates of potential resources and reserves in frontier areas of the OCS vary by as much as an order of magnitude. A major reason for the Federal government's lack of reliable independent information about the resources it owns is the fact that it does not conduct any exploratory drilling and only limited seismic and geophysical studies. A large-scale exploration program in frontier areas, sponsored and administered by the U.S. Geological Survey rather than by private industry, would greatly improve the government's resource data base and improve the Interior Department's efforts to receive revenues for oil and gas which truly represent a fair market value.

The usual bonus bidding system—in which oil companies place competitive bids for OCS tracts—gives the competitive edge to the largest companies with the greatest capital reserves. While small independent companies often participate in OCS leases as minority share-holders in joint ventures, they are generally unable to introduce a truly competitive element into the bidding through majority holdings. Alternative leasing systems are permitted under the Outer Continental Shelf Lands Act of 1953,⁵ and their implementation might alleviate this situation and restore effective competition among prospective bidders. One such system is the "royalty bidding" option, which the Interior Department tested in an October 1974 lease sale. Under this system, bidders compete in offering to pay the Federal government a percentage of the value of the oil produced, and pay only small, fixed bonus fees at the time of the lease sale. A third system would base competitive bidding on the percentage of net profits that companies were willing to pay to the government. Both the royalty and the profit sharing systems would reduce the amount of initial capital companies would have to pay, thereby eliminating a barrier to bidding for small companies.

⁴ *Our Threatened Environment: Florida and the Gulf of Mexico, Report* by the Committee on Government Operations, U.S. House of Representatives, October 1, 1974.

⁵ 67 Stat. 462, 43 U.S.C. §§ 1331-1343.

The present leasing system also fails to guarantee the timely development of resources under lease. While the lease theoretically expires after five years if no development takes place, the U.S. Geological Survey routinely extends the lease period at the operator's request.

* * * * *

There is widespread doubt about whether the oil industry can cope with such a large quantity of OCS development in so short a time.

Never before has the Interior Department offered more than three million acres for lease during a single year. It is unlikely, in light of current shortages of drilling rigs, manpower and tubular goods, that the oil and gas industry would be in a position to develop promptly all of the tracts on which it makes successful bids, if, in fact, it purchases 10 million acres.⁴

Even more important, under the bonus bidding system the capital requirements for such a large leasing program are enormous. Bonus bids on oil and gas tracts in recent sales have averaged between \$2,000 and \$5,000 per acre. To offer an average of \$3,000 an acre on 10 million acres, the industry would need \$30 million worth of capital just for bonus payments at the time of sale. This does not include the costs incurred by the industry in drilling exploration wells, developing tracts where oil or gas is discovered, or making royalty payments to the government on resources produced. In the face of these enormous capital requirements, even the highly profitable oil industry would experience cash flow problems.

In actual experience, however, the oil industry is likely to limit its annual capital investment in bonuses to a lower level by placing far lower average bids on the acreage leased. This is because of the need to spread its financial resources out over such a large quantity of offerings, and because of the financial uncertainty inherent in leasing in new areas where information about potential resources is scarce. Where promising geophysical data do exist, competition will prevail and bids will be high; in other areas, there may be no bids at all. Until exploratory drilling begins on the Atlantic, and the Gulf of Alaska, financial risks will be great for both the companies and the government. If significant quantities of oil and gas are found in frontier areas, the rapid leasing policy could result in the Federal government receiving revenues representing only a small fraction of the potential market value of those resources.

It remains unclear what part OCS leasing in 1975 is intended to play in the larger context of national energy policy.

Despite several Federal organizational changes, including the creation of the Federal Energy Administration, the Energy Research and Development Administration, the Nuclear Energy Commission and the Energy Resources Council, the nation still lacks a coherent national energy policy. Without such policy, it is impossible to determine whether or not the nation needs to lease 10 million acres of offshore

⁴ *Availability of Materials, Manpower and Equipment for the Exploration, Drilling and Production of Oil—1974-1976*, National Petroleum Council, September 1974.

lands in 1975. It is clear, however, that such a massive leasing program will do little to alleviate oil and gas shortages in the next few years and that energy conservation is the only means of reducing oil imports during this period.

* * * * *

The Senate recently passed the Energy Supply Act of 1974 (S. 3221) which would substantially improve the OCS leasing and management system.

Although the House of Representatives has not acted with respect to OCS legislation, making it unlikely that such legislation will become law in the 93rd Congress, there appears to be a growing momentum for OCS reform early in the 94th Congress.

The Senate bill improves OCS leasing and management practices in several ways. For example, it requires the Secretary of the Interior to prepare a 10-year leasing program, which would be updated annually. To develop the program, the Department must consult with the States and allow for public participation. The bill specifies further that the environmental impact statement on the leasing program must include an assessment of how the program fits into the larger picture of energy supply; a description of the environmental hazards posed in each proposed leasing area, and a discussion of the industry capability to develop the acreage leased. Furthermore, the Senate bill calls on the Secretary to conduct a large-scale survey of federal oil and gas resources to improve the Department's and the public's knowledge about these federally owned resources.

The new bill also offers substantial improvements in the environmental and safety regulation of OCS operations. It calls for strong performance standards, more frequent inspections, and stiffer fines for violations. It requires OCS operators to use the best available technology in the hazardous segments of drilling operations. It provides for strict liability for oil spills, and sets up an Offshore Oil Pollution Settlement Fund, financed by a tax of 2½ cents on each barrel of oil produced, to compensate fishermen, coastal land owners, or others damages by oil spills.

The OCS bill also calls for a report to Congress on the relative advantages of different leasing systems, including bonus bidding, royalty bidding, and net profit sharing.

A key feature of the new legislation is the establishment of a Coastal State Fund. Together with grants to States under the Coastal Zone Management Act of 1972, this Fund will greatly assist States in alleviating the impacts of offshore oil and gas development upon coastal lands. The Fund will come from oil revenues—up to 10 per cent of total royalties and bonuses, limited to \$200 million annually.

The Senate has clearly established its leadership and commitment to reform OCS leasing and management policies and has demonstrated a clear understanding of impacts within the coastal zone caused by OCS-related energy facilities siting. This makes it all the more important for new leasing programs now proposed by the Secretary of the Interior to conform to the intent of the State with respect to State participation, long-range planning of leasing programs, and sound environmental and safety practices in OCS operations.

B. RECOMMENDATIONS

1. There should be early enactment of legislation to improve OCS policies and practices, along the lines of the Energy Supply Act of 1974 (S. 3221) as passed by the Senate on September 18, 1974.

Following extensive hearings and investigations by two United States Senate Committees, the Committee on Interior and Insular Affairs and the National Ocean Policy Study of the Committee on Commerce, the Energy Supply Act was approved by the Senate by a roll call vote of 64 to 23. This action by the Senate came in the face of opposition from the White House, the Department of the Interior and spokesmen for some of the major integrated multinational oil companies. This Act, significantly amending the Outer Continental Shelf Lands Act of 1953, should receive the prompt attention of the 94th Congress. Moreover, the Congress should consider additional amendments requiring public access to information, government-sponsored exploration by the USGS (including drilling exploratory wells in frontier areas) and further research and experimentation on alternative leasing systems by the Secretary of the Interior. At the same time, Congress should, through research, hearings and other means, closely examine and consider whether alternative Federal organizational mechanisms are necessary to deal with the developmental, research and regulatory responsibilities associated with OCS oil and gas, which are now performed primarily by the Department of the Interior.

2. No leasing of offshore oil and gas lands should occur in frontier areas until the Interior Department demonstrates that such leasing is clearly necessary, safe, and in the public interest.

Several steps should be taken prior to leasing in frontier areas of the Atlantic, the Gulf of Alaska and the Pacific.

(a) Affected coastal States should be allotted emergency grants for special studies, to be completed within nine months of grant appropriation, to determine the critical issues that adjacent OCS leasing would pose for their Coastal Zones. The results of these studies should be available to the public and evaluated by the Interior Department, the National Oceanic and Atmospheric Administration's Office of Coastal Zone Management, the Council on Environmental Quality, and the Review Panel of the National Academy of Sciences before leasing.

(b) Environmental baseline studies of proposed leasing areas, which are currently underway, should be completed, published and evaluated by CEQ and the NAS Review Panel.

(c) A leasing schedule which begins with the areas of least environmental risk and potential socio-economic disruption should be drawn up.

(d) The Interior Department should demonstrate that it has exerted all possible effort to ensure that previously-leased tracts are developed and produced in a prompt and timely manner before leasing in frontier areas.

3. The proposed 10-million-acre OCS leasing program for 1975 should be replaced with a more realistic lease target based on sound management principles for publically-owned resources.

The principles of sound resource management include:

(a) OCS planning in the context of a comprehensive national energy policy;

(b) State participation in OCS planning, and assistance to States affected by OCS development;

(c) policies designed to ensure that the government and hence the taxpayers, receive revenues based on the fair market value of public resources;

(d) realistic appraisal of the oil and gas industry's ability to develop leased lands in a prompt and timely manner;

(e) use of the best available technology, regulations and procedures for environmental protection and safety;

(f) public disclosure of sufficient information on OCS resources to permit effective and useful public participation in leasing decisions.

II. INTRODUCTION

On February 19, 1974, the Senate unanimously adopted S. Res. 222, which was authored by Senator Warren G. Magnuson, Chairman, Committee on Commerce. This resolution authorized creation of a National Ocean Policy Study (NOPS) to undertake a comprehensive analysis of national ocean policy and Federal ocean programs.

This action was the most recent in a continuing series of congressional efforts over the last 15 years to focus national attention on the oceans as an important source of food, minerals, commerce, and recreation. Marine policy-making in the 1960's culminated in the passage of the Marine Resources and Engineering Development Act of 1966. This Act established a Commission on Marine Science, Engineering, and Resources to survey United States marine affairs and recommend alternative courses of action. Although the Commission made numerous recommendations for a comprehensive, long-range national ocean policy, many of these recommendations were never fully implemented. Several recent events, such as the energy crisis, passage of pollution control legislation and land use conflicts in the coastal zone, have pointed out the need for effective public policies to guide the use of ocean resources. Senate Resolution 222 was enacted to provide legislative proposals to deal with these policy issues.

In March, 1974, Senator Ernest F. Hollings, Chairman of the Commerce Committee's Subcommittee on Oceans and Atmosphere, was appointed chairman of NOPS. The Study selected as one of its first areas of investigation the energy potential of the Outer Continental Shelf (OCS) and the impact energy development could have on the environmental and socio-economic conditions of the coastal zone. Hearings were held April 23, 24, and 25 and May 2 and 22, 1974 on Federal OCS policies, the anticipated impacts of outer continental shelf oil and gas development upon the coastal zone, and the long-range energy needs of the Nation. An additional field hearing was conducted August 5, 1974 in Boston to receive testimony on anticipated coastal impacts of proposed development on the Georges Bank off Massachusetts.

In addition, on May 6, 7, 8, and 10, 1974, the Senate Committee on Interior and Insular Affairs held hearings on proposed amendments to the Outer Continental Shelf Lands Act of 1953. These hearings explored the need to assure environmental protection, to improve oil and gas leasing procedures and to assess the needs of coastal states.

This report summarizes the various alternative policy issues developed at these hearings and integrated them with information contained in related background documents. The NOPS staff also has worked with the Council on Environmental Quality in examining and assessing the risks and impacts involved in opening frontier OCS areas for oil and gas leasing.

III. OCS INFORMATION NEEDS

A. DATA NEEDS IN LAND USE AND GROWTH PATTERNS

Data on land use, growth patterns, and other socio-economic problems in the Coastal Zone associated with offshore petroleum development are inadequate and sometimes quite contradictory. In order to facilitate decisionmaking, authorities need socio-economic impact studies prior to offshore oil development; studies which rely on past and present experiences in Louisiana and other processing areas, and which separate clearly necessary developments from merely optional developments related to offshore oil production.

In testimony before the NOPS hearings, Dr. Russell Peterson, Chairman of the CEQ, stressed the need for such data to provide people with advice. He said

I firmly believe that the public interest requires that we first determine, in social, economic, and environmental terms, the cost of such action (OCS development) to be able to weigh them against the benefits of developing these resources and the consequences of foregoing development in all or some of these areas.

Offshore oil and gas developments are part of the larger problem of competing uses of the Coastal Zone, problems which can only be solved through comprehensive planning. Oil and gas development in the OCS will put additional demands on the use of land for tank-farms, separation facilities, and so on. During the construction stage in particular, new demands will be made on the infrastructure of the coastal zone adjacent to the offshore fields, and the growing population associated with the various stages of development will need housing, schools, hospitals, recreational facilities, etc. A review of the literature on employment associated with offshore petroleum development shows great variation and discrepancy in assumptions about the extent of employment effects, and advanced planning for offshore development in new frontier areas has become very difficult. As planning for additional commercial, recreation, and service-oriented facilities is dependent on accurate employment figures, additional studies of the economic impact of offshore petroleum development must be undertaken.

If the discrepancy in employment data is too large, as is the case in some of the studies made on employment impact associated with development of the Atlantic OCS (see sub-section below), it will be impossible for state planning agencies to assess accurately additional demands on the infrastructures and front-end capital required to provide additional social services for a growing population.

Local and State authorities also need data on possible adverse affects of demand for labor in the high-wage offshore oil industry on low-wage traditional industries. If traditional industries are severely

(9)

affected by labor-demands associated with offshore petroleum developments, states may be faced with unemployment problems once the more labor-intensive construction phase of offshore development has ended.

Local and State authorities also need more information on the physical and sociological impact of population growth associated with offshore developments on existing communities, particularly in rural areas where the traditional way of life can be seriously impaired by inflow of laborers from outside the area. Such developments are actually happening in part of northeastern Scotland and the Shetland Islands, where labor from other parts of the United Kingdom and from other countries is expected in some instances to double local populations.

Finally, there is little information on the impact of offshore oil developments on fisheries. On the surface the two industries appear able to live together; however, local and regional studies on the socio-economic and environmental impact of offshore drilling and production are needed to provide policy-makers with the necessary information for decision-making.

B. EMPLOYMENT

As the socio-economic impact of offshore petroleum development is closely related to actual job creation, accurate employment data are of prime importance for decision-making related to offshore oil and gas drilling and production.

Employment projections are subject to a great many variables, such as:

1. Estimates of recoverable oil and gas.
2. Lead-time from date of lease sale to full production of discovered fields.
3. Estimates of required onshore facilities.
4. Estimates of optional onshore facilities, such as petrochemical plants.
5. Whether or not drilling rigs and production platforms are manufactured locally or purchased from other parts of the country.
6. Availability of an adequate infrastructure.
7. Geographical location of offshore oil and gas fields.

These and other variables are of great importance in calculating possible primary and secondary employment impact associated with offshore petroleum development.

An example of widely differing estimates for Atlantic OCS development will serve to illustrate the importance of these assumptions.

The Council of Environmental Quality has estimated local and regional employment in the Atlantic region at 144,000 and 318,000 respectively, assuming high development of 500,000 barrels per day of oil and 600 million cubic feet per day of natural gas.

CEQ REGIONAL EMPLOYMENT ASSOCIATED WITH THE DEVELOPMENT OF OFFSHORE OIL AND GAS:
HIGH DEVELOPMENT (1985)

	Employment		Regional population increase
	Local	Regional	
New England.....	19,000	76,700	188,800
Mid Atlantic.....	28,800	104,200	227,000
South Atlantic/Charleston.....	59,200	57,300	250,000
South Atlantic/Jacksonville.....	37,000	53,900	142,800
Total.....	144,000	318,000	809,400

Source: CEQ, "OCS Oil and Gas—An Environmental Assessment," Washington, D.C., Apr. 18, 1974. Ch. 7. pp. 18, 28, 37, 45.

By contrast, Gulf South Research Institute in Baton Rouge estimated, on the basis of actual experience in Louisiana, and assuming offshore production of 500,000 barrels per day from the Atlantic by 1985, an increase of employment of 20,900 and a total population growth associated with offshore oil and gas development of 65,690.¹

Taking into consideration that the CEQ estimates are based on projected production of 1 million barrels per day (as opposed to 500,000 barrels per day), some 600 new jobs may be created in New England figures for further comparison.

Assuming production of 1.5 million barrels per day Gulf South figures on employment associated with the development of Atlantic offshore oil and gas would triple to 62,700 and total population growth to 197,070.

A third study, on Georges Bank OCS oil and gas developments, undertaken by Dr. William Ahern of the Rand Corporation, estimates that in case of high development of offshore oil and gas (about 500,000 barrels per day), some 600 new jobs may be created in New England. On the basis of experiences in Louisiana, another 1,012 jobs in manufacturing, construction, chemical and allied products and refining could be added. Secondary employment could add another 2,112 jobs. Hence, total employment associated with Georges Bank development would be approximately 3,724. On the basis of Dr. Ahern's assumption that Georges Bank may hold about one fifth of total potential Atlantic OCS petroleum, total employment created by offshore development for the entire Atlantic region would be approximately 18,620.²

Extrapolating Dr. Ahern's estimate of Georges Bank for the entire Atlantic at a daily production rate of 1.5 million barrels, total employment created would be around 55,860.

Comparing the studies of Dr. Ahern and the Gulf South Research Institute with experiences or estimates for other parts of the country, one tends to find more support for the lower estimates than for the

¹ For a detailed analysis of this study, see Section on Economic Consideration.

² William R. Ahern, Jr. *Oil and the outer Coastal Shelf, The Georges Bank Case*. Cambridge, Mass. (Ballinger Press). 1973, p. 12.

CEQ figures.³ It is very difficult to analyse the data, because one does not exactly know which activities are included in each of the studies, or how data were obtained. Moreover, extrapolating data for one region from data obtained in another area where circumstances surrounding oil and gas development may be quite different, is likely to create built-in biases and inaccuracies. Whatever the reason for the vast discrepancies between the CEQ figures and those of the other studies may be, it is clear that data on the employment impact of offshore oil and gas development in the Coastal Zone are insufficient to serve as guidance for policymakers. The difference in projected population increases is so vast as to have a serious impact on planning for schools, hospitals, roads, etc. New data must be collected on the potential employment impact, associated with OCS development, and standardized criteria for comparison need to be designed to minimize confusion.

C. OCEAN RESOURCES AND BIOLOGICAL DATA

Biological baseline data is needed to assess properly the impact of outer continental shelf oil and gas development on ocean and coastal zone ecosystems. Much of this information is not available at present and the data which is available is deficient. This was the consensus of witnesses in the National Ocean Policy Study hearings on outer continental shelf development. Dr. Robert M. White, Administrator of the National Oceanic and Atmospheric Administration (NOAA), testified that much of our current information is of a specific nature, focusing on specific areas or needs. He stated:

We have tended to treat our near shore ocean problems on an ad hoc basis. Each time there has been a need for ocean information for a specific outfall, a specific dumping site, a specific power plant, we have, on a crash basis, initiated specific studies to give specific pieces of information. It is my view that this kind of approach is costly for the nation and does not, because of its crash nature, yield the kind of information that is really needed. We must turn to a more comprehensive and long-range view of what we need to do with respect to research in our near shore and coastal waters.⁴

Dr. White also pointed out that information on biological systems suffers the same problem:

While our knowledge of fish stocks along our coasts is much improved, it tends to be highly concentrated on specific species

³ A Study by Sherman Clark Associates of Menlo Park, California, estimated employment associated with a production of 500,000 b/d off the Coast of Southern California at about 5,000, with secondary employment adding another 15,000-25,000. Data obtained from Mr. Sherman Clark, telephone conversation, September 9, 1974.

Another study on the Socio-economic impact of offshore oil and gas development in the British sector of the North Sea, estimates employment in exploration and production to rise between 4,800-9,600 for a production of 1 million b/d. Applying the Gulf of Mexico multiplier of 1.687 for jobs related to the oil industry, and a multiplier of 2.087 for secondary jobs, total employment associated with a North Sea production of one million b/d could increase somewhere between 21,800 and 42,300. See: John L. Kennedy, "North Sea Plans Turned Into Tangibles", *Oil and Gas Journal*, January 8, 1973, pp. 65-69. The British experience might be most relevant to New England, because both areas do not produce onshore oil and gas, and subsequently do not have many of the treatment and refining facilities which California and the Gulf States built during the period when they began to produce from onshore fields. It is interesting to note that in spite of these differences, the estimate for expected employment creation is very close to the low estimates of the Gulf South, Abern, and Clark Associates' studies.

⁴ U.S. Congress, Senate, Committee on Commerce, National Ocean Policy Study, *Outer Continental Shelf Oil and Gas Development 1974*, Hearings, 93d Congress, 2nd session, April 23-25, May 2, 22, 1974. Washington, U.S. Govt. Print. Off. (in press). Hereafter referred to as "NOPS Hearings."

that happen to be of immediate commercial and recreational value. I am convinced that as we develop the oil and gas resources of our shelf areas more broadly, there will be a continuing need for more systematic assessments of fisheries stocks. NOAA's Marine Resource Monitoring, Assessment and Prediction Program (MARMAP) is directed at this problem.²

Dr. White pointed out that base line data on the possible impact of oil and gas development on several important fishing areas, such as Georges Bank, were deficient:

The deficiency is not with respect to the extent of the stock of commercial fisheries resources. The deficiency is in what the effects of an oil development along Georges Bank would be on those fisheries stocks . . . The critical thing is the effect of oil on the eggs, larvae and young stages of these fish and this is an area where our knowledge is deficient.³

Although laboratory studies may be useful in gaining environmental data, Dr. White emphasized the need to find ways to apply the results of laboratory studies to actual conditions in the field.

In testimony at the same hearings Dr. William J. Hargis, Jr., Director of the Virginia Institute of Marine Sciences (VIMS) and vice chairman of the National Advisory Committee on Oceans and Atmosphere (NACOA), identified additional data gaps. He indicated that:

Current knowledge of continental shelf and slope circulation is inadequate . . . This is the single-most important parameter involved because circulation determines the extent and direction of spills—that is, the extent of spread and direction of spread of spills and is critical to both complete biological assessment and physical assessment of damage.⁴

According to Dr. Hargis there are serious gaps in the data base on bottom characteristics and geologic structures relative to pipeline construction and on the benthic and planktonic marine organisms offshore to determine potential biological damage. With regard to the coastal zone, Dr. Hargis testified:

In shallow or coastal areas there is little knowledge of the acute effects of exposure to oil in the various stages of the life histories of either benthic or pelagic species, particularly on the sensitive portions of life stages such as eggs and larvae of fish, crabs and shell fish. The same may be said for the chronic effects of exposure to low levels of hydrocarbons.

He added,

We are not satisfied with current standards applied to oil in coastal waters and estuarine waters. Several efforts are going forward to establish a better basis for standards but even here data are lacking.⁵

² *Ibid.*
³ *Ibid.*
⁴ *Ibid.*
⁵ *Ibid.*

In commenting on the Council on Environmental Quality's report on OCS development,^{5a} Dr. Hargis indicated our knowledge of potential oil spills is also based on insufficient data:

The data base for this best estimate [risk] evaluation, which we provided to CEQ, is considered inadequate for a truly defined estimate of potential impact. We would like to improve this data base before passing final judgment on the probability of a major spill impacting our shores and the subsequent effects.⁶

However, he maintained the CEQ report helps bracket the areas in which to concentrate studies leading to better use of limited resources for obtaining data.

Several witnesses at the National Ocean Policy Study hearings testified to the critical need for environmental baseline data and called on the Department of the Interior to begin immediately an emergency program to collect such information. Other witnesses recommended that the National Oceanic and Atmospheric Administration be responsible for conducting environmental assessments of potential leasing areas.

To achieve a beginning on an overall baseline research effort on the OCS, Congress approved on June 24, 1974, the Energy Research and Development Appropriations Act (P.L. 93-322) which included provision of an appropriation of \$6,630,000 for NOAA to remove from mothballs, refurbish and equip the research vessels *Discoverer*, *Surveyor*, and *Miller Freeman*. The report accompanying the bill stipulated that the vessels be used for gathering environmental baseline data in the OCS waters.

In the spring of 1974, a committee was formed, chaired by the Bureau of Land Management, with representation from the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, the U.S. Geological Survey, the National Fish and Wildlife Service, and the National Ocean Policy Study to coordinate baseline studies which pertain to oil and gas development on the outer continental shelves.

Jared G. Carter, Deputy Under Secretary, Department of the Interior, outlined at the NOPS hearings the Department of the Interior baseline data programs that are currently underway. These studies involve three sequential levels of effort: (1) an inventory and analysis of existing environmental and socio-economic data; (2) special field studies to fill short-term non-recurring data gaps pointed out in the first phase; and, (3) continuing ecological baseline and monitoring studies in existing fields and pipeline corridors. Mr. Carter also said,

We are contracting with universities for more specific analyses of frontier areas such as the North Atlantic, from the Bay of Fundy to Sandy Hook, New Jersey; the mid-Atlantic, from Sandy Hook to Cape Hatteras; the Gulf of Alaska, from Cook Inlet to Unimak Island. We also requested studies of southern California and are broadening

^{5a} U.S., Executive Office of the President, Council on Environmental Quality, *OCS Oil and Gas—An Environmental Assessment*, April 1974.

⁶ NOPS Hearings.

and updating our information concerning the Gulf of Mexico.⁷

In noting gaps in biological data, a recent report on oil spills and the marine environment, prepared for the Ford Foundation Energy Policy Project, concluded:

At present, assessment of the environmental impact of [off-shore oil and gas exploration and production] must be made in considerable ignorance and uncertainty because of large knowledge gaps and conflicting opinions. Because so many serious questions remain unanswered, and because of the alarming implications of some of the information available, we recommend great caution in making policy decisions involving oil and the marine environment. . . . The only remedy for our uncomfortable ignorance is more and better research into the problem—especially into the more neglected aspects, such as chronic pollution and sublethal effects.⁸

Among the recommendations of the Ford Foundation report are the following:

(1) More detailed field investigations of oil spills are needed to more fully comprehend the ecological effects of such incidents. Spill simulation and field experimentation are preferred approaches to the study of immediate ecological effects and ecosystem recovery.

(2) The effects of chronic or multiple pollution by oil need increased attention. Estuarine ecosystems already under stress deserve special attention because of their importance to coastal productivity.

(3) Experimental research is needed on the sublethal effects of oil on marine organisms, including effects on photosynthesis, metabolism, reproduction, behavior, and chemical reception.

(4) The uptake, retention, and release of petroleum hydrocarbons by marine organisms should be further studied. Background levels of "natural" and petroleum-derived hydrocarbons need quantification and qualification. Mechanisms of uptake, metabolic fate, and release are ill-studied. Knowledge of the persistence of various hydrocarbons in organisms and the non-living parts of the biosphere is required.

(5) The threat of oil pollution to human health needs further study and evaluation. Carcinogenic contamination of fishery organisms deserves special attention.

(6) Much of the lack of understanding about the effects of oil pollution stems from our lack of understanding of marine ecosystems. More baseline information is needed against which the effects of pollutants of all kinds may be measured.⁹

The Energy Policy Project report went on to conclude,

Considered in light of the magnitude of the problem and the level of support of other water pollution programs, one

⁷ *Ibid.*

⁸ D. F. Boesch, C. H. Hershner, and J. H. Milgram, *Oil Spills and the Marine Environment*, Ballinger Pub. Co., Cambridge, Mass., 1974, p. 45.

⁹ *Ibid.*, pp. 40-41.

must conclude that federal funding of research on the effects of oil pollution is grossly deficient.¹⁰

The Assembly Select Committee on Coastal Zone Resources of the California legislature held hearings regarding offshore oil drilling in the spring of 1974. In its official report of findings, the committee agreed there is insufficient environmental baseline data to permit an accurate assessment and measurement of any changes which may occur in the environment as a result of OCS oil and gas development activities.

The committee recommended that:

State and federal governments should cooperate in the conduct of environmental baseline studies in any offshore area for which development leases are being sought before such leases are issued. The studies should be conducted by a governmental agency with expertise in marine sciences, such as the National Oceanic and Atmospheric Administration, and should be subjected to independent review. Such studies should be carried out on a continuing basis after oil and gas development proceeds in order to enhance the accuracy and usefulness of the information for application in future offshore oil and gas management decision.¹¹

Witnesses at the National Ocean Policy Study hearings were asked to indicate what time frame is necessary for gathering adequate environmental baseline data. Dr. Russell Peterson, Chairman, Council on Environmental Quality, said CEQ has not developed a cost and time frame for acquiring adequate information on the outer continental shelf leasing. But Dr. Hargis suggested that three more years would be necessary to make a "tight" environmental impact analysis of outer continental shelf development. Dr. A. Gordon Everett of the Environmental Protection Agency (EPA) pointed out the need to develop baseline data quickly:

We evaluated the information in the environmental impact statement [for the Mississippi, Florida, and Alabama lease sale in a "virgin" area of the Gulf last December] and felt that it was inadequate for the long term federal management of the resources within the area . . . In discussions with the Department of the Interior we agreed that the kind of additional baseline information that could be developed and that was needed could be obtained concurrently with the initiation of their operations on the leasing program and concurrently with the onset of exploratory drilling. The drilling will not occur on all tracts at the same time and it did give us an opportunity to develop this information as we went along . . . I think this is an alternative we can consider but it is highly desirable and I think necessary for long term federal management of those resources that we develop this data expeditiously and that we phase in not only the baseline data at the beginning but begin to do the studies which have not been done on the concurrent long term impacts of development.

¹⁰ *Ibid.*, p. 42.

¹¹ California Legislature, Assembly Select Committee on Coastal Zone Resources, *Report on Hearings Regarding Offshore Oil Drilling*, July 18, 1974.

We don't even have that kind of data in any great abundance for the long term development areas off Louisiana.¹²

EPA's Alvin L. Alm noted that some of the data gaps make information used in the CEQ ranking questionable and agreed that more data is needed:

Considerable baseline data is needed so that adequate monitoring programs can be designed as a safeguard against adverse changes in the ecosystem. In new leasing areas it is important that biological and related environmental data be available prior to the commencement of production activities which may alter the existing conditions.¹³

Professor Don E. Kash of the University of Oklahoma, however, took issue with the alleged critical nature of baseline data:

One of the things that impressed us the most in the initial stages of the research we did was a tendency on the part of proponents and opponents of OCS development to rest their case on an illusive thing like better information. The argument ran as follows. If we had complete information it would demonstrate that the damage of oil and gas operations to the environment would be minimal or nonexistent or the alternative position was if we have adequate information it would demonstrate that these activities are so damaging that they should not be carried out. Now, to argue either of these points with the notion that you could answer the question of developing or not developing these resources if we had better data, is simply out of the question. The essential point is that we do not have that information and we are not going to have that kind of information in anything like the foreseeable future . . . We will not soon acquire the environmental data to adequately understand the ocean-coastal ecosystem. The critical need, therefore, is for a management planning system capable of accommodating conflicting interests and providing responsible direction under conditions of limited information.¹⁴

D. FISHERIES

While it appears that sports fisheries and some forms of commercial stocks—with the exception of oysters—have been able to flourish alongside oil developments in the Gulf of Mexico, considerable data gaps remain. The CEQ report on OCS development in the Atlantic and Alaska devoted little space to the environmental impact on fisheries because, in the words of Dr. Russell Peterson, Chairman of CEQ, "We could not find any information. MIT was responsible for the study in this area, and they consulted with a number of other universities and institutions in marine science, and the information available on the impact of oil base pollutants in the fish life is very modest. So it wasn't a case of our not looking for it. We did look for it and couldn't find it. What we need is some baseline studies now trying to under-

¹² NOPS Hearings *op. cit.*

¹³ *Ibid.*

¹⁴ U.S. Congress, Senate, Committee on Interior and Insular Affairs, Subcommittee on Minerals, Materials, and Fuels, Hearings, 93rd Congress, 2d Session, May 6-8, 1970, Washington, U.S. Govt. Print. Off. (in press). Hereafter referred to as "Interior OC" Hearings."

stand what is the nature of the biological life in the area and what is the change in that life as we proceed into the future?"¹⁵

In addition to laboratory studies being conducted by NOAA, there is a need to apply the results of experimental laboratory studies to actual conditions in the field, if we are to understand the real ecological impact of oil.¹⁶ Such studies are of potential economic importance to the fishing industry which landed almost a billion dollars worth of fish in 1973, and to the multi-million dollar sports fishing industry.

Fishermen could face labor problems when the demand for labor in the high-wage oil industry accelerates sharply during the early stages of offshore development. These problems can be expected to be more severe in the U.S. than among North Sea fishermen, whose wages—unlike those of their American counterparts—are currently high enough to compete with the oil industry.¹⁷

1. *NACOA Recommendations in Data Needs*

In its most recent annual report to the President and the Congress, the National Advisory Committee on Oceans and Atmosphere (NACOA) supports the funding through NOAA's Coastal Zone Management Program, of essential research, development, and advisory service programs for coastal States. This arrangement, NACOA argues, will ensure that adequate scientific data and technical support will be more available to the planners and managers who make decisions concerning the Coastal Zone.¹⁸ The NACOA report emphasizes the need for additional scientific research, stating:

Considerable effort has been devoted by several competent committees and individuals in the last decade to establish the scientific and technical needs of management. These efforts have almost universally concluded that, laid against the backdrop of the real needs of management for detailed, accurate, timely, and useable scientific data and engineering capabilities, existing R&D support capabilities falls short of meeting the needs of planners and managers. Problems present themselves faster than technically sound solutions can be provided. Even greater detail is required to answer the questions.¹⁹

NACOA believes that the Presidential proposal to increase by ten-fold the acreage leased for oil and gas development on the OCS, makes it imperative that adequate R&D be undertaken to produce the data needed for sensible choices. The advisory committee maintains that it would be possible to undertake offshore petroleum development which will be compatible with other uses of the Coastal Zone. However, it stresses the need for additional research into the natural, social and economic systems of the Coastal Zone to close the knowledge gap which makes the tasks of site selection, plant design, and facility construction unnecessarily difficult and lengthy.²⁰

¹⁵ NOPS hearings, op. cit.

¹⁶ Dr. White, Administrator of NOAA, NOPS hearings, op. cit.

¹⁷ For a complete summary of the situation in the North Sea, see *North Sea Oil and Gas: Impact of Development on the Coastal Zone*, U.S. Congress, Senate, Committee on Commerce, National Ocean Policy Study, 94th Congress, U.S. Govt. Printing Office (In press).

¹⁸ NACOA, A Report to the President and the Congress, Washington, D.C., June 20, 1974, pp. 30, 31.

¹⁹ *Ibid.*, p. 33.

²⁰ *Ibid.*, p. 33.

Additional research should have the benefit of Gulf Coast experiences with oil development in the Coastal Zone, but should also recognize that there will be some fundamentally different circumstances in new lease areas. Foremost among these differences is the fact that the Gulf Coast began its offshore experience after many years of nearby onshore oil development, and was already a major oil transport and refining center. Taking into account the specific circumstances of a detailed analysis of the socio-economic and environmental impacts of 35 years of offshore petroleum development in Louisiana and Texas may or may not be helpful in making projections for other States. Mr. Futtrell of the Sierra Club, in his summary before the NOPS hearings, said that one of the great defects in the CEQ impact study of the Atlantic and Alaskan OCS development was its failure to use the Louisiana experience.²¹

Dr. Russell Peterson, Chairman of the CEQ, and Dr. Hargis, Director of the Virginia Institute of Marine Science, agreed in NOPS testimony that additional information is needed to weigh the costs and benefits of developing offshore petroleum resources. Dr. Hargis maintained that detailed evaluation of the environmental and socio-economic impact would take at least three years.²²

However, those in the executive branch responsible for the nation's energy policy, maintain that waiting for the results of such studies would seriously impair our future energy supplies (see section below). Mr. Sawhill, Administrator of the Federal Energy Administration, has emphasized the need to speed up OCS petroleum development, and Jared Carter of Interior said in a recent statement in Los Angeles: "To stop the world until these studies were done would mean we could not hold any of the [OCS] lease sales that we already have planned."²³

A compromise between these two positions may be possible. While thorough environmental impact studies would indeed take several years to complete, preliminary socio-economic impact studies could be undertaken within one or two years, simultaneously with geological and geophysical studies (which do not involve drilling on the continental shelf). Several hypotheses could be made, taking into account such variables as estimated hydrocarbon resources, the need for pipelines, possible combination of onshore facilities, essential and optional onshore facilities, and so on.

Geological and geophysical studies should provide policymakers with a more accurate picture of potential hydrocarbon resources. The socio-economic study of the region could be adjusted on the basis of this additional information.²⁴

Once drilling has taken place and knowledge about actual reserves becomes available, the socio-economic impact study could be revised once more, thus providing policy makers with the information needed to make final decisions on pipeline routing and combinations of pipelines and onshore facilities.

Step-by-step updating of socio-economic impact studies would provide policy makers with information needed to lessen adverse impacts

²¹ NOPS hearings, op. cit.

²² *Ibid.*

²³ *New York Times*, July 14, 1974.

²⁴ Provided that some estimates based on the geological and geographical studies would be made available to policy makers.

of OCS development on the Coastal Zone. Few observers of OCS development would disagree with Senator Tunney of California, when he said,

I have a feeling that as we begin our move to develop the oil reserves in the OCS, we ought to know precisely what we are doing or if we cannot meet that high standard, at least, we ought to know an awful lot more about what we are doing than presently.²⁵

E. EXPLORATORY AND GEOLOGICAL DATA

1. Introduction

Though land areas will continue to be explored for petroleum deposits for years to come, the offshore areas of the world will provide a substantial portion of new sources of petroleum.²⁶

In 1972, offshore exploration for oil and gas was underway on the submerged continental margins of 80 countries with about 780 fields having thus far been discovered. It is estimated that the worldwide volume of oil found offshore as of January 1, 1973, amounts to 26 percent of total world reserves.²⁷

Approximately 90 percent of this oil is in 60 large fields. During 1972, about 400 drilling units were operating on the continental shelves of 70 nations and commercial production was reported from 26 nations. The number of offshore wells (including dry holes) drilled to date in the U.S. is about 18,000. The total number of producing wells completed around the world to January 1, 1973, was 17,400, most of which were located in the Gulf of Mexico and Lake Maracaibo. Of the 780 oil and gas fields in offshore waters around the world, 493 are oil producers and 287 produce gas.²⁸

2. Oil and gas resources of the United States

U.S. Geological Survey released revised estimates of the Nation's oil and gas resources in March 1974. These estimates were lower than those previously issued by the USGS reflecting a somewhat less optimistic view of potential oil and gas discoveries.

In commenting on the downward adjustment in estimates in a news release, Interior Secretary Rogers C. B. Morton said, "the prospects for discovery of petroleum on the outer continental shelf are still bright, and fully warrant continued investigation and exploration of this great frontier." The USGS emphasized that developing estimates of undiscovered resources is a matter of trying to appraise the unknown. This is particularly true of the Atlantic shelf where no exploratory wells have yet been drilled. Moreover, the USGS has not assessed the effect of recent increases in petroleum prices on reserves and resources. If prices remain high, it is almost certain that secondary and tertiary recovery of oil will increase and there will be production from previously uneconomic sources, both actions adding to recoverable reserves.

²⁵ Interior, op. cit.

²⁶ McCaslin, John C. "Tomorrow's Oil Will Be Found Offshore." *The Oil and Gas Journal*, v. 72, n. 31, Aug. 5, 1974, p. 95.

²⁷ *Ibid.*

²⁸ *Ibid.*

The Geological Survey estimates U.S. offshore undiscovered oil and natural gas liquids to be between 64 and 130 billion barrels and undiscovered offshore natural gas to be from 395 to 790 trillion cubic feet (tcf). The USGS estimate of total U.S. undiscovered oil and natural gas liquids is between 200 and 400 billion barrels with 1000 to 2000 tcf of natural gas listed as yet to be discovered. If the Geological Survey is correct, the Nation is at least a decade away from seriously depleting its domestic oil and gas reserves.

However, exception has been taken to these estimates by several authorities who feel U.S. oil and gas reserves are considerably less than the USGS maintains. These critics include geologists in Mobil and Sun Oil Companies and Dr. M. King Hubbert, of the U.S. Geological Survey. The oil companies point out total petroleum reserves could be as low as 88 billion barrels. Dr. Hubbert, on the other hand, places the estimate at between 170 and 220 billion barrels.

The oil companies' estimates are in part the result of their tendency to look for huge oil-bearing structures while the Survey's method takes into consideration the immense volumes of hydrocarbons believed to be hidden in small stratigraphic traps. Hubbert, however, believes that domestic oil production reached its peak in 1970 and is now on the decline, while the Survey figures imply a peak around 1985.

Whoever is right, the implications are that the Nation will urgently need dependable replacements for oil and gas beyond the middle 1980's. The difference between the two positions on hydrocarbon resources amounts to whether or not domestic oil and gas will be short during the next ten years. Currently the United States is down to about a nine-year reserve of oil. A 12-year reserve traditionally has been regarded as the lowest acceptable minimum.²⁹ It is possible to increase production by improving recovery technology and by drawing down reserves, but any expected increase in domestic production by 1980 from newly discovered oil will be based on a rather hazy assurance that the necessary oil really exists.³⁰ A review of these conflicting hydrocarbon resource estimates based on additional geological and economic data would appear necessary to any long range National energy plan.

3. Seismic indicators of oil and gas

The debate over the level of oil and gas reserves may be aided by the development of new exploratory technology. One such development has recently generated considerable interest.

Oil companies have long sought a reliable means of directly detecting the presence of oil and gas trapped beneath the earth's surface. Locations for wildcat drilling in the past have been based upon geological and geophysical evidences of the existence of a subsurface trap which may or may not contain hydrocarbons. The odds of finding oil or gas by these traditional methods are one in about eight or nine. A new method of analyzing seismic data quantitatively—called "bright spot"—has been developed which, although short of perfect detection, nonetheless has revolutionized the search for oil and gas. Preliminary

²⁹ Gillette, Report. "Oil and Gas Resources: Did USGS Gush Too High?" *Science*, v. 185, July 12, 1974, p. 130.

³⁰ *Ibid.*

reports are that in regions where this new method is most applicable, 60 to 80 percent of the wells drilled have been successful.²¹

The technique has been under development for a number of years, but its existence until recently was a closely guarded secret within the oil industry. It became evident last year, however, that some companies were willing to bid very much more than others for certain tracts in the Gulf of Mexico and the suspicion grew that the high bidders knew more than the others. It is generally conceded that the development and use of the bright spot was partly responsible for the erratic bidding.²²

Within the last year the technique has been adopted throughout the industry and has been used extensively offshore in Nigeria and Indonesia as well as in the Gulf of Mexico. It has also been used in a few regions within the continental United States such as the Sacramento Valley in California.

Although new geological and geophysical detection techniques may promise greater rates of success in future offshore operations, the recent trends in offshore explorations have apparently gone the other direction. For example, in 1972 the American Association of Petroleum Geologists reported a success ratio of only 2% in the offshore Southern Louisiana area; in 1973, it had slipped still further to 1%. (Table I) This almost total lack of exploratory success is largely unexplained. Those knowledgeable in potential oil and gas areas generally consider this area to be relatively a very good area for new drilling.

TABLE I.—SUCCESS RATIOS IN OFFSHORE EXPLORATORY WELL DRILLING
[Percent of total offshore exploratory wells, 1971-73]

Area	1971			1972			1973		
	Gas	Oil	Total	Gas	Oil	Total	Gas	Oil	Total
Total offshore.....	10.3	4.4	14.7	4.7	0.8	5.4	6.6	2.5	9.1
South Louisiana offshore.....	9.4	4.9	14.2	2.4	0	2.4	1.0	0	1.0
Texas offshore.....	21.1	0	21.1	14.9	4.3	19.1	24.2	9.1	33.3

4. Collection and disclosure of geological and geophysical information

A number of witnesses at both the Senate National Ocean Policy Study and the Senate Interior Committee hearings voiced the opinion that the Federal government does not have adequate geological and geophysical information regarding the location of oil and gas on the outer continental shelves of the United States.

Mr. Leonard C. Meeker, in his testimony before the Senate Interior Committee on behalf of the Sierra Club, the Friends of the Earth and the Natural Resources Defense Council, stated the Department of the Interior, as managing agency, does not have sufficient information to make decisions regarding leasing on the outer continental shelf.²³ Mr. Meeker felt that the Federal government should know how much oil and gas could be produced by the tracts it is putting up for lease. He suggested possible implementation of a Federal exploratory drilling program. Such a program would, according

²¹ Hammond, Allen L., "Bright Spot: Better Seismological Indicators of Gas and Oil," *Science*, v. 185, Aug. 9, 1974, p. 515.

²² *Ibid.*

²³ Interior OCS Hearings, *op cit.*

to Mr. Mecker, make it possible for the government to have information on outer continental resources comparable to that held by the oil companies; this information would also be available to the public and smaller oil companies. The Federal drilling program could be carried out either directly or by contract. But no matter how it was implemented, this system would provide the basic information needed to create effective national energy policies.

Former Vermont Governor Philip H. Hoff, representing the American-Canadian Energy Consortium said at the NOPS hearings he finds it "incredible" that the Federal government apparently is willing to proceed with leasing the Atlantic shelf with wholly inadequate information on the extent of potential resources. According to Governor Hoff, the reluctance to give the Geological Survey the tools with which to explore the outer continental shelves and to prepare its own evaluations of the location and extent of the oil and gas resources puts the United States at a severe disadvantage in selling leases and favors major oil industry firms over the smaller independent firms.

Governor Hoff said the American public cannot be expected to get a fair return on the sale of its resources when practically all of the relevant information is held by a handful of major oil companies and only a minor amount is possessed by the government:

It seems to me that the solution to these problems is to change the OSC program so that the Federal government, through the Geological Survey, is directly responsible for exploration on the OCS. The Geological Survey should make not only general geological studies of the OCS, but should be responsible for locating and defining oil and gas reserves. This information could be sold, or even provided free of charge, to all oil companies, both big and little, with the cost of collecting the information recaptured in the form of higher lease payments.²⁴

Governor Hoff said the Federal government could use this information to make such determinations as production time tables and environmental risks in higher oil and gas potential areas, and also provide for better coordination with state coastal zone management programs.

Mr. Jared Carter testified that the Department of the Interior is considering various alternatives to acquire additional geological information concerning the outer continental shelves.²⁵ The alternatives include: a new program of exploratory leases on selected promising structures with all information obtained by the lessee immediately being made public; a Federal exploratory drilling program under contracts issued by the Department with all information immediately being made public; a Federally conducted stratigraphic drilling program with all data immediately being made public; and/or issuing regulations authorizing privately conducted stratigraphic drilling under existing statutory authority.

He cautioned, however, that a limited number of exploratory holes does not necessarily provide sufficient geologic information. For ex-

²⁴ NOPS Hearing, *op cit.*

²⁵ *Ibid.*

ample, about 200 holes were drilled in the North Sea before oil and gas were found.

The Department of the Interior has published a notice of proposed rule changes concerning submission and disclosure of OCS geological and geophysical data in the *Federal Register* on May 16, 1974.³⁶ These rule changes attempt to impose new requirements with respect to geological and geophysical data obtained by exploration. Interior believes that the submission and disclosure of such information will serve the public interest, conserve natural resources, encourage competitive bidding, and assure the receipt of fair market value for Federal resources.

In a public hearing conducted on July 15, 1974, by the Department of the Interior, Mr. Merrill W. Haas, President of the American Association of Petroleum Geologists, testified against the adoption of the new regulations. Mr. Haas voiced the contention of the Association that the proposed regulation changes requiring disclosure of geologic and geophysical information are not pertinent to the stated objectives of the Department of the Interior. According to Mr. Haas, the disclosure of well data to the public 60 days after completion will retard the drilling of wells adjacent to open acreage and the collection of data as proposed would be the wedge for additional pressure to establish a Federal Oil and Gas Company. Mr. Haas concluded:

A geological interpretation is a working hypothesis displayed on a map and remains so until tested by the drill. It should be valued and protected as a copyrighted document—not to be taken away and distributed to those who request it. Oil is found in the minds of men and it is an infringement on individual rights to force the disclosure of private ideas. As professional geologists, we gain a livelihood by generating ideas and recording them in a workable and comprehensive form. These recorded ideas belong to those who have paid for them.

Before the Senate Interior Committee, Mr. Frank Ikard of the American Petroleum Institute said provision for governmental presale tract evaluation is unnecessary. A review of past lease sale bids reveals that, even with all the expertise available to private oil companies, opinions as to the worth of certain tracts vary widely. A Federal government evaluation, even if based on the same data, would constitute only one further estimate, probably no more or less accurate as to the true value of the lease.

Oil industry representatives at the same hearings maintained that it would be a mistake to allow a single government agency to establish priorities for leasing. The differing ways oil companies gather, interpret and use data is, according to witnesses, a major guarantee of continued competition and should be preserved and encouraged. Permitting the Federal government to do all the exploring and mapping, even though all data would be made public, would lead to the restricting of professional and scientific growth.

Industry witnesses were particularly concerned with suggestions which in their view failed to take cognizance of the historic and equitable concept of confidentiality of proprietary information. They also

³⁶ Department of the Interior, Bureau of Land Management, 43 CFR Part 3300, Outer Continental Shelf Lands Act, Geological and Geophysical Data Submission Disclosure, *Federal Register*, v. 39, n. 96, May 16, 1974, p. 17446-17447.

voiced concern over the confiscatory nature of any policy which would force oil companies to make public geophysical information gathered and interpreted at their private expense.

American oil companies operate throughout the world, however, and in other countries they must disclose the very data they seek to keep private in the United States. The Province of Alberta, in Canada, publishes data on reserves and potential productivity of each oil pool and area. Reserves are calculated by the Province's Energy Resources Conservation Board from logs, cores, engineering, geological and production data that must be submitted by every oil and gas operator in Alberta. Oil industry submissions are kept confidential for only one year, after which time they become available to the public at low cost in the form of maps, schedules, tables and annually updated estimates of reserves (by pool and area) of oil, gas, natural gas liquids and sulphur.

All the major American oil companies and many independents have functioned in Alberta under this requirement for over a decade without apparent difficulty. More recently, these same companies have been enthusiastic participants in the development of the North Sea, where similar data disclosure requirements exist.

There appear to be several possible solutions to the problem which concerns oil companies—that promising data on a particular lease tract will give potential bidders for adjacent tracts an unfair advantage. One possibility is to lease much larger tracts, as is customary in the British sector of the North Sea, increasing the likelihood that a single operator would hold lease to an entire oil field. Alternatively, operators of a successful tract could be given preferential bidding rights on adjacent tracts. At the very least, it appears reasonable to require the publication of data in a compiled form over areas covering a number of tracts. If the Interior Department were to publish information from offshore leases in compiled form, it would greatly enhance public knowledge of offshore resources without compromising the rights of individual lease-holders.

IV. ENVIRONMENTAL IMPACT ON THE COASTAL ZONE

Oil and gas development on the outer continental shelf will have an environmental impact in the coastal zone of adjacent states. As the Administrator of NOAA, Dr. Robert W. White, stated at the National Ocean Policy Study hearings:

Our experience in the Gulf of Mexico and off the California Coast leave no doubt that offshore petroleum drilling, production, transportation, storage, and refining operations can pose risks to other coastal resources. . . . It is the near shore parts of our coastal zone, however, that must absorb a major part of the impacts. In the Gulf of Mexico, by far the greatest environmental impacts have been those resulting from pipeline construction, dredge and fill activities, navigation and access channels, and the onshore construction of crew boat basins, wharves, equipment storage depots, tank farms, and refineries.¹

Dr. White called for long range research in the near shore and coastal areas as, "it is here that we encounter some of our most difficult scientific and technical problems."

Dr. David Wallace, Associate Administrator for Marine Resources of NOAA pointed out the impact of OCS development on the shrimp industry in Louisiana:

The greatest impacts of the oil industry have been in the estuarine areas, inshore, where the cutting of channels, laying pipelines, altering the currents has had a substantial impact upon the oyster industry, particularly, in Louisiana and other areas. They have had a substantial adverse impact upon that particular industry. The shrimp industry is still producing at about 100 million pounds per year and this has been fairly stable over the last several years. It is difficult to predict what the level would have been had there not been these environmental changes in the estuaries themselves. This catch of shrimp has been accomplished by substantial acceleration in the numbers of boats fishing and in the rate of fishing. Twenty years ago there were about 3,000 boats fishing for shrimp. Today there are 5,000 and [since that time] . . . there has been no increase in the production of shrimp even though the intensity of fishing has increased. I don't think we can say all of this stability has been acquired as a result of the oil industry and it is possible that there has been some detrimental effect on the shrimp industry.²

The Energy Policy Project report on oil spills and the marine environment cited estuaries as one of the three special marine envi-

¹ NOPS, Hearings, *op. cit.*

² *Ibid.*

ronments that deserve attention because of the increasing threat of oil pollution in these environments. The Ford Foundation report stated:

Several characteristics of estuaries suggest that oil pollution may have serious effects there. Because estuaries are generally confined and relatively shallow bodies of water, oil spills may not spread over a large area of the water's surface and have little chance to be swept to sea. Instead, there is a high likelihood that the oil will reach shore or the bottom. Estuaries are typically turbid, and therefore floating oil may tend to absorb onto fine sediment particles and sink to the bottom, where it may kill or contaminate bottom-dwelling organisms, including shellfish and bottom-feeding fishes. . . . If oil is deposited in sediments, it may persist for long periods under the anaerobic conditions typical of subsurface estuarine sediments. Also, long-term and rather high-level contamination of sediments may result from continuous low-level inputs.³

The Energy Policy Project report also pointed out that oil pollution can significantly affect food chain productivity:

The intertidal areas of estuaries are often characterized by extensive tidal wetlands—salt marshes in temperate latitudes and mangrove swamps in the tropics. These are thought to be in large part responsible for the very high productivity of estuarine environments and are a mainstay of the detritus-based estuarine food chain. Wetlands are vulnerable to dosage by floating oil. Although most experimental evidence shows that marsh grasses suffer little from a single dosage of oil, oils as different as the light Number 2 fuel oil and the heavy Bunker C fuel oil have caused lethal damage to marsh plants at West Falmouth, Massachusetts and Chedabucto Bay, Canada. Furthermore, chronic pollution—such as in the vicinity of a refinery effluent or near an oil handling facility—can kill off marsh plants and bare marsh sediments to erosion.⁴

Dr. William J. Hargis, Jr., pointed out that on-shore facilities will be a major impact of OCS development:

The most significant impacts of OCS development will be felt in the shoreside areas where pipelines come ashore or tanker unloading facilities are located. Also where refineries and other handling facilities are located . . . In the case of the offshore oil field exploitation, those [landside development] positions are fixed and the usual economic approach is to bring these things ashore as close as you can to the point of production. It is extremely important, therefore, that these needs and problems be "plugged in" early in the developing National Coastal Zone Management Program.⁵

Dr. Hargis also pointed out that catastrophic events such as oil spills from oil wells, pipelines, tankers or shoreline facilities must

³ Boesch *et al.*, *op. cit.*, p. 25.

⁴ *Ibid.*, p. 26.

⁵ NOPS Hearings, *op. cit.*

be considered a possibility. He urged preparation in the event a decision is made to move ahead with offshore leasing in the Atlantic, for such an eventuality. "Depending on size and location," he said, "the impacts of a catastrophic event will vary. It would be desirable if some research effort were expended on developing reliable restorative techniques for coastal habitats, particularly wetlands."⁶ He further stressed there is a lack of knowledge concerning inshore and shoreside ecosystems which is needed to assess impacts of shoreside facilities and operations on coastal environments. Dr. Hargis also stressed that additional data may not lead to negative results:

We can't overlook the extensive data which are relatively favorable to offshore oil operations, indicating no severe damage has been done in Texas and Louisiana and the Mississippi areas. There was a large series of studies carried out by Texas and the outcome was generally favorable. However, we would like to see more data and look at it more carefully.⁷

One criticism of the Council on Environmental Quality's report, *Outer Continental Shelf Oil and Gas—An Environmental Assessment*, was the environmental ranking failed to consider the long-term effects of oil and other pollutants. A thorough assessment should be made of the time effect of oil spills on wetlands, beaches, rocky coasts, and marine areas. For example, if the major concern over oil spill damage in a particular area is recreational loss of beaches, the Santa Barbara and other incidents have indicated that this may be only a temporary problem. On the other hand, damage to wetland breeding grounds may have a longer lasting impact, both ecologically and economically.

Mr. William Futrell of the Sierra Club pointed out in the NOPS hearings that effective coastal zone planning early in the development process could ease these impacts:

The Louisiana experience suggests that the severe wet lands destruction which occurred there from offshore production could have been prevented by environmentally sound coastal zone planning . . . The environmental impact was significant. The quarter of a century of development made severe impact on the coastal zone . . . For each mile of canal that is dredged eight acres of marsh land are destroyed, partially by the dredging and the erosion, partially by the depositing of soil along the banks. There are more than 8,000 miles of pipelines. This is in addition to the canal dredging that occurred in Louisiana . . . There are certain trends which if not studied carefully, monitored closely and perhaps checked, could result in damage in the long run to coast marsh and estuary productivity. These trends are, one, increasing acreages are being closed by pollution to oyster harvesting. Two, oyster yields per acre have decreased ten-fold. Three, shrimp catch per boat has decreased nine-fold. Four, salt water continues to intrude further inland. Five, wetlands are being lost at a net rate of 16.5 square miles per year.

Mr. Futrell testified that the cumulative impact of many projects was the primary area of concern:

⁶ *Ibid.*
⁷ *Ibid.*

In the wetlands and coastal waters of Louisiana, a single structure or activity, whether it is an oil well, a refinery or a highway, will not be decisive as to the health of the environment. An individual project may have little impact while the cumulative effect of such projects results in an irreversible environmental decline. No matter how rich a coast area a state may have there is a limit to the amount of environmental stress it can stand. A number of respected observers believe that point has been reached in the coastal zone of Louisiana.⁸

At the offshore oil drilling hearings held by the California Assembly Select Committee on Coastal Zone Resources, several findings related to coastal zone environmental impacts were developed. Some witnesses expressed concern over the possible development of offshore oil and gas resources and pointed out the risk of oil spills, if they occur, their adverse impacts on the marine environment, recreational opportunities, and on recreation and tourist-dependent businesses. Public concern was also expressed over the adverse aesthetic, visual impact of offshore drilling platforms and the onshore impacts of offshore oil and gas development such as pipelines, storage tanks, transportation terminals, expanded refinery capacities, and other support facilities and services. The adequacy of existing financial liability laws to compensate for any damages resulting from offshore activities was also discussed. The Select Committee found "There is little or no awareness on the part of the BLM or the USGS of the Federal Coastal Zone Management Act of 1972 and their responsibilities thereunder" and "there is no effective coordination between the Federal agencies responsible for leasing OCS lands and the California Coastal Zone Conservation Commission which is under a mandate from California voters to prepare a comprehensive coastal zone plan for the balanced conservation and use of California's coastal resources, including oil and gas."⁹

In its report to the California Assembly the Select Committee recommended, "Federal OCS leasing and management practices should be reviewed and revised to assure that Federal OCS activities are compatible with and provide maximum consideration of the adjacent state's interests as manifested by its policies and programs for the management of its coastal zone resources."¹⁰ The Select Committee also recommended,

A portion of the Federal revenues from OCS oil and gas production should be made available to California to assist it and local governments in insuring that measures are taken to mitigate against any environmental damage, and to assist in planning for the impact of this production on the State (e.g. planning for needed transportation terminals, additional refineries, pipelines and storage areas, and other support facilities.¹¹)

The Select Committee felt:

No New Federal OCS oil and gas development leases should be issued by the Interior Department until one, five, and ten

⁸ *Ibid*

⁹ California Legislature Hearings on Oil Drilling, *op. cit.*

¹⁰ *Ibid.*

¹¹ *Ibid.*

year plans for such oil and gas production and its impact on California's coastal zone have been prepared and made available to the public (e.g. how many platforms will be built, and where; where would the oil be refined and would additional refinery capacity be required; where would the pipelines, if any, be located; what other onshore support facilities would be required and where would they be located; etc.).¹²

A number of witnesses at the National Ocean Policy Study commented on the possible use of the environmental impact statement process to improve long-range planning. Dr. Irvin L. White of the University of Oklahoma, for example, suggested using impact statements until a more permanent process was implemented:

While awaiting more fundamental organizational changes, we see an opportunity to use the environmental impact statement process as an interim means for achieving greater coordination in planning and more carefully considered policies. Specifically, what we recommend is a 10-year development schedule which would specify the coastal regions to be developed as well as programs involving significant new risks—more severe weather, substantially deeper waters, or seismic activity, for example. We would retain the present five-year schedule as well. When an area appears on that schedule, we would have the Department of the Interior prepare a programmatic environmental impact statement which would constitute a development plan for the region or program. This statement would take into account energy, ocean, land use, and environmental concerns. This statement process would provide a point of access for the interested public at an early stage in the development cycle and should help to accommodate conflicting interests in a less debilitating way. We also propose that these programmatic statements be reviewed outside existing government agencies. We suggest a review by a broadly constituted ad hoc committee organized by the Council on Environmental Quality, the results of the review to be made public. The third step in this impact statement process would be to have Interior prepare an area-specific statement at the time of a competition for licenses or a lease sale. This statement should be considered supplementary to the programmatic statement and should avoid the current tendency to duplicate large sections from previous environmental impact statements. We recognize the limitations of this approach, but the environmental impact statement process has already been established and already forces some planning and policy coordination.¹³

The CEQ report recommended that state coastal zone management agencies be given the opportunity to cooperate with Federal agencies in preparing as well as reviewing regional environmental impact statements. As the Chairman of the CEQ stated,

I think the time can be shortened in many cases by real dedication on part of the management of the agencies to get

¹² *Ibid.*

¹³ NOPS, Hearings, *op. cit.*

the impact statement done promptly and well. I think that an impact statement is extremely important to resolving questions [of conflicting interests]. The adoption of that technique is a landmark in the history of our country, forcing us to weigh alternatives and look to the implications of our decisions, to future generations and to broader areas. We are making headway in expediting and getting impact statements more useful to the decision-maker and to the public. We need to encourage more action in that direction.¹⁴

The CEQ report suggests that the best means to ensure that Federal decision-makers are informed of the impacts of a proposed outer continental shelf use is to use the existing environmental impact statement process. This should include consideration of alternative uses of specific shelf, nearshore, and onshore areas in addition to comprehensive regional impact statements. The CEQ does not, however, examine the environmental aspects of proposed actions with regard to total national energy needs. It would appear that comprehensive Federal energy planning regarding offshore development should place such development in the perspective of the total energy needs and the total environmental impact of each option for developing that energy.

At the NOPS hearings, EPA's Mr. Alvin L. Alm agreed with CEQ that environmental impact statements broaden their focus to include discussion of regional and state problems rather than discussions of individual cases. He also felt Federal agencies could significantly improve the knowledge of impacts:

Outer continental shelf development can lead to environmental damages from both oil spills and onshore development. The authorities of a number of federal agencies, coupled with environmental impact analysis can minimize these damages. With respect to onshore development, the authorities of EPA and other federal agencies, the environmental impact analysis, and land use planning under the Coastal Zone Management Act can all help to limit environmental damages. It is important that all levels of government and interested private groups all fully participate in the development of OCS resources.¹⁵

Mr. William Futrell of the Sierra Club noted the need to look into lessening coastal zone impacts by locating refineries inland before development of the Atlantic outer continental shelf. Governor Hoff felt additional land use planning funds were a necessity:

The Coastal Zone Management Act provides limited financial assistance to the coastal states for planning and regulating land uses in the coastal zone. I believe it is important there be adequate funding of this program and that there be adequate funding of land use planning programs by the states in areas outside the coastal zone that will also be affected by offshore development. And I might add that the impact on New England as a whole could be really significant.¹⁶

¹⁴ *Ibid.*
¹⁵ *Ibid.*
¹⁶ *Ibid.*

The CEQ report indicated such funding is already available under the Coastal Zone Management Program and urged this program be used in dealing with all phases of new offshore development:

In the Atlantic and New England states and in Alaska, there has been little government experience with offshore oil and gas development. Affected states should strengthen their coastal zone management programs by developing special technical expertise on all phases of OCS development and its onshore and offshore impacts. Such augmented state coastal zone management agencies should attempt to ensure that state interests and regulatory authorities are fully coordinated with Federal OCS technical and management activities. Federal agencies should make every effort to cooperate with state coastal zone management agencies on an on-going basis at all stages of the management process.¹⁷

The Council on Environmental Quality recommended that state agencies jointly participate in developing these portions of the coastal zone management plans. In addition, the report urged the Secretary of Commerce to require the state plans to consider refineries, transfer and conversion facilities, pipelines, and other development within the coastal zone related to OCS operations. Under the Coastal Zone Management Act, plans must provide "adequate consideration of the national interest involved in the siting of facilities necessary to meet requirements which are other than local in nature." "At the same time," the CEQ report noted, "they should provide adequate consideration of the full range of state interests in the coastal zone."¹⁸ By requiring state coastal zone plans to include such siting considerations before Federal approval, there would be an opportunity for the Federal and state governments to work out mutually agreeable plans before any offshore development would begin. However, CEQ recognized that potential conflicts may be so complex that fully satisfactory solution to all of the issues may not be possible. In any event, coordinated state and Federal planning is necessary for rational outer continental shelf development.

A report by the National Academy of Science also concluded the Coastal Zone Management Program was an effective tool for on-shore planning. It stated: "The Coastal Zone Management Act—the only existing mechanism for comprehensive national coastal protection—should be strengthened and fully funded to encourage the development of coastal zone management plans and regulations" and that "no OCS leasing should occur until after the development of adequate coastal zone plans."¹⁹

Dr. Russell Peterson, Chairman, Council on Environmental Quality, testified at the NOPS hearings that large offshore oil and gas development activities would have an impact on-shore making coastal zone management necessary. Coastal zone management and planning, can reduce conflicts with other marine uses and can aid in avoiding, or preparing for, major impacts on-shore, especially in rural areas where many new support facilities will need to be added. Mr. Peterson stated, "the CEQ report does not pinpoint critical areas to be pro-

¹⁷ CEQ OCS Report, *op. cit.*, p. 9-6.

¹⁸ *Ibid.*, pp. 9-7.

¹⁹ *Ibid.*, p. National Academy of Science-30.

ected because the Coastal Zone Management Act was a better mechanism for defining environmentally critical areas and in appropriate cases, calling them off-limits for such activities as drilling."²⁰ He called for cooperation between the Department of the Interior and the Department of Commerce in this area.

The consensus of witnesses at the NOPS hearings was that since the CEQ report did not identify specific areas to be protected, coastal zone management in each state should be coordinated with Federal, state, and local governments well in advance of any OCS development. It was felt by some that the states should play a more direct role in planning, but that they would need Federal funds and expertise.

Dr. Robert M. White, Director of NOAA, stated that the coastal zone management program should be utilized in planning development and that trade-offs be clearly stated:

The Coastal Zone Management Act calls for a balance between the need for a quality environment on the one hand, and economic development of the coastal zone on the other.²¹

Dr. White testified that "one thing we can learn from our past experiences, is that detrimental effects have resulted in part because there has been a lack of adequate planning for use of our coastal environment."²² Dr. White went on to say,

If I were to single out an event which has more than any other placed us in a position to provide the necessary rational and balanced management of this new enterprise, it would be the passage in 1972 of the Coastal Zone Management Act. That Act now provides us with a means of establishing with the cooperation of the coastal states, a suitable management system. It establishes and clarifies the roles of federal, state and local governments in the planning and management of our coastal zone, placing the principal responsibilities for the planning and management with the states. It insures that federal actions are consistent with state plans and provides a means whereby a concerned public can have an opportunity to become involved in the planning and decision-making process.²³

Dr. William Hargis of the Virginia Institute of Marine Sciences emphasized that it is critical for the public to be accurately informed of total plans for onshore and offshore development. "One of the major problems we deal with in making recommendations to the Governor or to his agencies or to Federal agencies is the lack of adequate information from the people who are applying either for leases or for the use of the coastal zone or for development at the time we are being asked to make the decision. It is critical in this case that we get adequate knowledge of where industry wants to do things and what it wants to do, and the basis on which they want to do it."²⁴ Dr. Hargis also noted:

There are weaknesses in the operational controls that the states, and perhaps the Federal government are able to exer-

²⁰ NOPS Hearings, *op. cit.*

²¹ *Ibid.*

²² *Ibid.*

²³ *Ibid.*

²⁴ *Ibid.*

cise once exploration and exploitation begin. Some new controls need to be added.²⁵

The need for early planning in coastal zone management was also stressed by Dr. Thomas Grigalunas of the University of Rhode Island. He summarized the current situation by stating that, "In general, it appears that a variety of planning bodies react to individual development about two steps too late in the planning process."²⁶ Instead of having a philosophy of "Here is what we intend to do to carry out our development strategy," the philosophy seems to be one of reacting to industry initiatives and collecting statistics.²⁷

A recent study at the University of Oklahoma pointed out that more timely information is needed because of increased public interest in the environmental impact of OCS development:

Continued development of OCS oil and gas will take place within the context of continuing demands for environmental quality. OCS oil and gas operations appear to be identified in the minds of many citizens with the environmental concerns generated in the late sixties and early seventies . . . Concern with the impact of OCS oil and gas development has led to the creation of public interest groups and/or attracted the interest of already existing groups. These groups now exist at national, state, and local levels and appear to be continuing participate in the OCS policy-making arena.²⁸

²⁵ *Ibid.*

²⁶ *Ibid.*

²⁷ *Ibid.*

²⁸ Don E. Kash and Irvin L. White. *Energy Under the Oceans: A Technology Assessment of Outer Shelf Oil and Gas Operations*, (Norman: University of Oklahoma Press, 1973), pp. 10, 11-12.

V. SOCIO-ECONOMIC IMPACT: THE COASTAL ZONE

There will be give and take between energy and environment; neither need suffer. But neither can stand delay. If coastal states do not move, the Federal government will be compelled to move for them. Coastal Zone Management is no longer merely desirable—it is necessary—now.

SENATOR ERNEST HOLLINGS (March 28, 1974).

A. THE COASTAL ZONE

The Coastal Zone is of great importance, because the bulk of our population lives in or near the Coastal Zone and most of our valuable living ocean resources are dependent on the area for survival. The Coastal Zone is rich in a variety of natural, commercial, recreational, industrial and aesthetic resources of immediate and potential value to the present and future of the Nation. There is an urgent need with the competing demands on the Coastal Zone, to protect the natural system in this ecologically fragile area.¹

B. POPULATION GROWTH IN THE COASTAL ZONE

In 1940, 107 million people, or 80.9 percent of the population lived in the 30 coastal states. Thirty years later, population in these states had increased to 173 million or 85.1 percent of the total population. Not all people in coastal states live in or near the coastal zone. In 1940, 40.7 percent of the population of the United States lived in the 394 first-tier coastal counties, and by 1970 this figure had increased to 49.0 percent.²

In 1970, 42.57 percent of the industrial work force was employed in the Coastal Zone, which is only 8.58 percent of the United States land area.³

The trend towards population concentration in the Coastal Zone is expected to continue. It has been projected that by the year 2000, approximately 80 percent of the U.S. population (estimated at 225 million) may be living within 50 miles of the Atlantic and Pacific coasts, the Gulf of Mexico and the Great Lakes.⁴

In addition to the people who are actually living in the Coastal Zone, the area is visited annually by millions of tourists demanding facilities. Thus, even where the Coastal Zone is sparsely populated year around, it is subject to the rising pressures of vacation community development.

¹ For a complete text of the Coastal Zone Management Act, see Appendix.

² Miller B. Spangler, "Projections of Socio-economic Trends in the Coastal Zone", *M.T.S. Journal*, vol. 6, no. 4, July-August 1972, p. 21.

³ Nops Hearings, *op. cit.*

⁴ *National Journal*, December 9, 1972.

C. PUBLIC AWARENESS

Only in recent years have people become aware of the importance of the Coastal Zone, and uncertainty about possible adverse effects of development on the ecosystem resulted in adoption of Proposition 20 in California and of a tough new coastal zone protection act in Delaware, which was designed to halt development of heavy polluting industries in the Coastal Zone. Proposition 20, passed by California voters in November 1972, created the Californian Coastal Commission and six regional coastal zone commissions which have the responsibility for planning development along the California coast. The regional commissions are to present comprehensive plans for the preservation of the coastline within each region. These plans are submitted to the State Commission which in turn will submit its plan, based on regional studies, by the fall of 1975.

Recently, people in New Hampshire and Maryland have voted down proposals for construction of refineries in their coastal zone, and New Jersey and Maine have raised serious questions over deepwater ports to accommodate supertankers.

At a time when the Department of the Interior is proposing to speed up offshore leases, the people of New England and Southern California have become increasingly opposed to drilling for oil and gas off their coasts. Fear of aesthetic disruptions, of large-scale commercial development, and the memory of the Santa Barbara oil spill, are among the reasons for opposition. Some believe that, if pressure groups in Southern California were to succeed in convincing the people of Ventura and Los Angeles counties that offshore development should not take place, drilling may be postponed indefinitely. During a recent visit to Southern California, Deputy Undersecretary of the Interior Mr. Jared Carter referred to offshore drilling, saying: "If the ten million people of Southern California say 'no,' then it ain't gonna happen." He added, however, that a "strong statement" by a few community spokesmen would not have as great an influence on Interior's decision to grant offshore leases.²

Similar strong anti-development emotions were expressed at OCS hearings conducted by Senator Edward M. Kennedy of Massachusetts, in Boston, on August 11, 1974.

D. COMPETING USES

Coastal zone problems are essentially problems associated with competing claims over the use of this important coastal area. Since many of the resources and natural amenities of the coastal zone are for legal and technical reasons common property, i.e., owned by no one in particular, they are subject to the same misuse and ultimate destruction as other common property resources such as air and water. In the absence of a clear government policy, oil companies will choose sites in the coastal zone to meet their particular needs and electric power companies will seek to locate nuclear plants close to cooling water. Industry is not the only source of pressure for coastal development. Recent years have seen a boom in second homes, condominiums, resorts, motels and boat marinas. These many conflicting uses of the coastal zone need

² *Journal of Commerce*, July 18, 1974.

to be balanced and controlled, taking into consideration the socio-economic and environmental impact of development.

E. WETLANDS: THEIR VALUE TO SUSTAIN COASTAL FISHERIES AND WILDLIFE

Protection of the Nation's coastal wetlands is of vital importance for the survival of commercial and sport fisheries, and wildlife in the coastal zone. Commercial fisheries may have declined in recent years, but remain important to local and regional economies. In 1973, about 160,000 American fishermen landed 3,825 million pounds of finfish and 907 million pounds of shellfish, representing \$910 million.⁶

Sport fisheries are of equal importance to the economy. Their contribution to the G.N.P. has exceeded one billion dollars in recent years. Hence, protection of our fisheries is of great economic importance.

The coastal zone is the key to the productivity of the oceans. Howard Pollock, Deputy Administrator of NOAA, said at a recent conference on the oceans and national economic development, that seven out of the ten most valuable commercial species spend all or part of their life cycles in the coastal zone, and that at least another 80 commercially important species also depend upon estuarine waters in one stage or another of their lives.⁷

Dr. Beatrice Willard, a Member of the Council on Environmental Quality, said that all of the ocean's living resources are—directly or indirectly—dependent on the coastal zone, through the avenues of the food chain and through what happens to the water medium for marine ecosystems.⁸

Dr. Willard called the coastal zone, and in particular the rich grassbeds, marshes, estuaries and tidal flats, the true "marine nurseries," capable of producing up to six times as much plant material per acre as the average acre of wheat.⁹

The coastal zone is also of great importance for the survival of wildlife, including the many species of migratory birds. Unfortunately relatively little is known about the long term effects of man's activities in the coastal zone. It is not yet known how much filling, dredging and constructing in the coastal zone can occur before major damage will be done to fisheries and wildlife. Studies prior to development, and subsequent action taken by the local, state, and federal authorities, are necessary to measure impacts and protect the remaining coastal areas. One major damage has been done to the coastal zone, it will be virtually impossible to restore the area to its earlier pre-development state.

F. DESTRUCTION OF COASTAL ESTUARIES

Estuaries are commonly understood to include those coastal complexes where fresh water from the land meets the salt water of oceans with a daily tidal flux. The Interior Department's Fish and Wildlife Service tabulated the twenty-year record of loss of important fish and wildlife estuarine habitats along the Atlantic, Gulf and Pacific coasts and the Great Lakes shorelines (Table II). They found that for the

⁶ NOAA, *Fisheries of the United States*, USGPO, March 1974, p. 56.

⁷ U.S. Senate, Committee on Commerce, *The Oceans and National Economic Development*, Washington, D.C., Government Printing Office, December 1973, p. 153.

⁸ *Ibid.*, p. 157.

⁹ *Ibid.*, p. 158.

26 states involved, the total important area of basic fish and wildlife is 8 million acres, of which 570,000 acres, or over 7 percent, has been destroyed by dredging and filling. California lost a total of 67 percent of the estuarine area of significance to fish and wildlife, followed by several states in the North East. Loss to fish and wildlife habitats in the Gulf States ranges from 1.5 to 2.2 percent, except for Texas, which has 8.2 percent loss.¹⁰

TABLE II.—NATIONAL SUMMARY—LOSS OF IMPORTANT FISH AND WILDLIFE ESTUARINE HABITAT

State	Acres of estuaries			Percent loss of habitat
	Total area	Basic area of important habitat	Area of basic habitat lost by dredging and filling	
Alabama.....	530,000	132,800	2,000	1.5
Alaska.....	11,022,800	573,800	1,100	.2
California.....	552,100	381,900	265,800	67.0
Connecticut.....	31,600	20,300	2,100	10.3
Delaware.....	305,500	182,400	8,500	5.6
Florida.....	1,051,200	796,200	59,700	7.5
Georgia.....	170,800	325,000	800	.6
Louisiana.....	3,545,100	1,076,900	65,400	3.1
Maine.....	30,400	15,300	1,000	6.5
Maryland.....	1,466,100	376,300	1,000	.3
Massachusetts.....	207,000	31,000	2,000	6.5
Michigan ¹	151,700	151,700	3,500	2.3
Mississippi.....	251,200	76,300	1,700	2.2
New Hampshire.....	12,400	10,000	1,000	16.0
New Jersey.....	778,400	411,300	53,900	13.1
New York.....	378,600	132,500	19,800	15.0
New York ¹ (Great Lakes).....	48,900	48,900	600	1.2
North Carolina.....	2,206,000	793,700	8,000	1.0
Ohio ¹	37,200	37,200	100	.3
Oregon.....	37,000	28,200	200	3.5
Pennsylvania ¹	5,000	5,000	100	2.0
Rhode Island.....	94,700	14,700	900	6.1
South Carolina.....	427,900	200,400	4,300	1.6
Texas.....	1,344,000	828,100	68,100	8.2
Virginia.....	1,670,000	428,100	2,400	.6
Washington.....	193,300	95,000	4,200	4.5
Wisconsin ¹	10,000	10,000	0	0
Total.....	28,628,200	7,988,100	508,800	7.1

¹In Great Lakes only shoals (areas less than 6 feet deep) were considered as estuaries.

Source: U.S. Fish and Wildlife Service.

The adverse environmental effect of channelization, filling and other activities causing loss of habitat can be illustrated by a few examples.

A report on the Caw Caw Swamp by the North Carolina Wildlife Resources Commission states that, subsequent to drainage of the 1,000 acre swamp within the 23,700 acre watershed, virtually all waterfowl habitat has been destroyed. Otter, mink and alligator which had previously inhabited the swamp were eliminated.¹¹

Another example is the channelization of Florida's Kissimmee River. In the 1960's, the river was channelized and shortened from its original 102 miles length to 53 miles in order to control floods in the watershed. Extensive marshlands, more than 30,000 acres, were also drained. Prior to alteration, the Kissimmee River and surrounding wetlands provided a variety of habitats for game birds and animals, as well as a fresh-

¹⁰ U.S. House of Representatives. Committee on Merchant Marine and Fisheries. Subcommittee on Fisheries and Wildlife Conservation. Hearings. 90th Congress, First Session. March 6, 8, 9, 1967, Washington, D.C., Government Printing Office, 1967, p. 81.

¹¹ David R. Allardice, *et. al.*, *Water Law in Relation to Environmental Quality*, Fort Collins, Colorado (Colorado State University Press), March 1974, p. 169.

water sport fishery. Following channelization, the migratory waterfowl population of the drainage has almost disappeared. A variety of fish and wildlife species, once abundant in the area, have also been eliminated.¹²

The Fish and Wildlife Service has indicated that shellfish, finfish, crustacea, and wildlife may all be affected by drainage and filling of wetlands. It found that of the 22 seacoast States, loss of habitat was reported for the highly valued oysters in 20 States, crabs in 18, clams in 14, and shrimp in 10.¹³

Among the finfishes, the Service reported significant habitat loss for striped bass, flounder, salmon, shad, bluefish, mullet, and sea trout. Every State incurred loss of waterfowl habitat, and in about half of them there were important losses for shore birds, wading birds and fur-bearing mammals.¹⁴

The Council of Environmental Quality maintains that these estuarine wetlands are most in danger from OCS related development.¹⁵ The actual damage done to wetlands in offshore producing States such as Louisiana and Texas is not yet clear, though there is evidence that oil development in the coastal zone itself, and channels dug for pipelines from offshore fields, have caused considerable damage to the salt marshes of Louisiana.¹⁶

In addition to the damage caused by producing oil and gas from the coastal zone and offshore areas, the oil industry has attracted other industries to the coastal zone, which accelerated population growth. Consequently, ever larger areas of wetlands are being filled and drained to meet the demands of expanding towns. Oil and gas developments are only one cause of this wetland loss. The Fish and Wildlife Service found that navigation, commercial developments and housing developments were among the most important purposes of dredging and filling in most States. Additional purposes other than oil included highway construction, mining, marinas, military bases, garbage dumps, and beach erosion. Housing was the purpose of first importance in Florida, gas exploration in Louisiana, commercial development in New Jersey, Rhode Island and Washington, and navigation in the remaining States.¹⁷

G. OFFSHORE OIL AND GAS DEVELOPMENTS: EXPERIENCES OF TEXAS AND LOUISIANA

With the possible exception of employment figures, few hard data are available to measure the social and economic impact of offshore oil and gas developments on the coastal zone of Texas and Louisiana. Oil developments within the coastal zone of Louisiana itself have had known effects on the environment. When oil rigs moved into the marshlands in the 1930's, little was known about the great ecological value of the wetlands. Operators would cut through the marshes and dredge canals in order to move heavy equipment to the drilling and (later) production sites. Mr. William Futrell, chairman of the Off-shore Task Force of the Sierra Club, testified before the NOPS Hear-

¹² *Ibid.*, p. 170.

¹³ U.S. House of Representatives, Committee on Merchant Marine, Subcommittee on Fisheries and Wildlife Conservation, Hearings, *op. cit.*, p. 31.

¹⁴ *Ibid.*, p. 31.

¹⁵ C.E.Q., *op. cit.*, p. 7-77.

¹⁶ See subsection on the experiences in Texas and Louisiana.

¹⁷ *Ibid.*, p. 31.

ings that for each mile of canal that is dredged, eight acres of marsh land are destroyed, particularly by the dredging and erosion, and partially by the depositing of soil along the soil banks.¹⁸

As a result of massive canal dredging (some 8,000 miles of pipeline have been laid in the Gulf of Mexico), salt water continues to intrude further inland, destroying the tundra-like plant support which keeps marshlands stable. Wetlands are being lost at a net rate of 16.5 square miles per year, causing erosion of some 500 square miles into the ocean over the past 30 years.¹⁹ Mr. Futrell maintained that 40 percent of the destruction of marshlands was caused by dredging, and of this total he believed two thirds was directly related to oil developments.²⁰

The Louisiana Wetlands Commission does not hold any particular coastal user group as primarily responsible for these trends. In a prospectus, the Wetlands Commission states: "It is a combination of many uses of the coastal environment which has brought about the conditions now being analyzed. It is clear, however, that insufficient attention has been given to planning and managing conservation and growth in the Louisiana zone region. Conservation and environment impact considerations have not been adequate".²¹

The Sierra Club believes that the oil industry, particularly those companies developing oil and gas within the coastal zone, is one of the groups with major responsibility for the destruction. The offshore exploration and production (as opposed to developments within the coastal zone) has not caused as much harm. But, the Sierra Club maintains, offshore developments will have some indirect effect on the coastal zone. Platforms are serviced from the coastal area, and construction of rigs and platforms also takes place in the coastal zone. Consequently, while the population in the State of Louisiana remained static between 1950-1971, it increased by more than 50 percent in the coastal zone when the oil industry was developing.²²

Between 1938 and 1971, 80 percent of all new investment in manufacturing in Louisiana was made in the coastal zone, turning Louisiana's coast into an oil coast. Mr. Futrell argued that in the event that the massive environmental degradation of the past thirty years were to continue, the entire system might collapse.²³ Futrell also said that in the coastal zone of Louisiana, oyster yields per acre had declined ten-fold and that increasing acreages are being closed by pollution to oyster harvesting.²⁴

Dr. Devaney of M.I.T. and Dr. Hargis of the Virginia Marine Science Institute, who also testified before the NOPS Hearings, maintained that they were under the impression that the offshore oil industry had had little effect on shrimp fishing. Emphasizing the lack of knowledge about the environmental effects of oil development in the coastal zone, Mr. Devaney said: ". . . we cannot overlook the extensive data which are relatively favorable to offshore oil operations, indicating no severe damage has been done in Texas and Louisiana and the Mississippi area. There was a large series of studies carried out by Texas and the outcome was generally favorable."²⁵

¹⁸ NOPS Hearings, *op. cit.*

¹⁹ *Ibid.*

²⁰ *Ibid.*

²¹ *Ibid.*

²² *Ibid.*

²³ *Ibid.*

²⁴ *Ibid.*

²⁵ *Ibid.*

Dr. David Wallace of NOAA also stated that there was no indication that oil development in the Gulf of Mexico had interfered in any way with shrimp fishing, but he agreed with Mr. Futrell that it had caused a severe decline in the oyster industry. The adverse impact of the offshore oil developments was mainly felt on estuaries inland, where, according to Dr. Wallace, "cutting of channels, laying of pipelines, altering the currents had had a substantial impact upon the oyster industry, particularly in Louisiana and other areas".²⁶

OCS petroleum development may also in other ways interfere with the fishing industry. In the first place, reduction of seafloor areas from trawling and dredging activity will cause some loss of acreage where drilling platforms are clustered. Secondly, obstruction on the seafloor such as debris or abandoned wells may cause damage to trawling nets. Bottom trawling could damage capped wells, causing oil or gas leakages. It is therefore imperative that capped wells and abandoned wells are properly marked.

II. OFFSHORE OIL AND GAS DEVELOPMENT: IMPACT ON THE COASTAL ZONE

While experts will agree that the need for onshore facilities to service offshore platforms, and the need to transport and refine crude oil can cause damage to wetlands, or compete with other uses of the coastal zone, there are no comprehensive studies on the uses of the coastal zone broken down by industry and other non-commercial users.

The CEQ report on OCS development in the Atlantic and the Gulf of Alaska estimates that in the Atlantic coastal zone some 171,400 acres of land will be needed to accommodate commercial and other development associated with the exploration and production of 1.5 million b/d of oil.²⁷

Actual impact of OCS development on the social and economic structures of the coastal zone will depend on a number of variables, such as:

1. Location of oil and gas fields.
2. Location of leased tracts in relation to shipping lanes, recreation areas, wildlife refuges, and so on.
3. Expected size of the reservoirs, estimated production rates, and type of production.
4. Geological, geophysical, economic and other data to indicate whether oil and gas are likely to be transported ashore by pipeline or tanker.
5. Expected size and location of required storage facilities.
6. Whether rigs and platforms will be constructed locally, or imported from traditional supplier states.
7. Existing infrastructure and industrial capacity.
8. Whether only necessary or also optional development associated with offshore petroleum production is planned. Necessary facilities include treatment plants, separation facilities; optional production facilities include petrochemical plants.

²⁶ *Ibid.*

²⁷ CEQ, *op. cit.*, table 1-2.

Two examples, one assuming major discoveries of oil in extensive fields on Georges Bank, and another assuming small stratigraphic structures in the same area, may serve to illustrate the difficulty of predicting impacts on the coastal zone.

Assuming considerable discoveries in extensive fields, oil companies are likely to need one or more pipelines to pump the oil ashore into storage tanks. From the storage tanks crude oil can be pumped through pipelines to existing or newly built refineries in the State, or shipped to other states for further treatment. As it is usually more economical to construct refineries close to the market, and because of the existing shortage of refineries in New England, it is likely that large oil discoveries on Georges Bank would accelerate the need for construction of new refining capacity. Some oil may also be used as feedstock for the petrochemical industry, which also would prefer to locate in the vicinity of the raw material sources.

Assuming small discoveries in relatively small stratigraphic structures, the oil companies are less likely to need pipelines. Instead, oil may be stored beneath the production platform, where tankers will collect the crude oil and transport it ashore for further treatment. In that case, crude oil might be refined in refineries in New England, in the New Jersey/Delaware region, or elsewhere.

The impact on the coastal zone will be substantially different. In the first case, coating and preparation of pipelines will require onshore facilities. Rigs and platforms may be constructed in New England, resulting in additional demand for land in the coastal zone (unless existing shipyards can be used). The use of pipelines would require storage tanks in the coastal zone, and it is probable that some new refinery capacity would be contemplated.

In the event that only small discoveries are made, the need for onshore facilities could be minimal, because oil might not even be shipped from the production area to New England.

Demands on the infrastructure may not be very high in either case. Boston has a large international airport, a good highway system, and many underutilized port facilities. In the event major oil or gas discoveries are made, Boston harbor would be able to provide berth space and warehouse facilities. The CEQ study on OCS development in the Atlantic and the Gulf of Alaska assumes, however, that most new facilities associated with Georges Bank oil development will be constructed in Bristol county. Hence, it is believed likely that increased employment will have a substantial local effect. Fall River and New Bedford, two of the cities which could serve as the center for the offshore industry suffer higher unemployment rates than most other parts of Massachusetts. Employment creation associated with offshore development is likely to have a beneficial effect on the economy of these two cities.

Refineries may have to be built regardless of contemplated offshore developments. Requirement for refinery products is determined by demand for specific products rather than by sources of supply. Currently, New England refines less than 15 percent of the oil products it consumes. The net effect of offshore production will be to displace imported oil as refinery feedstock.²⁸

²⁸ See: Testimony by Mr. William Vogely, Acting Deputy Assistant Secretary of the Interior, before recent OCS Hearings, U.S. House of Representatives, Committee on the Judiciary, Subcommittee on Immigration, Citizenship and International Law, Hearings, 93rd Congress, 2nd Session, January 24, 30, February 7, March 6, 14, 1974. Washington, D.C., Government Printing Office, 1974.

The CEQ report indicates that there is likely to be some additional emission of particulate matter, sulfur oxides, nitrogen oxides, hydrocarbons and carbon monoxide, but air and water pollution associated with offshore oil development is not likely to be significant in the coastal zone, because of the use of emission and effluent control standards.²⁹

Most experts would agree with the CEQ report that natural gas recovery and processing would seem to have significantly less environmental and socio-economic impact than oil recovery and processing, especially if oil will be used as a feedstock for the petrochemical industry. Gas processing and recovery requires less labor, less acres in the coastal zone, and causes less emission of pollutants.³⁰

Developments in other parts of the nation may resemble these projections, but are likely to be different. The socio-economic impact of additional OCS development on Louisiana and Texas may be relatively small, because these States already have onshore facilities to treat crude oil and natural gas. As onshore petroleum production has already peaked, offshore production may not significantly change overall production levels in Texas and Louisiana. Offshore exploration and production in Southern California will require new facilities in the coastal zone, but here too, the impact may not be very significant because offshore oil and gas will offset declining onshore production yields.

In primarily rural and underdeveloped areas, such as Alaska, the impact of offshore development on employment, population growth, and subsequent demands on social services and the infrastructure, has already proved to be quite substantial (see chapter on revenue-sharing and financial aid to States).

It is difficult to generalize on the socio-economic impact of offshore oil and gas development due to vast local and regional structural differences. Only detailed analyses of local and regional implications of offshore petroleum development on adjacent States will provide policy-makers with the necessary data to plan for development of the coastal zone in such a way as to interfere least with the existing socio-economic and environmental structures.

I. OCS DEVELOPMENT: EMPLOYMENT IMPACT

While general information on the socio-economic impact of offshore petroleum development shows serious gaps, some reliable estimates of increased employment related to offshore oil and gas development have been made. On the basis of experiences in Louisiana, the State which produces most of the Nation's offshore petroleum, the Gulf South Research Institute has made estimates of direct and indirect employment associated with the offshore industry for other parts of the country (see also chapter on Data Needs).

The oil mining and refining industry is highly capital-intensive. Hence, the number of people directly employed in offshore oil and

²⁹ CEQ, *op. cit.* p. 7-78.

³⁰ CEQ, *op. cit.* p. 7-78.

gas development is not very large. Offshore Louisiana produced the equivalent of 1,773,000 barrels of oil and gas per day in 1972. The number of people directly and indirectly employed as a result of OCS activity is as follows:

TABLE III

Broken-down employment category	Estimated number employed as a result of OCS activity	Employees and dependents
Mining.....	15,000	47,150
Manufacturing.....	10,500	33,000
Construction.....	4,700	14,770
Chemical and allied products.....	7,300	22,940
Refining.....	2,800	8,800
Total.....	40,300	126,660
Supporting employment.....	84,100	264,330
Total.....	124,400	390,990

Source: "Offshore Revenue Sharing, An Analysis of Offshore Operators in Coastal States," prepared by Gulf South Research Institute, Baton Rouge, La., 1973, p. 46. For a detailed analysis of the methodology of the study, see app. B., pp. 1-6.

A survey of employment associated with offshore oil and gas development in Louisiana conducted by the Mid-Continent Oil and Gas Associated, produced figures slightly, but not significantly, lower:

Persons directly employed in offshore production.....	8,000
Persons directly employed in oil industry related area.....	30,000
Subtotal	38,000
Persons indirectly employed.....	76,000
Total	114,000

Source: Mid-continent Oil and Gas Associates, *The Economic Impact of the Louisiana Offshore Oil Industry on the State of Louisiana*, Baton Rouge, Louisiana, 1973.

For an analysis of the methodology used, see page 9 of the study.

On the basis of projected crude oil and natural gas reserves for the Gulf of Mexico and the Atlantic and Pacific OCS, the Gulf South Research Institute estimated regional employment associated with the development of offshore petroleum to grow at comparable rates (see tables).

Employment estimates by the Gulf South Research Institute assumed certain additions to the oil and gas reserves in the three regions. It is quite possible that actual discovered reserves between 1970-1985 will be significantly more or less. This will not be known until actual drilling takes place. Changes in reserve estimates will alter the potential employment impact.

TABLE IV.—PROJECTED REGIONAL CRUDE OIL RESERVE ADDITIONS DURING THE PERIOD 1971-85

[In billions of barrels]

Region	High finding rate and medium drilling rate	Low finding rate and medium drilling rate
Atlantic Ocean.....	0.5	0.4
Pacific Ocean.....	4.2	3.1
Gulf of Mexico.....	6.4	4.6.

Source: U.S. Energy Outlook: A Report of the National Petroleum Council's Committee on U.S. Energy Outlook, December 1972, p. 84.

PROJECTED REGIONAL NON-ASSOCIATED GAS RESERVES ADDED DURING THE PERIOD 1971-85

[Cumulative in thousands of cubic feet]

Region	High finding rate and medium drilling rate	Low finding rate and medium drilling rate
Atlantic Ocean.....	11.4	7.6.
Pacific Ocean.....	3	3
Gulf of Mexico.....	95.6	63.3

Source: U.S. Energy Outlook: A Report of the National Petroleum Council's Committee on U.S. Energy Outlook, December 1972, p. 103.

ESTIMATED REGIONAL EMPLOYMENT ASSOCIATED WITH THE DEVELOPMENT OF OFFSHORE OIL AND GAS

Region	Mining employment	Other basic industry employment	Supporting activity employment	Total employment	Population
Assumption I: High finding rate and medium drilling rate:					
Atlantic Ocean.....	2,520	4,250	14,130	20,900	65,690
Pacific Ocean.....	11,150	18,810	62,520	92,480	290,670
Gulf of Mexico.....	26,960	45,490	151,190	223,640	702,920
Assumption II: Low finding rate and medium drilling rate:					
Atlantic Ocean.....	1,860	3,130	10,410	15,400	48,400
Pacific Ocean.....	8,240	13,900	46,200	68,340	214,800
Gulf of Mexico.....	18,810	31,730	105,470	156,010	490,360

Source: Gulf South Research Institute, Offshore Revenue Sharing: An Analysis of Offshore Operations on Coastal States, Baton Rouge, La., 1973, p. 55.

VI. ENVIRONMENTAL IMPACTS: OCEAN RESOURCES

The environmental impact of OCS oil and gas development on the oceans is difficult to assess. This area is poorly studied as Dr. Hargis pointed out because "There are biological resources which are unused or unexploited in the deeper portions of the continental shelf and on the continental slopes. The extent of these resources must be understood before an adequate impact assessment can be made."¹ In identifying the special problems of oil spills in the ocean, Dr. Hargis went on to say,

In the offshore region oil spills mainly affect the surface of the water. Increasing evidence from our data and other laboratories indicates that this surface film of water may be considered one of the most productive areas of the open shelf waters. Very high concentrations of both phytoplankton and zooplankton are found in the top few centimeters of the water column.²

Another problem of particular concern described by Dr. Hargis is chronic sublethal effects of oil on the ability of marine organisms to respond to chemical clues in the environment which is particularly critical to migrating species such as shad, herring, striped bass, and salmon along the Atlantic coast.

With regard to the trawl fisheries Dr. Hargis stated :

There is no question that the development of offshore oil fields will impinge on the trawl fisheries wherever they exist. This is particularly true in the Virginia sea, the Midatlantic area and on the North Atlantic. That has to be figured as a cost. Now in terms of water quality questions, we were talking about mechanical impingement, interference with movement of vessels, with dragging, with fishing operations. When you are talking about water quality problems, it is very likely that the impacts of carefully controlled operations on bottom fisheries, that is, on the viability of bottom fisheries, will not be very high. There are some things we don't yet know. Of course oil surfaces relatively quickly. There is some dissolution as it passes through the water column. We need to know more about that. So, the bottom fisheries in terms of water quality would not be damaged too severely, it is likely, in a carefully operated rig."³

The problem of assessing the impact of oil on the marine environment is complicated by lack of confidence in oil spill records. According to Dr. Hargis, One of the difficulties is establishing "confidence of

¹ NOPS Hearings, op. cit.

² *Ibid.*

³ *Ibid.*

records" from areas in which these activities have occurred. Data presently supports the conclusion that the greatest hazard of oil spillage comes not from drilling activities and production activities but from moving oil by tanker. However, even in confined waters like Chesapeake Bay, numerous spills went either undetected or unreported until recently.

Methods of reporting spills have not been standardized, leading to some latitude in interpretation of the data. For example, according to U. S. Coast Guard data in 1971, 56 percent of the offshore oil spills and 82 percent of the spill volume were attributed to pipelines. In 1972 the Coast Guard reported 2 percent of the offshore spills and 3 percent of the spill volume attributed to pipelines. As the CEQ report points out, much of this discrepancy may be due to whether or not spills were assigned to offshore production or offshore pipeline categories. Many spills occur on or near production platforms and some confusion in assigning the cause is likely.

Another problem in treating oil spill statistics is that very large spills are quite rare, making averages of spill sizes relatively meaningless. For example, if the MIT oil spill analysis for CEQ used 1970 data which included the Santa Barbara spill, the average offshore production facility spill would be a factor of ten larger than in 1972.⁴

The CEQ report attempted to rank OCS frontier areas according to their relative environmental risk and potential environmental impact. Although CEQ acknowledges that risk ranking must be balanced against the value and benefits of the oil and gas to be recovered, in the absence of any solid data on the actual quantity and value of the reserves, the ranking is unbalanced. As Jared G. Carter pointed out, it is conceivable that slightly higher risks would be acceptable to develop a large field that would yield a higher value of return. The greater value of a large field could support a greater expenditure for environmental protection equipment and safeguards than would be economically feasible to install in a small oil or gas field. Furthermore, the discovery and development of a large field might eliminate the need to develop several smaller fields to yield the same amount of oil or gas, thus preserving several areas at the expense of environmental damage to one.

In assigning environmental risks CEQ gave little or no consideration to the effects of oil on the marine environment or fisheries industry. The Council's ranking is almost entirely based on the probability of oil spills impacting biologically productive coastal wetlands and estuaries and intensively used recreational beaches. Although comprehensive data on oil in the marine environment are lacking, some application of existing data would have been useful. Size of hypothetical spills could be related to the total size of a particular fishery area, say Georges Bank, and concentrations of oil in water or on the surface could have been estimated. Combining this with data on the effects on marine organisms of known concentrations of oil hydrocarbons would allow some appreciation of the scope of the oil spill problem. Rough estimates of this sort might indicate that the area such as Georges Bank, if it had a large spill may result in significant environmental

⁴ Primary, physical impacts of offshore petroleum developments. Report to Council on Environmental Quality, Report No. MITSG 74-20, Mass. Inst. of Tech., Cambridge, Mass., April 1974: Section II, p. 5.

damage to only a tiny part of the entire fisheries area. On the other hand, such an analysis may show that an oil spill of any significant size may have a devastating environmental impact if it occurred at spawning time or in some similar risky time. Governor Hoff testified that since fishing on the Georges Bank has dropped precipitously due to superior competition from European fleets, future oil and gas development on the banks must take into account the need to preserve domestic fishing operations.

Many witnesses in both NOPS and Interior Committee's hearings felt that offshore oil and gas development can be handled with minimal risk to the marine environment. Professor Kash testified that the best technologies used in the North Sea are adequate to permit oil and gas development, production, and transportation at acceptable levels of risk. Witnesses from the petroleum industry pointed out that 18,000 offshore wells have been drilled with only four major spills (the number of spills considered major or derived only from offshore drilling depends on the definitions used). They pointed to the offshore experience in the Gulf of Mexico where the record has been good and allegedly there have been no lasting effects from spills.

Petroleum industry witnesses also testified that \$1.4 billion was spent by industry on environmental protection research and development between 1966 and 1972, but no data are available on what percentage of this amount was for environmental concerns offshore. It was admitted, however, that oil spill clean-up technology is not well advanced in cold waters or in heavy seas. EPA announced that in fiscal year 1973 it conducted a \$2.14 million research and development program in oil spill containment, removal, and recovery, of which approximately 30 percent was allocated to the completion of an advance testing and evaluation facility for oil spill control equipment.

Another Federal agency engaged in oil containment research, the U.S. Coast Guard, recently announced that an open-ocean oil containment barrier system under development since 1969 is now nearing completion. This system is designed to be effective in 5 foot seas with 20 mph winds, and to survive 10 foot seas with 40 mph winds. The barrier can contain oil effectively in currents of from 0.5 to 1.0 knots and can be rapidly air delivered to a spill site.⁵

The Coast Guard has also contracted for the design and development of a Fast Current Oil Response System to operate in currents up to 10 knots and seas up to 10 feet in height.⁶

However, further research in oil spill technology is needed. In assessing the effects of various measures of oil spill clean up, the Energy Policy Project report noted:

At least for most larger spills present measures have proved relatively ineffectual and in some cases have worsened the biological impact of an oil spill. Techniques have variously involved containment by barriers and physical removal of floating oil, the use of absorbent material to concentrate oil, sinking, burning, chemical dispersal, and steam cleaning of oiled shores. Containment and removal are most desirable from the viewpoint of avoiding biological damage, because

⁵ Abrahams, R. N. and C. W. Koburger, Jr., "Open-ocean barrier near completion." *The Oil and Gas Journal*, v. 72, no. 16, 1974, p. 98, 103-104, 106.

⁶ *Washington Letter of Oceanography*, v. 8, no. 17, August 19, 1974.

oil is removed from the environment without the addition of and foreign substance. Unfortunately, the floating booms and skimmers used are only efficient in calm water, and the technology developed to this point has not proved successful in severe weather . . . The sinking of oil with chalk or sand has often been recommended and used in Europe. However, from the biological viewpoint it appears to be among the least acceptable countermeasures. Sinking an oil slick may save the intertidal zone from pollution, but it deposits oil over a large area of the bottom, where it may persist in the sediments. In coastal and estuarine environments, it is the productive benthic life that supports most of the finfisheries as well as shellfisheries.⁷

The Energy Policy Project went on to conclude that the containment, removal, and cleanup of spilled oil are among the most difficult and most misunderstood problems in ocean engineering:

There are many reasons why oil spill cleanup problems are so difficult. There is a lack of understanding of the physics and chemistry underlying some of the pollution control difficulties. Some oil slicks cover tens of square miles. Currents and waves generate enormous forces on equipment. The logistics of dealing with something so large and so mobile in the face of the large forces of the sea are staggering . . . Asked for his honest recommendation for dealing with a large spill at sea, a former tanker captain from one oil company said. "The best thing you can do is uncork another bottle of whiskey!"⁸

Among the witnesses at the National Ocean Policy Study there seemed to be no consensus as to whether a large spill was more of a problem than small day-to-day chronic spills. Dr. John W. Devanney of MIT stated,

From an economic point of view the large spill, if it hits shore, is the more damaging. But with respect to the biological, nonmarket effects, the biologists haven't convinced me one way or the other."⁹

Dr. Devanney also pointed out if an offshore single buoy mooring operates to decrease the possibility of a tanker grounding and major spill, then there is less economic impact despite the greater number of small mooring-related spills. Dr. Russell Peterson stated the viewpoint held by many biologists that small day-to-day spills are statistically more significant and more dangerous to the marine ecosystem than a major spill because they do not allow the ecosystem time to recover. However, data in this area are particularly sparse.

The Energy Policy Project summarized the debate on oil spills in the following manner:

Uncertainty begins with how much oil actually finds its way into the sea each year, with estimates varying from one to ten

⁷ Borch et al., *op. cit.*, p. 27.

⁸ *Ibid.*, p. 25, 26.

⁹ NOPS Hearing, *op. cit.*

million tons. Most of this comes in small but continuous doses from routine tanker operations and onshore disposal of the voluminous oil wastes from industry and motor vehicles. Big accidents get more attention, but overall account for a smaller volume of oil spills.¹⁰

¹⁰ Roesch *et al.*, *op. cit.*, Summary, p. 1-2.

VII. FEDERAL MANAGEMENT AND LEASING POLICIES

A. OCS LEASING POLICIES

Several Federal statutes contain policy objectives and collectively establish a legal and administrative system for the management and control of outer continental shelf oil and gas development. Current leasing practices are controlled by provisions of the Outer Continental Shelf Lands Act of 1953 (OCS Lands Act). Under the Act, the Secretary of the Interior is authorized to grant, to the highest qualified bidder, oil and gas leases on the outer continental shelf; each lease is not to exceed 5,760 acres in area. The lease sale includes sealed bids containing bonus payments; a royalty on production is applied to each lease by the Secretary of the Interior at not less than 12½ percent. Alternatively, the Act authorizes the Secretary to lease under a royalty bidding system, in which the royalty percentage—rather than the bonus bid—is competitive. In practice, however, virtually all OCS leasing has followed the bonus bidding system. The leases run for a period of five years and as long thereafter as oil or gas is produced or drilling operations are under way. All money paid to the Secretary for or under the leases granted are to be deposited in the Treasury of the United States and credited to miscellaneous receipts.

The policy objectives and administration of outer continental shelves were further refined by the passage of the National Environmental Policy Act (NEPA) in 1969. NEPA established a national policy for protecting and restoring the environment. The effect on outer continental shelf management has been the requirement that the Outer Continental Shelf Lands Act be administered and interpreted in accordance with the policy expressed in NEPA. An increasing concern for the environment is also evident in provisions included in the Federal Water Pollution Control Act (FWPCA) Amendments of 1972; the Coastal Zone Management Act of 1972 and the Marine Protection, Research, and Sanctuaries Act (Marine Sanctuaries Act). A section of the FWPCA Amendments of 1972 prohibits the discharge of oil or other hazardous substances in harmful quantities into or upon navigable waters, adjoining shorelines, or the waters of the contiguous zone. The same section also provides for a National Contingency Plan for the removal of spills of oil or other hazardous substances.

The Coastal Zone Management Act authorizes the Secretary of Commerce to provide grants-in-aid to coastal States to encourage the establishment of management programs to control uses of land and water in coastal areas and to mitigate impacts of onshore and offshore developments and to require, for the first time, consistency of Federal programs with State plans.

The Marine Sanctuaries Act authorizes the Secretary of Commerce, after consultation with the heads of other interested agencies and the approval of the President, to designate areas extending seaward as

far as the outer edge of the outer continental shelf as marine sanctuaries. The Secretary of Commerce may take this action when he considers that it is necessary for the purpose of preserving or restoring the areas for their conservational, recreational, ecological, or esthetic values.

The Occupational Safety and Health Act (OSHA) which was passed in 1970 requires employers, including those engaged in outer continental shelf development, to provide a safe working environment for all employees. The Outer Continental Shelf Lands Act also assimilated state civil and criminal laws in effect at the time the Act was passed. These laws, when not in conflict with Federal laws, are enforced by Federal officials and courts.¹

The Department of the Interior has the major role in the management and administration of resource development on the outer continental shelves. The Secretary of the Interior is authorized to grant oil and gas leases on the shelves and is also responsible for administering the leases including prescribing the rules necessary for regulating oil and gas development in a manner consistent with Acts listed above. Within the Department of the Interior, the Bureau of Land Management (BLM) administers the leasing provisions of the OCS Lands Act and the U.S. Geological Survey supervises oil and gas operations on leased lands. The leasing is carried out in accordance with Interior's currently defined goals of orderly and timely resource development; protection of the environment; and receipt of a fair market value.²

Deputy Under Secretary Carter, in testimony before the National Ocean Policy Study outlined in detail Interior's role in offshore oil administration:

To assure that the most promising offshore areas are made available for development first and the environment receives the maximum protection achievable, we have recently initiated a two-tier request for views on OCS leasing. Under this system, the first tier includes a regional approach in which industry, states, and other groups are invited to rank the regions they think are most favorable for development from the standpoint of geologic potential and time to reach peak production and to identify environmental conditions and problems in these regions . . .

The Interior Department will use the rankings of regions along with its own evaluations of resource potential and need to protect environmental values, the CEQ Atlantic and Gulf of Alaska reports, and the views of other Federal agencies to develop a revised and updated proposed leasing schedule.

Subsequently, in the second phase of the two-tier system, industry and other groups are asked to provide their views on individual tracts within regions as has been done in the past. A NEPA statement will be prepared, the tracts selected for sale, the terms of the leases established, and the sale held.³

The Department of the Interior's responsibilities do not stop with the lease sale. Mr. Carter testified that management of a lease begins when the lease is issued:

¹ Kash, Don E. et. al., *Energy Under the Oceans*, op. cit., pp. 100-101.

² *Ibid.*, p. 101.

³ NOPS Hearings, op. cit.

Usually the operator will want to commence drilling within the first year, but prior to this, he must submit exploratory drilling plans to the Department for the geological area of interest. Regulations require that these plans must include the geophysical and geological data and mapping, drilling rig specifications and well procedures.

Following approval of the plan, a form application for a permit to drill must be submitted for each well showing such details as casing setting and cementing practices, blowout prevention and other factors. Following a discovery and the probability of commercial production, the operator submits development plans for drilling, which include platform specifications, geological mapping, well locations and reservoir completions, and the procedures in general for drilling and completion. Then an application to drill each proposed well is submitted for final approval.⁴

Other Federal agencies are also involved with OCS development. The Secretary of the Army has the responsibility for the prevention of obstructions to navigation. The Corps of Engineers, acting for the Secretary, requires that a permit be obtained for each oil development structure placed on the shelf.

The Department of Transportation, through the Coast Guard, has the responsibility of insuring that structures on the shelf are properly marked to protect navigation; of establishing and enforcing safety regulations of shelf structures; and, maintaining surveillance for oil spilled or discharged into shelf waters. The Office of Pipeline Safety, also in the Department of Transportation, has responsibilities for pipelines. Its major concern is the supervision of the safety of gas pipelines, including establishing design criteria.

The National Oceanic and Atmospheric Administration (NOAA), within the Department of Commerce, provides weather data used in platform design and has responsibilities concerning the environmental and multiple use impacts of OCS development in its effects on commercial fisheries, as well as administration of the Coastal Zone Management Act and programs dealing with manned undersea submersible operation and design.

The Federal Power Commission (FPC) and the Interstate Commerce Commission (ICC) have jurisdiction over pipelines which are linked to interstate commerce. The FPC also sets the wellhead price of natural gas produced on the OCS.

The Federal Maritime Commission is charged with determining financial responsibility of oil shippers operating adjacent to U.S. coasts.

The Environmental Protection Agency (EPA) is consulted in the preparation of the Department of the Interior's lease sale environmental impact statement and in setting and enforcing discharge levels. EPA also has an input into oil spill contingency planning and implementation.

The Department of Labor is responsible for enforcing the rules established by OSHA to provide employees with safe working conditions.

⁴*Ibid.*

The overall picture which emerges from an examination of the government regulation of OCS oil and gas development and management is one of complexity and possible conflicts of interest. The Secretary of the Interior has multiple roles. He is responsible for the promotion of OCS oil and gas development, and also for its regulation. The present Federal regulation of the outer continental shelf also operates with inadequate consideration of the role to be played by OCS oil and gas in the larger context of overall national energy supply.

B. OCS LEASING PROBLEMS

John C. Whitaker, Under Secretary of Interior, in his testimony before the Senate Interior and Insular Affairs Committee on May 6, 1974, stressed that the Department is continually considering different methods of bidding for outer continental shelf mineral leases. He said the Department's objectives are: to increase competition for individual tracts; to assist more smaller companies to enter the field without a corresponding decrease in the use of environmental protection technology; and, to promote expeditious development of leases. The bonus bidding system has historically been used for Federal OCS leasing at a fixed $16\frac{2}{3}$ percent royalty rate. Under this system, the government receives revenue regardless of whether the lease is productive or not. The experience of the Department is, he said, that a large cash bonus encourages rapid exploration and development of oil and gas leases because the operator is anxious to get a return from production or abandon the lease and recover part of the bonus through tax deductions. Early development appears to be the pattern encountered for recent lease sales where large cash bonuses have been paid. Bonus bidding may limit participation to financially strong and perhaps technically more competent operators who are able to meet pollution control requirements. However, this system does limit bidding only to those with the ability to pay the large bonuses, thereby restricting competition.

Turning to royalty bidding, Mr. Whitaker said that such a program may provide a return to the government more commensurate with the actual resource, but the government assumes a greater share of the risk. If there is no production, the government receives no return except the rentals and any fixed bonuses involved. He agreed that royalty bidding, lowers the capital requirements for entry and enhances the opportunity for independent operators with less capital to participate. Large sums of money which would otherwise be committed to bonuses are available for exploration and development. Also, a greater number of tracts could be offered without concern that larger sales might depress bids for individual tracts as with the case of bonus bidding.

However, Mr. Whitaker cautioned that a particularly troublesome aspect of royalty bidding is the high royalty bid may result in abandonment of potentially productive reservoirs. As operating costs increase due to declining production and high royalties, leases might be abandoned. Should this occur, opportunities for maximizing recovery through secondary and tertiary methods may be foregone. This problem might be handled by a sliding scale royalty with declining royalty rates to match declining output. The Department of the Interior also felt this type of system would be difficult to administer. The Depart-

ment did conclude, however, that the potential advantages in royalty bidding merit a small controlled test. The Department tested royalty bidding at a lease sale of 1.4 million acres in October 1974 off Louisiana. The sale consisted of 295 tracts, ten of which were subject to royalty bidding. The ten acres, carrying a fixed cash bonus of \$25 per acre, were awarded to the bidder who makes the highest acceptable royalty offer. The bids were expected to be several times the minimum royalty of 12½ percent,⁵ and in fact the highest bidder offered to pay royalties of 82 percent. To resolve the abandonment problem, the Department of the Interior will provide for the progressive reduction of royalty rates.

Mr. Whitaker testified the Interior Department is examining the feasibility of a number of other leasing systems such as profit sharing, installment or contingency bonus payment, and work program requirements. He said, "Thus far we have not been successful in devising a system significantly better than bonus bidding . . . In short, the present system works well and we are not convinced that any alternative system for which legislation would be required would be better." According to Mr. Whitaker the Department is approaching the issue of possible anticompetitive impacts of the present system not only by conducting a royalty bidding experiment, but also by an intention to exclude joint bidding by major oil companies.

C. ALTERNATIVE OCS LEASING AND MANAGEMENT POLICIES

Petroleum industry witnesses, at both the NOPS and Interior hearings, testified that the Outer Continental Shelf Lands Act has been satisfactory and that the cash returns to the Federal government have been outstanding. The industry representatives stressed the need for further lease sales in all areas and recommended increasing the size of each block offered for sale. They also recommended that the highest competitive bid on any lease block be accepted by the Federal government: the present system of rejecting all bids when the bonus is not considered acceptable, results in the government setting a higher market price on oil and gas.

Mr. D. G. Couvillon of Standard of California, in his testimony before the Senate Interior Committee, testified there is a trend toward increased participation in offshore leasing by independent oil companies. He felt this trend could perhaps be accelerated by smaller front end bonuses and increased royalties, but only if royalties were not raised to a level where they would reduce available exploration funds. He was in favor of extending the five-year term of the leases to ten years in areas of adverse seasonal weather such as the Gulf of Alaska.⁶

Mr. Melvin Hill of Gulf Oil, also preferred the existing Act as the best leasing system and felt that increased royalties and royalty bidding would result in oil being left in the ground due to premature abandonment of leases of low productivity.⁷ Mr. Hill then suggested a proposal in which the cash bonus would represent an obligation to spend that amount of money on exploration and development of the lease tract. If the lease proves barren of oil and gas, any excess money

⁵ "U.S. to Test Royalty Bidding in Big Gulf Sale," *The Oil and Gas Journal*, v. 72, n. 31, August 5, 1974, p. 47.

⁶ Interior OCS Hearings, *op. cit.*

⁷ *Ibid.*

obligated could then be spent either on the exploration of other company leases or on unleased tracts. The intention of this proposal would be to accelerate exploration and production rather than having the bonus money go into miscellaneous receipts of the Treasury.

In general, it was felt by oil company representatives that actions should not be taken to reduce the industry's cash flow at a time in which it is trying to expand the nation's energy supply through increased exploration.

Frank Ikard of the American Petroleum Institute also supported the present system, pointing out that a steady growth has taken place in both the number of companies bidding and the number of companies winning acreage. He also felt current OCS leasing system is highly competitive. Mr. Ikard further testified that the present system provides the government fair market value on the day of the bid and estimated that the current total Federal share of outer continental shelf oil and gas production including bonuses, royalties, and taxes exceeds 50 percent.

A number of proposals to change the present OCS leasing system were presented at both the NOPS and Interior Committee hearings.

Don E. Kash and Irvin L. White, both of the University of Oklahoma, suggested substituting a licensing system for leasing, adapting the procedure followed by several countries adjacent to the North Sea oil fields. According to Messrs. Kash and White, the licenses should be awarded on the basis of a competitive work program which includes full disclosure of geological information, development time schedules, environmental plans, and cooperation with state coastal zone management programs. The areas licensed should be large (about 30,000 acres) with 75 percent of the tract reverting back to the Federal government after a short fixed time period during which exploration by the licensed company would determine the quarter it would elect to develop. This system would give an advantage to a bidder who used innovative technology to protect the environment. The Federal share of production under this procedure should be in the form of a royalty. All competitive work plans submitted by bidders should be made public when the licenses are awarded. This would allow public assessment of the fairness of the awards and also provide a great deal more geologic and environmental information than is publicly available at the present time.

Monte Canfield of the Ford Foundation Energy Policy Project also suggested leasing larger tracts in Senate testimony.⁵ Mr. Canfield suggested that tracts in the range of 50,000 to 100,000 acres be leased with three-quarters of the tract reverting to the Federal government after the end of a 5-year period. He maintained that it is unlikely that the high level of competition and large bonuses resulting from past sales can be maintained under any large increase in lease acreage using the existing system. Mr. Canfield recommended study of a system in which these large tracts would be offered to a consortium of companies by notice with explicit requirements for production expenditures and drilling within a certain time frame. The consortium would explore the area under a Federal license and determine the locations most likely for production. At the end of a given time period, the portions of the tract the consortium planned not to develop would revert to the govern-

⁵ Interior OCS Hearings, *op. cit.*

ment, the remainder being retained for development by the consortium. Development would then begin and the government would receive its revenue on the basis of royalty or profit sharing. Under Mr. Canfield's plan, the oil companies would participate on the basis of pro-rate costing of the expenses of the consortium. A system would be established in which given expenditures would have to be made within a certain time frame once production was established. The consortium would have to come to the Federal government with a plan for development and obtain approval before proceeding.

Dr. John W. Devanney of Massachusetts Institute of Technology, stated at the NOPS hearings that there is much to recommend in the present bonus system provided competition can be maintained among bidders. According to Dr. Devanney, the bonus bid is lost as soon as it is paid and thus will not affect subsequent exploration and development decisions. The company that can pay the most for a lease is likely to prove an efficient developer. Until the recent oil price increases, Dr. Devanney estimated that the bonus policy has had the effect of transferring as much as 75 percent of the increase in national income associated with offshore oil directly to the general public revenues. The major problems associated with the present lease bidding, according to Dr. Devanney, are the wide discrepancy between the likely cost of producing OCS oil and its value, and the problem of maintaining competition in the lease sales. Only a few companies with an extremely large capital base can afford such large bids given the risks involved. Thus, combinations of very large major oil companies have been developed to bid on expensive tracts. Such combines make it increasingly difficult to maintain effective competition among bidders in future lease sales. Dr. Devanney recommended serious consideration of public exploratory drilling. The exploration results would be made public at which time competitive bidding for the rights to develop would take place where bidding combines of firms would be made illegal. He reasoned that an independent developer would use the results of the public exploration drilling in the reasonable hope of obtaining capital. The large company would not have as great an advantage over the smaller operator as is now the case and competition would be maintained.

Senator Tunney, in testimony before the Senate Interior and Insular Affairs Committee, described a proposal for a revision of offshore leasing. Based on geological information obtained from industry, Geological Survey, or from other public or private sources, the Secretary of Interior would rank all proposed lease sites for the next five years in order of increasing hazard to the environment. The process of developing this listing would require public hearings and be open for public comments. Senator Tunney concluded,

Once the ranking process is completed, the government would lease only those safer areas from the top of the listing * * *. This ranking process would assure that critical environmental areas are not touched, and it will allow better technology to be developed before drilling occurs in relatively more hazardous areas.

Senator Cranston, at the same hearings, proposed a system of royalty bidding in place of the bonus bidding, but only after eight

very specific environmental provisions have been met. The royalty system would encourage independent oil companies who do not have resources for high front end bonuses. The system would also include a production time table and a sliding scale of decreasing royalties to guard against premature abandonment. The Federal royalty share would be taken in oil which would then be made available for sale to independent refiners which can demonstrate a need, with the excess sold on the market.

Senator Bentsen testified that the OCS Lands Act should be amended to increase greatly the Federal government's share of the proceeds from the sale of oil and gas produced from Federal offshore lands.⁹ According to Senator Bentsen, the U.S. will have to accelerate offshore leasing in order to develop self-sufficiency in oil. As offshore leasing is accelerated, the dollar amounts and numbers of bids for particular leases may decrease and make it difficult to determine if a true market value has been met. One possible method to accelerate leasing and still have a high bidding level is to change the bidding process to de-emphasize the front end bonus payment and to increase the participation of the Federal government in the oil and gas found on that lease.

Senator Bentsen proposed at the Interior hearings that an oil company keep 40 percent of the total oil and gas revenue until it has recovered its production costs. The Federal government would receive 60 percent of all revenues above operating costs. This arrangement is a net profit sharing which would cause a de-emphasis on the front end bonuses and would permit more small and medium size companies to effectively participate in lease sales. Senator Bentsen opposed a straight royalty bidding system for fear that groups with no financial responsibility would bid very high royalties and then would not use adequate technology for development or for the protection of the environment.

⁹ *Ibid.*

VIII. THE STATE ROLE

A. JURISDICTION

The offshore lands consist of three relevant legal categories: inland waters, the territorial sea and the continental shelf. Inland waters are those over which a state may exercise full sovereignty as if the waters were part of the land mass; for example, rivers, bays and historic waters. The territorial sea consists of a belt of sea adjacent to the coast over which the littoral state may exercise sovereignty subject to a right of innocent passage for ships of other states. While there is no universal agreement on the precise extent of the territorial seas, the United States still adheres to the traditional three-mile limit. The term "continental shelf" refers to "the sea-bed and subsoil of the submarine areas adjacent to the coast but outside the area of the territorial sea, to a depth of 200 meters or beyond that limit to where the depth of the superjacent waters admits of the exploitation of the natural resources".¹

The dispute between the United States and the coastal states concerning jurisdiction over the offshore lands can be traced to a letter by the Secretary of the Interior in 1939, by which the Federal Government claimed the offshore lands within the three-mile limit for itself. Prior to that time, the coastal states of the United States had exercised sole jurisdiction over the offshore lands adjacent to their coasts.

In a suit filed in the Supreme Court by the United States against California in 1945, the United States was awarded exclusive jurisdiction over the offshore lands beyond the inland waters of California.² Similar decisions were reached in respect to the Louisiana and Texas offshore lands.³

However, political forces were marshalled by the states and resulted in enactment, in 1953, of the Submerged Lands Act. The Act returned to the coastal states jurisdiction over the submerged lands to a distance of three geographical miles from their coast lines into the Atlantic and Pacific Oceans; and up to three marine leagues (about 10½ miles) into the Gulf of Mexico, if a state's historic boundary prior to joining the Union was more than three miles from shore, or if such a boundary had previously been approved by Congress. In the same year, Congress passed the Outer Continental Shelf Lands Act (August 7, 1953), which provided for the jurisdiction, control and power of disposition of the United States over submerged lands lying seaward of those granted to the states. The Act authorized the Secretary of the Interior to grant mineral leases on the Outer Continental Shelf and to prescribe regulations for their administration.

¹ Geneva Convention on the Continental Shelf, 1958, Art. 1.

² *United States v. California*, 332 U.S. 19, 22-23 (1947).

³ *United States v. Louisiana*, 339 U.S. 699 (1950) and *United States v. Texas*, 339 U.S. 707 (1950).

The seaward boundaries of the OCS have not yet been defined and are subject to discussion at the Third Law of the Sea Conference, which commenced in Caracas, Venezuela, in June, 1974.

The quit-claim of at least three geographical miles of offshore lands satisfied the immediate needs of the coastal states, and it was not until the late 1950's, when technology allowed for petroleum exploitation beyond three miles from the coast, that the issue of establishing an exact dividing line between Federal and state jurisdictions became once more very important.

In a suit between the *United States vs. Louisiana, et al* (Texas, Mississippi, Alabama, Florida), the Supreme Court held that Louisiana, Mississippi and Alabama were not entitled to jurisdiction over offshore lands lying more than three miles from their coasts. It also confirmed that Texas possessed jurisdiction out to three leagues (about 10½ miles) from its coast and that Florida also had rights out to three leagues in some areas off its Gulf coast.

However, the question of what constituted the coastal points from which the three-mile (or in the case of Texas and Florida, the three league) boundary was to be measured, remained. The Submerged Lands Act refers to boundaries "extending from the coast line" and "coast line" is defined as the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters.⁴

In the second California case (1965), the Court held that the water area lying between the California mainland and a series of offshore islands were not "inland waters", but following the 1958 Convention on the Territorial Sea and Contiguous Zone, it held that the 24 mile closing line, together with the semi-circle test, represents the position of the United States and that the meaning of "inland waters" in the Submerged Lands Act should conform to the Convention. Hence, of the bays claimed earlier by California, only Monterey Bay met the 24 mile closing line-semi-circle test, and the state's title was limited to three miles from shore and around each of the coastal islands.

The decision settled some disputes but added new cases by incorporating the Convention's terms into the Submerged Lands Act, new cases concerning ambulatory boundaries (caused by natural or artificial accretions to the land mass) and drawing closing lines around historic bays.

Disputes between the United States and Texas were settled in 1969, but territorial claims of Louisiana and Florida have not yet been solved.

Florida contends that territorial sea boundaries extending three leagues around the entire state were contained in the state's Constitution of 1868. The United States contends that Florida's jurisdiction extends three leagues only at some places in the Gulf of Mexico and not on the Atlantic. A special master's report has been filed with the Supreme Court which is expected to render a decision soon.

In the case of Louisiana, the Court laid down guidelines for the application of the Territorial Sea Convention to the Louisiana coastline, but by reason of the technical nature of this proceeding, the Court

⁴ 43 U.S.C. § 1301 *et seq.*

appointed a special master to make a preliminary determination, consistent with this opinion, of the precise boundaries of the submerged lands owned by Louisiana in the Gulf of Mexico. While litigation of this case persists, the Federal government keeps the revenues derived from disputed areas in escrow.

In yet another Federal-State controversy (*U.S. vs. Maine*), the state of Maine granted exclusive exploratory rights in 3.3 million acres of offshore lands to King Resources, a Denver, Colorado mining company. The United States filed suit against Maine in April, 1969, claiming that its jurisdiction over the OCS beyond the three-mile limit both preceded and was unchanged by the passage of the 1953 Submerged Lands Act. Maine and twelve other Atlantic Coastal states, which joined as defendants, contend that they entered the Union with rights of the natural resources of the continental shelf more than three miles from the coast in the Atlantic Ocean, and that these rights have not been forfeited. In June, 1970, the Supreme Court appointed a special master to hear arguments in the case. The master recommended in August, 1974 that the court reject the claims of the States. The master felt unless the court overturned the previous decisions, the Federal government should continue to have jurisdiction over resources beyond the three-mile or three-league limit. The Supreme Court should consider the master's recommendations during the 1974-75 session.

In testimony before the Senate Commerce Committee's National Ocean Policy Study hearings, Mr. Bruce C. Rashkow, Chief, Marine Resources Section of the Department of Justice's Land and Natural Resources Division, said that his department had "entered into an agreement with the states that no formal proceedings toward leasing will occur with regard to the Outer Continental Shelf on the Atlantic Ocean unless here has been a decision in this case or we have reached agreement with states involved."⁵

B. REVENUE SHARING AND FINANCIAL AID TO COASTAL STATES

Revenues from offshore mining and petroleum activities have been the focus of congressional attention for many years. Some issues were resolved, and new problems have emerged, but the question of who is entitled to how much has never been settled to the complete satisfaction of all parties concerned. The States, as owners of resources in or under the territorial waters adjacent to their shores, are entitled to all revenues generated by oil and gas development within the three-mile limit. Beyond the territorial limits, the Federal Government owns all mineral resources and is entitled to all revenues from mineral leasing of the Outer Continental Shelf lands. These revenues are entered into the Federal Treasury under miscellaneous funds, and are disposed of as deemed fit by the Office of Management and Budget. Revenues from disputed areas are placed in escrow pending court decision.

Outer continental shelf receipts consist of bonuses, rents and royalties. Oil companies have invested heavily in offshore oil and gas developments since 1955, and revenues entering the Federal treasury have increased steadily to a point where the disposition of such funds became an issue of major concern to Congress. (See Tables 1-5.)

⁵ NOPS hearing, *op. cit.*

TABLE V.—OUTER CONTINENTAL SHELF RECEIPTS, FISCAL YEAR 1955 THROUGH 1973 (UPDATED THROUGH MAY, 1974)

	Bonuses rents	Royalties	Escrow	Total
1955.....	\$142,404,630.48	0	\$12,217,134.37	\$154,621,764.85
1956.....	111,171,041.53	\$52,814.63	26,518,518.78	137,742,374.94
Adjustment ¹	(57,434,228.69)	1(1,656.94)	57,435,885.63	.....
1957.....	1,976,361.00	232,342.31	10,969,890.58	13,178,593.89
1958.....	2,630,090.41	830,760.69	12,208,496.48	15,669,347.58
1959.....	1,145,720.00	2,266,484.40	20,418,121.35	23,830,325.75
1960.....	226,616,838.22	2,839,980.97	172,265,367.50	401,722,186.69
1961.....	1,716,161.23	5,580,525.60	43,762,875.15	51,067,561.98
1962.....	6,006,921.00	5,605,230.15	498,586,287.97	510,198,439.12
1963.....	359,370,525.43	7,443,921.55	(229,540,465.57)	137,273,981.41
1964.....	5,870,970.00	10,620,439.52	135,904,544.80	152,395,954.32
1965.....	42,223,700.64	11,246,201.92	89,032,099.84	142,502,002.40
1966.....	161,893,155.47	86,424,061.11	(39,552,372.76)	208,764,843.82
1967.....	596,202,951.97	41,107,770.26	148,129,983.44	785,440,705.67
1968.....	1,222,487,097.00	201,136,931.00	121,497,143.00	1,615,121,171.00
1969.....	111,660,685.00	240,090,666.00	258,633,592.00	610,384,943.00
1970.....	944,553,673.00	283,494,568.00	146,947,620.00	1,374,995,861.00
1971.....	906,304,523.00	350,042,488.00	221,707,956.00	1,478,054,967.00
1972.....	2,251,347,556.00	363,556,339.00	182,327,302.00	2,797,231,197.00
1973.....	3,082,462,611.00	401,126,114.00	106,172,977.00	3,589,761,702.00
1974 (May 29, 1974).....	3,564,362,605.00	NA	66,311,862.00	.....

¹ GAO adjustment taken from general fund and placed in escrow.

Source: U.S. Department of the Interior, Bureau of Land Management; U.S. Geological Survey.

TABLE VI.—OUTER CONTINENTAL SHELF, REVENUE AND PRODUCTION VALUE
 PERCENTAGE CUMULATIVE REVENUE OF CUMULATIVE PRODUCTION VALUE CALENDAR YEARS 1953-73—ALL STATES -

Year	Bonuses	Minimum royalties	Rentals	Shut-in gas payments	Royalties	Total revenue	Total cumulative revenue	Total production value	Total cumulative production value
1953			81,359,630	130,650	9957,892	12,358,172	12,358,172	35,036,861	35,036,861
1954			3,855,333	86,950	2,748,977	147,660,265	150,018,437	14,370,098	19,406,959
1955	1140,969,005		3,406,351	122,000	5,140,005	117,197,082	267,215,519	27,060,679	46,467,638
1956	108,528,725		4,006,193	79,950	7,629,383	11,715,526	278,931,045	39,497,871	85,965,509
1957			3,270,122	110,268	11,391,245	14,840,218	293,771,261	61,072,508	147,038,087
1958		848,581	2,420,584	121,218	17,423,878	20,150,076	313,921,337	96,471,136	243,509,223
1959		184,396	2,285,725	84,984	26,539,977	118,828,715	432,750,052	150,472,527	393,981,760
1960	89,746,993	171,036	3,603,140	49,350	37,095,301	323,781,831	756,531,883	200,969,615	594,951,375
1961	282,717,065	316,975	3,073,861	37,100	47,920,332	51,345,414	807,877,297	273,636,456	868,587,831
1962		517,722	8,412,297	62,200	66,096,334	564,589,574	1,372,466,871	376,675,900	1,245,263,731
1963	489,481,111	684,339	8,435,184	52,350	76,999,725	98,863,285	1,471,330,156	450,866,484	1,696,130,215
1964	12,807,587	820,343	9,798,573	45,800	8,400,339	194,339,272	1,666,349,428	506,783,510	2,202,913,715
1965	33,740,309	1,072,699	8,731,378	38,450	102,862,540	146,445,376	1,812,794,804	594,222,732	2,797,136,457
1966	209,199,893	1,367,250	6,869,277	41,700	136,987,537	354,465,657	2,167,260,461	801,724,611	3,598,861,068
1967	510,109,742	1,891,515	6,708,936	41,400	157,607,609	675,659,202	2,843,119,663	947,214,691	4,546,075,759
1968	1,346,487,097	2,145,178	8,230,787	52,300	201,136,931	1,548,052,293	4,401,171,956	1,179,912,209	5,725,987,968
1969	111,660,685	1,923,632	8,312,607	41,650	240,080,666	362,029,240	4,763,201,196	1,443,870,472	7,169,858,110
1970	944,553,673	1,745,864	8,607,855	47,700	283,494,568	1,238,449,660	6,001,650,856	1,737,593,650	8,877,451,860
1971	96,304,522	1,891,000	7,741,997	32,300	350,042,488	456,012,307	6,457,683,163	2,135,677,078	11,013,128,968
1972	2,251,347,556	2,019,533	7,984,897	48,550	363,556,339	2,624,957,875	9,082,621,038	2,229,179,121	13,242,308,089
1973	3,082,462,611	2,391,249	8,948,816	52,560	401,126,114	3,094,981,440	12,577,602,478	2,486,864,855	15,729,172,944
Total all States	9,805,990,900	19,509,433	125,563,453	1,281,120	2,625,257,572	12,577,602,478	12,577,602,478	15,729,172,944	15,729,172,944

Note: Revenue—charges and/or collection—bonuses and 1st year rentals adjusted from book transaction dates (years) to GS from BLM, to actual sales dates. Distribution of escrow funds totaling \$28,316,545 to the State of Louisiana and lessees, pursuant to Supreme Court decree dated Dec. 31, 1965, was not deducted from calendar year 1966 revenue charges, nor was the production value of \$157,000,000 deducted. 1970 bonuses increased \$951,875 and rentals increased \$22,500—leases on appeal validated.

Source: U.S. Department of the Interior, Geological Survey, Outer Continental Shelf Statistics, 1953-73, Washington D.C., June 1974, p. 47.

TABLE VII.—SUMMATION OF BONUSES, MINIMUM ROYALTIES—RENTALS, SHUT-IN GAS PAYMENTS, AND ROYALTIES OUTER CONTINENTAL SHELF

State year product	Bonuses	Minimum royalties	Rentals	Shut-in gas payments	Royalties	Total
Total, all states, 1973.....	\$3,082,462,611	\$2,391,249	\$8,948,816	\$52,650	\$401,126,114	\$3,494,981,440
Aug. 7, 1953-Dec. 31, 1973:						
total by States:						
Alabama.....	135,834,100	222,500	222,500	.....	.....	136,056,418
California.....	636,715,849	201,695	8,883,564	.....	58,561,372	704,362,480
Florida.....	1,102,111,093	.....	2,453,760	.....	.....	1,104,564,763
Louisiana.....	5,546,874,980	18,210,623	94,457,835	1,281,120	2,529,875,983	8,190,700,541
Mississippi.....	115,702,000	.....	103,680	.....	.....	115,805,680
Oregon.....	27,768,772	.....	3,759,021	.....	.....	31,527,793
Texas.....	3,233,219,268	1,097,115	14,284,195	.....	36,820,217	2,285,420,795
Washington.....	7,764,928	.....	1,399,089	.....	.....	9,164,008
Grand total.....	9,805,990,900	19,509,433	125,563,453	1,281,120	2,625,257,572	12,577,602,478

Source: U.S. Department of the Interior, Geological Survey, "Outer Continental Shelf Statistics, 1953-73," Washington, D.C., June 1974, p. 77.

TABLE VIII.—OUTER CONTINENTAL SHELF—PRODUCING AND NONPRODUCING LEASES (OIL, GAS, SALT AND SULFUR) UNDER SUPERVISION AS OF DEC. 31 (1954-73)

Year and adjacent State	Producing		Nonproducing		Total	
	Number	Acreage	Number	Acreage	Number	Acreage
1973:						
Alabama.....	.....	.....	13	74,106	13	74,106
California.....	17	82,576	52	269,301	69	351,877
Florida.....	.....	.....	62	357,120	62	357,120
Louisiana.....	660	2,769,934	309	1,306,336	969	4,076,270
Louisiana—salt.....	2	4,995	.....	.....	2	4,995
Louisiana—sulfur.....	5	6,953	1	1,875	6	8,828
Mississippi.....	.....	.....	6	34,560	6	34,560
Texas.....	42	174,960	97	531,267	139	706,227
Total.....	726	3,039,418	540	2,574,565	1,266	5,613,983

Source: U.S. Department of the Interior, Geological Survey, Outer Continental Shelf Statistics, 1953-73, Washington, D.C., June 1974, p. 27.

TABLE IX.—SUMMARY OF OUTER CONTINENTAL SHELF LEASE SALES OCTOBER 13, 1954, THROUGH DECEMBER 20, 1973 (BY STATE AND BY MINERAL)

By State and by mineral	Number of Leases	Acreage	Bonus	1st year rental
Alabama.....	13	74,106	\$135,834,000	\$27,2318
California.....	129	678,121	636,715,849	2,038,361
Florida.....	85	489,600	1,102,111,093	1,468,800
Louisiana.....	1,333	5,636,059	5,546,874,980	19,493,455
Mississippi.....	6	34,560	115,702,000	103,680
Oregon.....	74	425,433	27,768,772	1,276,302
Texas.....	360	1,626,666	2,233,219,268	4,880,004
Washington.....	27	155,420	7,764,928	466,260
Grand total.....	2,027	9,119,965	9,805,990,900	29,949,180
Oil and gas.....	1,966	9,012,345	9,770,196,127	29,651,320
Salt.....	2	4,995	105,814	14,985
Sulfur.....	59	102,625	35,688,959	282,875
Grand total.....	2,027	9,119,965	9,805,990,900	29,949,180

Note: 1970 bonuses increased \$951,875 and rentals increased \$22,500—leases on appeal validated.

Source: U.S. Department of the Interior, Geological Survey, Outer Continental Shelf Statistics, 1953-73, Washington, DC, June 1974, p. 27.

Under the present OCS Lands Act, all royalties, bonus and rental payments from OCS oil and gas production flow to the Federal treasury. Most of the social costs of environmental pollution associated with OCS petroleum production are borne by the local community. In testimony before the Senate Interior Committee, Professor Walter Mead of the University of California, Santa Barbara, stated that offshore petroleum developments have been of little benefit to Santa Barbara county. Santa Barbara's share in the revenue and tax income associated with the oil industry has been almost negligible, and benefits in the form of business generated was also virtually negligible, because most of it went to Los Angeles. On the other hand, Santa Barbara did bear all of the social costs of the 1969 spill.⁶

Professor Mead stated that the people of Santa Barbara strongly oppose leasing and operations offshore from Santa Barbara county. However, if revenue from OCS developments were forthcoming, local authorities could use part of the funds for land use planning, to study the implications of offshore drilling for oil and gas, and to prepare for emergency situations.

Other states are facing similar environmental problems. Senator J. Bennett Johnston of Louisiana testified that his state was losing 16.2 square miles of marshlands every year, and the authorities do not know the cause. He suspects that it is related to canal digging for the oil industry, and would like to study what it takes to safeguard that 16.2 square miles or to save barrier islands off Louisiana.⁷ Such studies and consequent actions to halt this process could be financed with revenues from OCS developments.

Another argument for revenue sharing has been made by representatives of Louisiana, a state with 26 years of offshore oil and gas experience. State authorities have calculated that net onshore costs associated with services provided by Louisiana and for which they are not compensated by any taxes that can be levied beyond three miles on any operations in the Gulf of Mexico, are in the vicinity of \$38 million a year.⁸

This means, according to Senator Russell Long, "that the rest of Louisiana is picking up a tax cost of \$38 million a year in order to service the people who are operating beyond three miles."⁹

Mr. Edward W. Stagg, Executive Director of the Council for a Better Louisiana testified that "if the industry operating off the Louisiana coast beyond three miles in 1972 had been operating on the Louisiana shores, they would have paid \$267 million in sales, corporate income, corporate franchise and other taxes, to state and local governments."¹⁰

Oil companies do not pay any taxes to the state for their operations beyond the area of state jurisdiction. The state, however, has to provide

⁶ Interior, OCS Hearings, *op. cit.* It should be noted that most of the clean-up costs were intervalized by Union Oil and its partners.

⁷ *Ibid.*

⁸ *Ibid.*

⁹ *Ibid.*

¹⁰ *Ibid.*

such services as schools, health care, highways, protection and so on. Louisiana authorities have estimated that state costs associated with offshore developments until 1985 could be between \$500 and \$700 million, to be borne in connection with the supply of services for the people involved in that operation.¹¹

Production from within the three mile limit in Louisiana is rapidly declining, and state revenues from this resource are not nearly enough to compensate for present and future expenditures for services to the offshore industry. (See tables 6 and 7)

¹¹ *Ibid.*

TABLE X.—OIL AND CONDENSATE—TOTAL OFFSHORE STATE AND FEDERAL OCS
 [Number of barrels in thousands]

Year	Alaska			California			Louisiana			Texas			Total		
	Barrels	Percent		Barrels	Percent		Barrels	Percent		Barrels	Percent		Barrels	Percent	
		State	OCS		State	OCS		State	OCS		State	OCS		State	OCS
Prior.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1954.....	32,665	100	.....	472,385	100	.....	54,803	98	2	10	100	.....	477,188	100	.....
1955.....	33,232	100	.....	32,665	100	.....	15,926	79	21	156	99	.....	48,601	89	11
1956.....	32,348	100	.....	32,348	100	.....	25,731	74	27	140	90	.....	59,139	85	15
1957.....	30,561	100	.....	30,561	100	.....	40,906	70	30	256	98	.....	73,394	81	19
1958.....	28,363	100	.....	28,363	100	.....	52,835	57	43	470	100	.....	83,652	71	29
1959.....	26,787	100	.....	26,787	100	.....	57,381	51	49	499	100	.....	86,214	64	36
1960.....	28,074	100	.....	28,074	100	.....	72,793	44	56	567	100	.....	100,079	57	43
1961.....	29,887	100	.....	29,887	100	.....	88,122	38	62	292	100	.....	133,376	52	48
1962.....	34,613	100	.....	34,613	100	.....	103,197	29	71	803	100	.....	146,763	45	55
1963.....	38,346	100	.....	38,346	100	.....	126,801	29	71	711	92	.....	162,217	44	56
1964.....	30	100	.....	30	100	.....	149,087	30	70	663	99	.....	188,102	43	57
1965.....	6	100	.....	6	100	.....	173,709	27	73	577	99	.....	214,819	40	60
1966.....	2,650	100	.....	2,650	100	.....	199,293	23	77	1,246	29	.....	242,652	37	63
1967.....	15,937	100	.....	15,937	100	.....	243,080	23	77	3,400	16	.....	300,270	40	60
1968.....	52,530	100	.....	52,530	100	.....	284,033	20	80	3,400	9	.....	368,177	43	57
1969.....	60,887	100	.....	60,887	100	.....	329,922	18	82	3,109	11	.....	471,191	41	59
1970.....	70,007	100	.....	70,007	100	.....	365,691	16	84	3,046	26	.....	525,832	37	63
1971.....	66,152	100	.....	66,152	100	.....	396,378	13	87	2,885	42	.....	575,714	32	68
1972.....	63,749	100	.....	63,749	100	.....	444,363	14	86	3,035	43	.....	615,117	33	67
1973.....	61,715	100	.....	61,715	100	.....	452,584	13	87	3,018	46	.....	614,786	32	68
Through 1973....	393,663	100	.....	393,663	100	.....	4,108,100	24	76	28,136	40	.....	6,040,699	45	54

Source: Bureau of Mines, Alaska Scouting Service, Conservation Committee of California, Louisiana State Mineral Board, Louisiana Department of Conservation, Texas Railroad Commission, Louisiana and Texas are estimated in part.

TABLE XI.—GAS—TOTAL OFFSHORE "STATE" AND "FEDERAL OCS"

Year	Alaska			California			Louisiana			Texas			Total		
	Million cubic feet	Percent		Million cubic feet	Percent		Million cubic feet	Percent		Million cubic feet	Percent		Million cubic feet	Percent	
		State	%CS		State	OCS		State	OCS		State	OCS		State	OCS
Prior
1954	91,675	.....	22	78	.....	.....	.....	.....	.....	3,440	.....	91,675
1955	81,325	.....	69	31	.....	.....	.....	.....	.....	6,800	.....	87,765
1956	121,279	.....	67	33	.....	.....	.....	.....	.....	6,890	.....	128,159
1957	136,527	.....	61	39	.....	.....	.....	.....	.....	13,765	.....	150,292
1958	160,472	.....	51	49	.....	.....	.....	.....	.....	24,080	.....	184,552
1959	233,967	.....	55	45	.....	.....	.....	.....	.....	24,080	.....	258,047
1960	329,280	.....	63	37	.....	.....	.....	.....	.....	30,960	.....	360,240
1961	408,365	.....	67	33	.....	.....	.....	.....	.....	440,461	.....	448,826
1962	458,481	.....	77	23	.....	.....	.....	.....	.....	478,144	.....	526,625
1963	582,361	.....	77	23	.....	.....	.....	.....	.....	640,312	.....	648,673
1964	706,545	.....	80	20	.....	.....	.....	.....	.....	763,274	.....	771,819
1965	783,474	.....	79	21	.....	.....	.....	.....	.....	809,960	.....	817,434
1966	871,124	.....	74	26	.....	.....	.....	.....	.....	960,757	.....	968,881
1967	1,265,899	.....	76	24	.....	.....	.....	.....	.....	1,373,197	.....	1,385,896
1968	1,655,223	.....	66	34	.....	.....	.....	.....	.....	1,837,752	.....	1,849,375
1969	2,057,291	.....	59	41	.....	.....	.....	.....	.....	2,321,331	.....	2,330,622
1970	2,478,745	.....	74	26	.....	.....	.....	.....	.....	2,844,676	.....	2,856,421
1971	3,219,200	.....	17	83	.....	.....	.....	.....	.....	3,750,679	.....	3,763,879
1972	44,830	.....	22	78	.....	.....	.....	.....	.....	3,750,679	.....	3,795,509
1973	37,581	.....	19	81	.....	.....	.....	.....	.....	158,772	.....	196,353
Through 1973....	390,398	100	.....	595,131	91	9	23	77	77	1,603,577	48	52	28,332,189	27	73

Source: Bureau of Mines, Alaska Scouting Service, Conservation Committee of California, Louisiana State Mineral Board, Louisiana Department of Conservation, Texas Railroad Commission, Louisiana and Texas are estimated in part.

At the NOPS hearings, Dr. Russell Peterson testified that in some places offshore development could help the economy, and in other places, "it could markedly increase the burden on the general community for facilities such as schools and roads and sewage treatment plants and so on".¹²

One of the difficulties states are facing is to find front-end money for housing, roads, schools and so on. Such facilities are normally financed by state and local taxes, but the impact of these expenditures does not get back on the tax rolls for five or six years. Senator Ted Stevens of Alaska, in testimony before the Senate Interior Committee stated that it costs the state of Alaska at least 40 cents in state public expenditures for each barrel of oil produced, to supply needed onshore facilities and services. Referring to the state's onshore responsibilities, he said:

We feel they are substantial, we feel there is an advantage to the concept I have suggested because one of the primary problems is front end money. These developments when they start offshore will have an immediate impact on the things onshore that require a great deal of money * * * schools, hospitals, police force, environmentally [related matters] such as air, water pollution, solid waste disposal * * *.¹³

Senator Stevens cited a study on oil and gas developments in Alaska that concluded the development of petroleum in the Gulf of Alaska calls for the building of a completely new city to service the offshore industry. Even if revenue sharing is forthcoming, the state will still be facing a shortfall of several hundreds of million dollars before any revenue will be realized from the production of the Gulf of Alaska oil.¹⁴

Local parishes in the state of Louisiana, which has been producing oil from offshore areas for 26 years, are faced with similar costs. Mr. George W. Healy, retired editor of the New Orleans Times-Picayune provided the example of the parish of Plaquemines in the coastal zone of Louisiana. The parish found that the road from Bel Chase to Venus, Louisiana, which is a take-off point for crew boats and other surface craft that serve offshore rigs and platforms, was hopelessly congested. Ninety per cent of the traffic on that road is related to the offshore industry; men driving to and from work, and supplies being shipped to the rigs. The parish had to build a four-lane road to serve this take-off point for offshore surface boats. It cost between 75 and 80 million dollars, for which there was no compensation. The road is constantly in need of repairs, because the industry uses heavy trucks. In the swampy coastal area of Louisiana, road repairs are very expensive.¹⁵

In view of these and other costs to the state, Mr. Stagg maintained that the federal government ought to share some part of the responsibility for financing this problem as it would develop.¹⁶

The representatives from Louisiana did not disagree with those who argued that their state had benefited from offshore petroleum

¹² NOPS Hearings, *op. cit.*

¹³ Interior, OCS Hearings, *op. cit.*

¹⁴ *Ibid.*

¹⁵ *Ibid.*

¹⁶ *Ibid.*

development, but they also indicated that the state has become so dependent on the oil industry that it will have to support further development. If the state were to oppose development, it would lead to considerable unemployment in this already poor state (45th in terms of per capita income). It was also pointed out that much of the infrastructure had already been built (but not completely paid for) and that these facilities would be underutilized if offshore developments were to decline.¹⁷ The oil industry is a major taxpayer in Louisiana from its onshore operations and operations within the area of three miles off the coast of Louisiana, and it has absorbed part of the infrastructure costs. However, with the industry moving more and more beyond the area of state jurisdiction, less taxation can be expected.

A third reason for revenue sharing set forth by witnesses in NOPS hearings is related to the willingness of the people in a coastal state to agree to offshore development. For example, the likelihood of finding oil within three miles off the coast of New England is very slim indeed. Hence, the New England States would receive all of the disadvantages associated with offshore oil exploitation and production and few of the benefits.

Dr. J. W. Devanney of the Massachusetts Institute of Technology, in testimony for the National Ocean Policy Study, maintained that under the existing system of revenue distribution, there is very little incentive for people in coastal states to favor offshore oil development. He stated that exploitation of a ten billion barrel, ten trillion cubic feet (oil and gas in place) find on Georges Bank would be worth \$5 billion in increased national income associated with the exploitation of the revenue. This increase in national income is independent of whether or not the Federal Government or regional government receive the lease and royalty payments, and it is also independent of whether or not gas prices are decontrolled. However, New England's share of the increase in national income depends critically on these policy variables. If the Federal Government controls Georges Bank and new gas prices are deregulated the increase in regional income, will be one-tenth of what it would be if the region took all the lease and royalty payments. And the increase in real income of the people who would be adversely affected by the environmental impact of the oil will perhaps be one-hundredth or one-thousandth of the region's share. Thus, according to Dr. Devanney, it becomes quite clear for those in the immediate vicinity of a development to oppose it, for they see only a minute proportion of the economic benefit of this particular development and all the environmental disbenefits.¹⁸

The major question facing the energy-deficit states of the Atlantic seaboard is whether they will be able to get guaranteed alternative sources of oil and gas. Because, as Dr. Russell Peterson pointed out: "Every state, if they could get the energy without having to face up to any of these risks would prefer that."¹⁹

People in energy-surplus states whose local economics are not yet very dependent on the offshore oil and gas industry are even less likely to favor development than those in energy-deficit states. Sen-

¹⁷ *Ibid.*

¹⁸ NOPS, Hearings, *op. cit.*

¹⁹ Interior, OCS Hearings, *op. cit.*

ator Ted Stevens, at the NOPS hearing, expressed the feelings of the people in his state by saying:

I don't know how they can expect us to take the risks and burdens involved unless there are in fact compensatory dollars, income, to meet the extra burdens that the taxpayers of the state will have to face, particularly in most of the states which will not end up by consuming much of the oil and gas from the offshore developments.²⁰

The consensus of most witnesses testifying in the NOPS hearings was that, since the adjacent state will bear the economic and environmental impact of offshore development, some form of compensation to them is in order. It was felt that coastal states should share in the offshore revenue in order to encourage their participation in OCS development with the stipulation that any funds returned to them be used for offshore oil development related problems and not for something else.²¹

Most witnesses believed that without some form of offshore revenue sharing with the Federal Government, the net result of offshore development would be an economic loss to the adjacent state. It was suggested in one case that the law affecting OCS revenues should be modified to resemble the provisions of the Mineral Leasing Act of 1920. That Act gives to the States within whose borders Federal lands exist 37½ per cent of the mineral income derived from these lands.²²

The Department of the Interior, on the other hand, does not share the position of the coastal states on revenue sharing. In testimony before the Senate Interior Committee, Under Secretary John C. Whitaker denied the need for revenue sharing, arguing that infrastructural needs can be met from general revenue sharing funds not associated with OCS income. Moreover, he expressed opposition to the creation of yet another trust fund "in favor of whatever happens to be our next problem."²³

Under Secretary Whitaker compared revenue sharing from OCS developments with the creation of the Highway Trust Fund, where an institution was set up and has become self-perpetuating. He felt OCS receipts belong to the whole country and that there are other appropriate remedies possible for the problems of coastal states.

Senator Dewey F. Bartlett of Oklahoma agreed with Under Secretary Whitaker. The senator was opposed to revenue sharing which he regards as "a kind of bribe or encouragement of other states for the development of the OCS lands where development can legally take place".²⁴ As to state revenue, Senator Bartlett pointed out that coastal states receive revenue from many onshore activities related to OCS development, such as refineries and supplies.

On the other hand, Mr. Duke R. Ligon, Assistant Administrator of the Federal Energy Administration, was not opposed to revenue sharing, but added that "such action has broad ramifications and im-

²⁰ NOPS, Hearings, *op. cit.*

²¹ It should be noted that in the economically depressed areas of Scotland, onshore adjacent to oil rich areas of the North Sea, local authorities expect to share revenue with the central government and to utilize part of those revenues to diversify the economy. This will facilitate an easy transition to the period when North Sea oil wells will be depleted.

²² In a recent meeting, western governors suggested an increase to 66½ percent of the revenue of mineral production on Federal lands. Washington Post, Aug. 2, 1974.

²³ Interior, OCS Hearings *op. cit.*

²⁴ *Ibid.*

plications, not only in the OCS area but wherever we may be developing any energy resources". "Since such a proposal," he continued, would involve a significant shift in revenue policy, it should be explored more fully and in a wider context than the subject that we are discussing here this afternoon".²⁵

Mr. Ligon said that one could argue that royalties granted to states for development of Federal onshore lands is different from the OCS. On land, states do not receive tax income from federally owned land and revenue sharing makes up for tax losses. There is no loss of tax base with regard to coastal states.²⁶

Mr. George W. Healy represented the views of the coastal states in his reply to the Interior Department's position. He said that he did not quarrel with Interior Secretary C. B. Morton that the OCS belongs to all Americans, just as do the public lands in Wyoming, Colorado and other states that have public lands. Mr. Healy continued by saying: "I accept this principle as valid, but I do not acknowledge that because all Americans own the OCS and inland public lands that the income from the OCS and inland public lands should be shared equally among all Americans. The Mineral Leasing Act of 1920 placed the government of this country on record as opposing the principle that there should be equal distribution of land—equal distribution of revenue from the inland lands".²⁷

C. COASTAL ZONE MANAGEMENT

The impact of offshore oil and gas exploration and production, other industrial and non-commercial development on the coastal zone, has taken on such dimensions, that planning of such activities and management of coastal zone resources has become imperative. Recognizing the urgency of the matter, Congress passed the Coastal Zone Management Act in the fall of 1972, and the President signed it into law on October 28 of that year. The Coastal Zone Management Act is designed to encourage coastal State to develop tools for the long-term planning and management of invaluable and irreplaceable coastal resources. To achieve these laudable goals, the Coastal Zone Management Act deserves to be funded to the full amount (\$30 million) provided for in the law.

1. *Historical Background*

Prior to the 1960's there was little awareness of the adverse effects of man's activities on the coastal zone. States played a relatively

²⁵ *Ibid.*

²⁶ *Ibid.*

²⁷ *Ibid.* The Mineral Leasing Act of 1920 states that: "All moneys received from sales, bonuses, royalties and rentals of public lands under the provisions of this chapter shall be paid into the Treasury of the United States; 37½ per centum thereof shall be paid by the Secretary of the Treasury as soon as practicable after December 31 and June 30 of each year to the State within the boundaries of which the leased lands or deposits are or were located; said moneys to be used by such State or subdivision thereof for the construction and maintenance of public roads or for the support of public schools or other public educational institutions, as the legislature of the State may direct; and, excepting those from Alaska, 52½ per centum thereof shall be paid into, reserved and appropriated, as a part of the reclamation fund created by the Act of Congress known as the Reclamation Act, approved June 17, 1902, and of those from Alaska 52½ per centum thereof shall be paid to the State of Alaska for disposition by the legislature thereof: Provided, that all moneys which may accrue to the United States under this chapter from lands within the naval petroleum reserves shall be deposited in the Treasury as "miscellaneous receipts", as provided by the Act of June 4, 1920 (41 Stat. 213), as amended June 30, 1938 (52 Stat. 1252). All moneys received under the provisions of this Chapter not otherwise disposed of by this section shall be credited to miscellaneous receipts. U.S. Code Title 30 § 191.

passive role in coastal zone matters, which were thought to be essentially local in nature. Through the zoning power, local governments acted as they saw fit with regard to the use of the coastline. Traditionally, coastal zone management efforts separated approvals for port development, drainage of wetlands and growth of communities, from controls over the projects, such as dredging restrictions and water quality controls. Different agencies dealt with different types of controls, which normally came long after the projects had been planned. Traditional coastal zone management also focused on a single resource at a time, such as fish, agriculture, ground water, or oil production, and activities lacked long-term goals. Since there were no goals, governments and private individuals competed against each themselves for short-term advantages. Gradually, during the late 1950's and early 1960's, coastal States became aware of the interdependence of various uses of the coastal zone, and of the fact that local decisions could have repercussions that reach far beyond local jurisdiction. The degradation of bays, harbors, estuaries, wetlands, etc., had clearly reached a point where conflicting uses of the coastal zone had to be reconciled.

2. Need for Coordinated Planning

In the past, jurisdiction over the coastal zone was left entirely to local authorities through the zoning power. Growing pressure on the coast from many onshore and offshore activities, and the realization that these developments could mutually affect each other over a wide area, have produced widespread concern. Rapid developments along the coast raised the question of whether due consideration was being given to environmental preservation and cultural and esthetical values. Gradually, the need for a broader perspective became evident, and Congress recognized this need after several years of debate by passing the Coastal Zone Management Act of 1972.

The need for coordinated comprehensive planning can be illustrated with a few examples.

1. The ecological and economic value of wetlands goes far beyond the local community. If large areas are filled and developed, the loss of these ecosystems can cause damage to wildlife and fisheries, and may also interfere with natural waste treatment. Upstream communities which previously relied on natural waste treatment in the wetland area may have to make large investments in waste treatment facilities once the wetlands have been filled. Hence, coastal wetlands are of local regional and national importance.

2. Rapid industrial development in particular local communities, may upset traditionally stable communities in the same region. An area much larger than the local community may be disrupted by the influx of new people and by employment shifts.

Comprehensive planning and assessment of the consequences of the various competitive uses of the coastal zone require resources and technical expertise not always available in small communities. Moreover, as the impact of coastal zone development frequently goes beyond the interest of a local community, there is a need for a State policy as well. States in turn, may need to cooperate on a regional basis to consider siting of onshore facilities whenever general States are adjacent to or likely to be affected by potential offshore producing areas. In testimony before the NOPS Hearings, Dr. Russell Peterson of the CEQ emphasized the need for State planning of the coastal zone, and

warned that without coastal zone management plans we will repeat the mistakes of the past.²⁸

The CEQ report on the OCS also recommended that States affected by the new OCS developments strengthen their coastal zone management programs by developing special technical expertise on all phases of offshore development and its onshore and offshore impacts.²⁹ According to the report, "such augmented State coastal zone management agencies should attempt to ensure that State interests and regulatory authorities are fully coordinated with Federal OCS technical and management activities, and Federal agencies should make every effort to cooperate with State coastal zone management agencies on an ongoing basis and at all stages of the management process".³⁰

The 1972 Coastal Zone Management Act can serve as a tool to enable States to plan their coastal zone activities in a rational way.

3. Purpose of the Coastal Zone Management Act

The purpose of the Coastal Zone Management Act is to assist States to protect, preserve and restore the quality of their coastal areas. Senator Ernest F. Hollings, the principal architect of the Coastal Zone Management Act, explained the purpose of the Act in the following words: "It provides States with national policy goals to control those land uses which impact upon coastal waters. The States will establish a framework for a commonsense balance between the many competing activities within the coastal zone, which range from industrial development to wildlife conservation, to recreation needs. The goal is to protect the beaches, bayous and marshes of the coastal area".³¹

The purpose of the Act is to balance economic needs with the needs to protect the coastal environment. It provides a framework for Federal-State cooperation in planning for onshore development included in part by OCS operations.

4. Federal-State Cooperation

The Coastal Zone Management Act revised traditional patterns of government involvement in the coastal zone. Under the new law, the day-to-day management role continues to be exercised by local authorities through their zoning power. However, the Coastal Zone Management Act places principal responsibility for long-range planning and management with the States. It ensures that future Federal actions will be consistent with State plans and provide a means for a concerned public to become involved in the planning and decision-making process. It encourages States to work with local governments as much as possible in the planning and implementation phases, and to work together on a multistate or regional basis to solve problems of a larger scale.

The Federal role is one of overseeing the adequacy of State planning processes, not the specifics of individual State land and water decisions. No attempt is made by the Federal government to diminish State authority through Federal preemption. Rather the aim of the Act is encourage and assist the States to assume greater planning and regulatory powers over the coastal zone. The Federal government with its

²⁸ NOPS Hearings, *op. cit.*

²⁹ CEQ, *op. cit.*, p. 1-29.

³⁰ *Ibid.*, p. 1-29.

³¹ *Congressional Record*, October 13, 1972, § 17875.

expertise in several agencies is to aid States in developing land and water use programs for the coastal zone, including unified policies, criteria, standards, methods and processes for dealing with land and water use decisions of more than local significance.²²

The Coastal Zone Management Act also requires a reordering of the Federal role to respond to the State guidelines rather than transmitting guidelines from Washington. The Coastal Zone Management Act does not require State participation; there are no sanctions or penalties for lack of State action, but instead there are two major incentives. First, to encourage the coastal States to protect shorelands and estuarine waters, the Act authorizes the Secretary of Commerce to make grants of up to two-thirds of the cost of developing management programs. The measure provides that management programs must specify the boundaries of the coastal zone, identify the permissible land and water uses within the zone and preclude uses having an adverse impact, and specify how control will be exerted over land and water uses within the coastal zone. When a management program has been developed and approved, grants of two-thirds of the cost of administering the program can be made by the Federal government. The total amount of grant money authorized to develop State management programs is \$9 million per year; administrative grants can go up to a total of \$30 million per year for all States. In addition, \$6 million can be made available each year to help States acquire "estuarine sanctuaries" for long-term scientific observation and analysis. Administrative grants can only be made after the management programs of States have been approved by the Federal government.

In addition to management program development and administrative grants, there is one other incentive for States to adopt a coastal zone management program. States that adopt management programs consistent with Federal guidelines gain additional leverage in dealing with the Federal government, Federal activities, or those licensed by the Federal government that affect a State's coastal zone must, in general, be consistent with the State's approved management program. This gives the States influence in dealing with the Federal government where differences of opinion exist concerning proposed Federal actions that would affect the coastal zone. OCS development is regarded as among the most significant Federal actions affecting the Coastal Zones.

5. CEQ Recommendation

The Council of Environmental Quality has recommended that the Secretary of Commerce require that State coastal zone plans consider refineries, transfer and conversion facilities, pipelines and related development as a condition of approval of State management programs. State coastal zone management agencies and concerned Federal agencies should jointly participate in developing these portions of the plans.²³

The CEQ also recommended that States affected by OCS development strengthen their coastal zone management programs by developing special technical expertise on all phases of OCS development and its onshore and offshore impacts. Coordination with Federal OCS technical and management activities is encouraged in the CEQ report,

²² See: Robert W. Kuecht, "Coastal Zone Management—A Federal Perspective", *Coastal Zone Management Journal*, vol. 1, no. 1, Fall 1973, p. 127.

²³ CEQ, *op. cit.*, p. 1-30.

and it calls for cooperation between Federal agencies and State coastal zone management agencies on an ongoing basis at all stages of the management process.²⁴

The Coastal Zone Management Act also provides grants to be used for the development of estuarine sanctuaries. The law can provide grants up to \$6 million per year; \$4 million have been appropriated for 1974. Several States have informally applied, but only one, Oregon, received a grant of \$825,000. The reasons for such limited grant application and approval are related to the cost of developing estuarine sanctuaries (States have to pay one-half of the cost), the problems involving acquisition of the land, and the need to undertake an extensive environmental impact study.

On August 19, 1974, Senator Hollings introduced a bill calling for several technical amendments to the provisions of the Coastal Zone Management Act of 1972. Senator Hollings' bill would amend the act in four ways:

1. It would increase the appropriation for grants for developing management plans from \$9 to \$12 million.

2. The bill would amend the act to remove the present 10 percent limitation on the amount any one State may receive out of the total appropriated amount for management grants and replace it with specific dollar limitations for specified yearly intervals. This amendment is designed to deal with an unusual situation that is expected to occur only in the first and last years of the implementation of section 306. States will not all complete their coastal zone management programs at the same time; in fact only four are expected to be eligible for coastal zone program management grants in fiscal year 1975. The present 10 percent limitation places those States that complete their program early at a disadvantage by limiting the amount of funds that they can receive. With only four applicants and each funded at up to a minimum of 10 percent of the funds available, only 40 percent of the funds available could be expended, shutting off the possibility of additional assistance for those States. Senator Hollings' bill calls for a yearly limit of \$2 million per State for fiscal year 1975, \$2.5 million for fiscal year 1976, and \$3 million for fiscal year 1977.

3. The third amendment to the act proposed by the bill would extend grant assistance for the creation of estuarine sanctuaries for 3 more years. As it now stands, the Act authorized appropriations for fiscal year 1974 only at an amount not exceeding \$6 million, with no State being allowed to receive more than \$2 million.

So far at least 20 coastal States have indicated a desire to establish estuarine sanctuaries. For fiscal year 1974, a total of \$4 million was made available for estuarine sanctuary grants to the States. Although the \$4 million is to remain available until expended, it will not be adequate to fund even half the estimated estuarine sanctuaries needed. To correct this situation, Senator Hollings' bill would extend the authorization for estuarine sanctuary grants to June 30, 1977. This should give NOAA the flexibility it needs to assure that State demands for estuarine sanctuary assistance are adequately met.

4. Senator Hollings' bill also would extend the availability of coastal zone management grants for an additional 2 years. Reasons for the extension are related to the initial failure of the last Administration to fund the program, and more recently to the consequences of the energy crisis. The crisis has dramatically increased the need for coastal States to develop planning mechanisms to deal with deepwater ports, offshore oil and gas development, refinery construction, and other forms of offshore and onshore development. The Coastal Zone Management Act is, in the opinion of most experts, the best tool to minimize socio-economic and environmental impact. The proposed two-year extension will provide States with the extra time they need to develop coastal zone management programs to cope with the onshore impact of energy-related offshore development. Senator Hollings believes that these amendments will ensure that the Coastal Zone Management Act will continue to serve the interest of the States and the nation in the best possible way.²⁵

²⁴ *Ibid.*, p. 1-29.

²⁵ *Congressional Record*, August 19, 1974, S 15180-S 15182.

6. Coastal Zone Management Funding

Funding of the Coastal Zone Management Act was held up by the Office of Management and Budget until almost a year after its enactment. In late 1973, funds were released and NOAA has awarded grants to 29 states for the development of coastal zone management programs.

TABLE XII.—COASTAL ZONE MANAGEMENT—SEC. 305, GRANTS AWARDS TO DATE

Number and State	Federal share	Total program	Date
1—Rhode Island.....	\$154,415	\$231,623	Mar. 13
2—Maine.....	230,000	345,000	Do.
3—Oregon.....	250,132	419,689	Do.
4—Michigan.....	330,488	534,447	Apr. 23
5—California.....	720,000	1,648,653	Do.
6—Mississippi.....	101,564	152,346	Do.
7—South Carolina.....	196,485	298,500	May 10
8—Maryland.....	200,000	465,765	Do.
9—Washington.....	308,820	563,230	May 14
10—Texas.....	360,000	551,648	May 16
11—Ohio.....	200,000	306,300	May 21
12—Massachusetts.....	210,000	315,000	June 4
13—Connecticut.....	194,285	321,644	June 5
14—New Hampshire.....	78,000	117,000	June 7
15—Hawaii.....	250,000	375,000	June 10
16—Georgia.....	188,000	303,400	June 13
17—Delaware.....	166,066	250,000	June 14
18—Florida.....	450,000	686,000	Do.
19—Wisconsin.....	208,000	354,000	June 20
20—Alaska.....	100,000	150,000	Do.
21—Pennsylvania.....	150,000	225,000	Do.
22—North Carolina.....	300,000	500,000	June 21
23—Minnesota.....	98,500	140,250	Do.
24—Illinois.....	206,000	309,000	June 24
25—Louisiana.....	260,000	394,000	June 26
26—Puerto Rico.....	250,000	375,000	Do.
27—Alaska.....	600,000	960,000	Do.
28—New Jersey.....	275,000	412,500	June 27
29—Virginia.....	251,044	376,586	Aug. 12

Source: Congressional Record, Aug. 19, 1974, S. 15162.

Total funding for F.Y. 1974 has been \$7,199,353, and so far one grant has been made in F.Y. 1975 to the State of Virginia (\$251,044). Congress has not yet appropriated funds for F.Y. 1975, but NOAA hopes to get \$9 million (the maximum under section 305 of the Act) to assist States to develop management programs.²⁴

By mid-1974 no State had yet completed or submitted a coastal zone management program for approval which qualifies for administrative grants under section 306 of the Act. Once a State's coastal zone management program has been completed, the State will be eligible for section 306 grants. A few States may be eligible in F.Y. 1975. A State may propose a segmented plan under section 306. Having completed a coastal zone management program for a certain geographic region within the State, the State may be eligible for an administrative grant.

²⁴ Information received from the Coastal Zone Management program of NOAA, on August 29, 1974.

IX. OCS PRODUCTION AND TRANSPORTATION TECHNOLOGY

A. SAFETY AND SPILL PREVENTION TECHNOLOGY

In the past, OCS development technologies had only to meet Federal regulations regarding safety and prevention of waste. Now, however, environmental concerns have changed the criteria of determining what is acceptable. When evaluated on the basis of these new criteria, standards and procedures, present OCS technologies appear to some to be inadequate.¹ The problem of technological inadequacy can, according to some critics, be related to the relatively permissive nature of government regulation resulting in large part from a lack of adequate resources to be a more active regulator.² The OCS regulations have always been well within the state of the art as practiced by the petroleum industry thus compliance has not presented a serious challenge.

Blowouts, a visible type of accident, are often credited with being of major influence in the loss of public confidence in offshore oil and gas regulation and development. For the period from 1953 through 1971 the blowout rate on the OCS has been approximately one for each 500 holes drilled.³ The magnitude of the spills and the damage associated with blowouts, however, is often in dispute. Thus it is important to distinguish between gas and oil blowouts. Gas blowouts normally vent to the surface and dissipate into the atmosphere. Oil blowouts are more serious for the released oil normally forms a slick on the surface and unless contained can cause damage. Blowouts on multiwell platforms can cause mechanical damage to other wellheads and, if followed by fire, can burn away other structures. In response to potential blowout situations, better measurement and monitoring equipment is needed.⁴

The ability to measure pressure continuously at the bit face would provide an early indication of potential blowout danger. There has been a recognition of the need for such instrumentation, but the industry has as yet not been successful in its development. Since rapid accurate measurement of downhole pressure is important in improving the ability to maintain well control and to reduce the possibility of blowouts, it was recommended by the Council on Environmental Quality that the Department of the Interior determine which technologies could improve the measurement of the formation pressure near the drill bit and incorporate these into the OCS regulations.

Successful drilling involves a balance between drilling mud weight and downhole pressures. A sudden loss of mud is an indication of blowout danger. Equipment is available which is capable of measuring the

¹ Kash, Don E. et al., *Energy Under the Oceans*, op. cit., p. 118.

² *Ibid.*

³ *Ibid.*, p. 114.

⁴ *Ibid.*, p. 115.

loss or gain of one barrel mud, although its use has not been universal. The equipment is generally considered to be accurate enough to warn of a potential blowout.

When a potential blowout is indicated, the usual response is to apply a combination of an increase in pumping rate and the addition of heavier drilling mud. If the danger persists, the next action is to close any or all of the three hydraulically actuated blowout preventers attached to the top of the casing. The top two preventers on the blowout preventer stick close around the drill pipe. If only these are actuated a blowout is still possible through the drill pipe. This may be prevented by closing the third preventer which either crimps the pipe and thus closes the hole or shears off the pipe completely and allows it to drop into the hole. A third alternative is a recently developed internal preventer which closes off flow through the drill pipe.

The CEQ study found no major inadequacies in blowout preventer technology but cautioned that since specific requirements depend upon the characteristics of the formations to be drilled, orders for new OCS areas must be based on a careful review of the geological conditions to ensure that the technologies can be transferred. The indications are that blowout preventer stacks are reliable if they are properly maintained and tested and operated by a well-trained drilling crew. Although technical developments could contribute to more effective identification of potential blowout conditions, the oil industry identifies human error as the major blowout problem. Specifically the problem is identified as inexperienced and/or poorly trained personnel or inadequate procedures.⁵

There has been a gradual improvement in all phases of drilling and blowout control technology in response to the specific requirements of OCS regulations and the general pressure of public opinion. However, OCS oil and gas operations are hazardous and it is impossible to guarantee that drilling and blowout accidents will never occur.

B. OFFSHORE PLATFORMS

The structural design of offshore platforms has reached a high degree of competence. However, the modification of OCS technology used in relatively benign environments like the Gulf of Mexico to meet the challenges of a more hostile set of weather and sea conditions such as those in the North Sea has complicated the technological challenge. The threat to personnel safety and the potential for pollution from loss of well control make it essential that environmental hazards be fully considered in the approval of platform designs for use in such areas as the Atlantic and Gulf of Alaska. The Council on Environmental Quality recommended that the Departments of Interior and Transportation coordinate their evaluation and approval procedures for offshore platforms in new OCS areas and called for detailed performance requirements for these platforms with full consideration of the potential natural hazards in new areas.

Of some concern is the trend to multi-well platforms. Recent fires in the Gulf of Mexico have illustrated the domino effect of single well accidents on such platforms. More effective fire walls are needed and more care should be taken to isolate critical components and personnel.

⁵ *ibid.*

On multi-well platforms the Christmas trees are often vulnerable to damage from adjacent wells. Thus, a down-hole safety device is used for defense against blowouts during production operations. It consists of a valve which is actuated by changes in velocity of the production stream. Although actual statistics on the failure rate of the velocity actuated down-hole safety valve are not available, their record appears poor.⁶

A change in the U.S. Geological Survey's OCS orders requires that remotely-actuated down-hole safety devices be installed on new wells in the Gulf of Mexico. Wells already producing need not be fitted with this new device until the tubing is removed for maintenance. A new subsurface safety valve controlled from the surface could be substituted for the velocity actuated device on existing wells without the necessity of pulling the tubing would be an important contribution to OCS.

1. Concrete Production Platforms

On June 30, 1973, a mammoth concrete oil storage tank was safely installed on the sea floor in Norway's Ekofisk oil field in the North Sea, signalling the arrival of concrete technology in offshore operations. A few weeks later, the oil companies awarded two contracts for concrete drilling and production platforms. By August, 1974, eight concrete platforms were under construction. Concrete is a suitable material for several reasons including ease of construction and resistance to corrosion and fire. One reason for the apparent popularity of the concrete design in the North Sea is the nature of the marine soil conditions at the sites where the platforms will rest. Unlike the Gulf of Mexico, where deep deposits of soft clay predominate, marine soil conditions at most of the major fields in the North Sea consist of stiff clays and dense sands which are able to support the heavy loads introduced by the concrete gravity platforms. As their name implies, gravity platforms rest on the ocean floor stabilized by their own weight, without deep pilings.

The principal technical requirement is for stability of the concrete platform, which depends on prevention of foundation failure. Conceivable modes of foundation failure include: sliding between the base of the structure and the soil, bearing capacity failure, progressive failure caused by softening along the rim of the base, and the liquefaction of said.⁷ The governments of Great Britain and Norway, in whose sectors of the North Sea the structures will be located, are developing regulations governing the design, construction, and maintenance of concrete gravity platforms.⁸

The major difficulty associated with concrete production platforms is the scarcity of coastal sites in which they can be built. Unlike steel designs, concrete platforms are built in an upright position and finished largely on shore before being towed vertically to their destination at sea. The platform fabrication site must have very deep water and a clear path out to sea with a depth of as much as 100 fathoms. Few coastal sites meet these requirements. In Britain, industry applications to use the few available sites have generated considerable pub-

⁶ *Ibid.* p. 120.

⁷ Foss, Ivar. Concrete Gravity Structures for the North Sea. *Ocean Industry*, v. 9, n. 8, August 1974, p. 58.

⁸ *Ibid.*

lic controversy because of their high scenic value and the socio-economic disruption that would result from importation of the labor-intensive platform fabrication industry into small, remote communities.

Gravity platforms currently under construction are made entirely of concrete, but hybrid designs—with a concrete base unit and steel tower—are currently under development. The structure is completed onshore before being towed to a location and installed at sea. (All-steel platforms, by contrast, are completed at sea.)

In Santa Barbara Channel, Exxon has developed plans for a giant platform which would be 940 feet high and contain 28 wells. It would be in a record 850 feet of water.⁹ The platform may be built in Los Angeles Harbor, but other locations are available on the West Coast. Deep water platforms such as this together with necessary onshore construction, treating, and storage facilities will strongly affect the coastal zone and thus require careful advance planning. The changes in design and construction in response to deeper waters and differing seabed, water-column, and weather conditions will demand expansion or alterations of existing coastal facilities and services, or completely new construction facilities and services for which few sites and limited choices may be available in the United States. These in turn will alter the magnitude and nature of the social, economic, and other related impacts on the coastal zone.

2. Seafloor Production Systems

Progress has been made toward development of safe and economically viable subsea production systems to replace conventional production platforms. The potential advantages of these systems include: fail-safe and redundancy characteristics to improve reliability and safety; increased automation to reduce the chances of human-error accidents; reduced threats of earthquake and storm damage; and reduced conflict with surface uses such as fishing and shipping. Some critics believe, however, that fishing might be hurt more by subsea system wellheads spread over the ocean floor than it would be by wells clustered as they occur with directional drilling systems. It is conceivable, however, that with the aid of a shield or dome, subsea wellheads could avoid snagging fishing nets. The Council on Environmental Quality recommends that subsea production equipment be used in new OCS areas where it would provide a higher degree of environmental protection and reduce the conflict between development operations and such competing uses of the ocean as navigation, fishing, etc.

⁹ Interior Okays Santa Ynes Production. *The Oil and Gas Journal*, v. 72, n. 34, August 26, 1974, p. 63.

In NOPS testimony, NOPS, op cit., E. P. Wheaton of Lockheed Aircraft Corporation described Lockheed Petroleum Service's Subsea System. The system places men and hardware on the ocean floor where standard oilfield techniques are used in completing each subsea well. The wells are then linked to subsea manifolding and production facilities. Each wellhead and each manifolding and production unit is enclosed in an individual man-rated pressure chamber. Within these chambers, men using regular tools and techniques assemble control valves, piping, and production equipment. Flowlines inter-linking the various chambers are drawn into ports in each chamber wall using a dry pull-in technique. The service capsule is equipped with life support systems, communications, and electric power all provided through an umbilical linking to the surface support vessel. The present system has a water depth capability of 1,200 feet, but future systems will be operable at several times that depth as the basic concept is relatively insensitive to water depth.

According to Mr. Wheaton, Lockheed's examination of offshore concepts began with a reexamination of the conventional platform system, particularly the costs of these structures as their height is increased for deeper-water applications. Lockheed also considered the use of divers for the installation of subsea wells and discovered that their capability to do useful work is very limited. Divers can work at 300 feet, and down to 600 feet with special training and equipment. Research dives have been made to 1000 feet. Oil field equipment is, however, generally heavy and difficult for divers to handle. The use of robots was also considered by Lockheed, but the cost appeared too great. The result was a decision to develop an atmospheric chamber to allow experienced oil men to work in shirt-sleeve conditions on the ocean floor, using standard oil field equipment which has years of proven reliability rather than specialized subsea equipment. The atmospheric chamber would also allow for inspection and checking of the installation by company and government inspection personnel, and would facilitate maintenance and upkeep operations.

The system now under development by Lockheed consists of the wellhead cellars, which are placed on the individual wells; the manifold center, which brings these together and can monitor the oil and gas from the producing zones; and the separation and pumping station from which oil and gas can be pumped ashore or to the surface. Lockheed is now taking orders for single wells, and expects by about 1978 to have the complete system which can operate without a platform on a multiple well unit. A diagram of the system is shown in Figure 1.

LPS PROTOTYPE SYSTEM

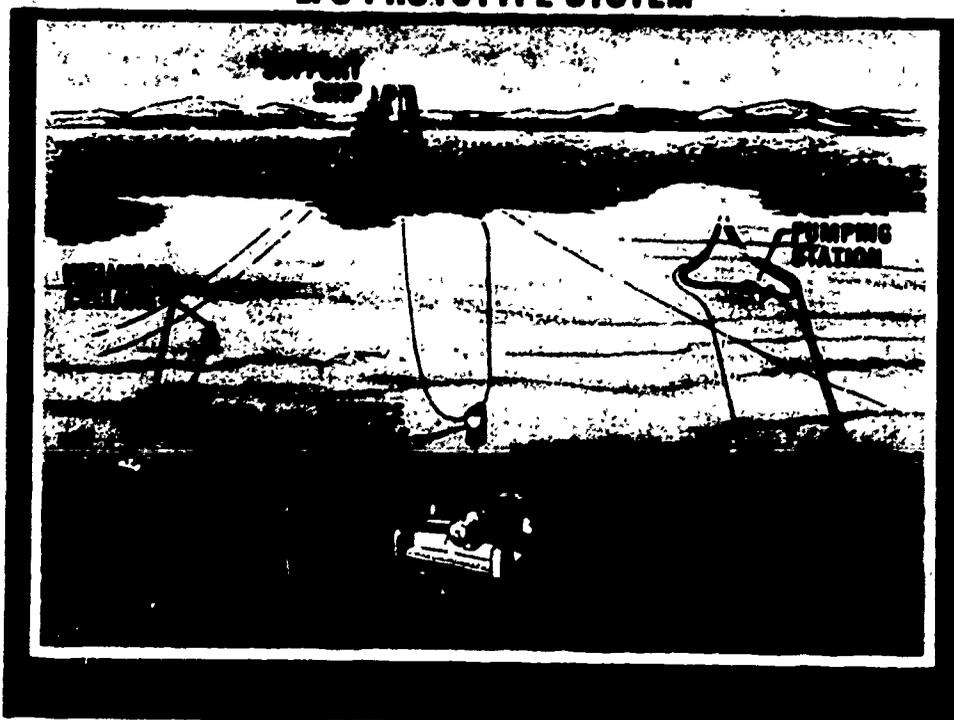


FIGURE 1.—Conceptual design of an underwater petroleum production system. The system involves construction and emplacement on the ocean floor of manned pressure hulls containing normal oil-field components. Components are serviced by manned capsule.

Source: Lockheed Petroleum Services, Ltd., British Columbia, Canada.

Albert P. Jaffe, in NOPS testimony, outlined the subsea oil production systems developed by Subsea Equipment Associates, Ltd. (SEAL).^o The SEAL multiple-well production system is presently installed on the sea floor in 250 feet of water in the Gulf of Mexico. The system houses conventional collecting, testing, and metering equipment for oil and gas production in a nitrogen atmosphere to prevent fire and explosions. A single multiple-well system can combine and control oil and gas production from as many as 18 wells, which are drilled from a surface ship. The system is installed on the ocean floor without the use of divers. A base is towed to the site and submerged, hauling down the subsea equipment enclosure. The equipment enclosure has a control section for electrical equipment and a lower portion for oil handling equipment. Wellhead connectors are lowered from the ocean surface by use of guidelines. The connectors link the wells drilled on the periphery of the enclosure to the oil control and handling equipment outside of the enclosure. The multiple-well production system normally operates without manned intervention; however, service personnel can be lowered into the subsea enclosure with a transfer bell to work in a shirt-sleeve environment on the ocean floor.

Another subsea production unit developed by SEAL is the single-wellhead system which will be tested in 500 feet of water in the Medi-

^o NOPS, op. cit.

terranean Sea. It is designed for single, high-production wells in moderate to deep ocean depths, and can be remotely installed and maintained without divers from a surface ship. The system consists of three basic modules with the base and master valves normally remaining on the sea floor. When servicing is required, a special re-entry and handling tool replaces the module in question with a reconditioned module and, if man should ever have to intervene, a back-up work enclosure can be installed over the wellhead. Service personnel are lowered to the enclosure by means of a transfer chamber. The oil or gas produced by subsea systems can be routed to a shore facility, a platform, or a surface tanker.

The multiple-well production system was designed for operations in depths to 1,500 feet, and the single-wellhead system was designed for operation in 1,200 feet of water. The designs for both systems could be extrapolated for operations in water depths approaching 6,000 feet.

According to Mr. Jaffe, an inherent advantage of subsea production systems is the added protection against the risk of pollution. The wellhead control equipment is located on the ocean floor and thus is free from the vulnerability of damage by ships and storms on the surface. The systems have been designed to withstand earthquakes, and would shut down automatically should anything go wrong. Fire hazards have been reduced as the oxygen atmosphere necessary to support combustion has been eliminated.

Mr. Jaffe said that conventional platforms which are rigidly erected and protrude above the sea surface are, in general, limited economically to depths of about 300 to 600 feet. The cost of these platforms increases exponentially with water depth. New design platforms not rigidly connected to the sea bottom are generally limited economically to water depths of about 400 to 1000 feet. The cost of these platforms in general increases at a linear rate with increasing water depth. Subsea systems are attractive in depths of 250 feet and are currently, according to Mr. Jaffe, the most economically-attractive production method beyond 600 feet. The cost of subsea systems increases at a very low rate with increasing water depth.

Frequently, expensive platforms are spaced at distances which do not permit full recovery of oil from an offshore field, stated Mr. Jaffe. Subsea production systems can be used to produce oil from areas not reached by the platforms. He also pointed out that subsea production systems can produce oil economically from exploration wells which are normally plugged and abandoned, as the base portion of a subsea system can be installed over the exploration well with the control portion added later when the field is placed in production.

All of the gas and almost all of the oil produced offshore is transported to shore by means of pipelines. Pipelining is a relatively safe and accident free phase of offshore operations and, in comparison with barging and other surface transportation, its record has been good.¹⁰ However, according to Geological Survey statistics, there have been four pipeline incidents on the OCS which resulted in environmental and property damage during the period between 1953 and 1971. Two of these breaks were caused by anchors and one by overpressurization. The cause of the fourth has not been determined. One of the anchor

¹⁰ *ibid.*, p. 124.

incidents released 6,000 barrels of oil and the other 160,000 barrels, the largest spill ever recorded from OCS operations.¹¹

Pipelines also appear to be a major source of small chronic pollution. Although it is almost impossible to identify specific amounts of oil released by them, it was estimated that in 1971 about 84 percent of all oil introduced into U.S. waters from offshore facilities came from pipe ruptures and line leaks.¹²

Current techniques for detecting leaks include mass flow monitoring, visual surveys, and pressure measurements. At the present time, no satisfactory method is available for identifying incipient pipeline failure as a guide to preventive maintenance. If there are no major modifications in pipeline systems, the amount of oil spilled from pipelines will probably continue to be about the same proportion of oil spilled from offshore facilities as was the case in 1971.¹³

Oil and gas development in parts of the Atlantic and Gulf of Alaska will require laying pipelines at depths beyond that now possible with current technology. During the summer of 1973, 32-inch diameter pipe was laid in 420 feet of water in the northern part of the North Sea. The same equipment is capable of laying pipe of comparable size in water depths of 600 feet, and with modifications and improvements, the equipment will be able to lay large diameter pipe in water depths of 900 feet.

Bringing pipelines ashore can result in significant environmental impacts. Laying pipe in shallow water and marshlands involves extensive canal building and dredging, and often results in substantial alternation of coastal lands.

In spite of technological problems associated with offshore oil and gas development, Prof. Don E. Kash testified before the Senate Interior Committee that, "In our two studies of offshore oil and gas operations, we concluded that the best physical technologies being used on the OCS and in the North Sea are generally adequate to permit OCS oil and gas resources to be found, developed, produced, and transported at acceptable levels of risk."¹⁴

¹¹ *Ibid.*

¹² *Ibid.*

¹³ *Ibid.*, p. 125.

¹⁴ Interior OCS Hearings, *op. cit.*

X. SHORTAGES OF DRILLING RIGS, EQUIPMENT AND MANPOWER

Spurred by the growing demand for energy from the oceans, manufacturers of drilling rigs anticipate a production increase of thirty percent for the next two years. However, worldwide shortages of steel, derricks, masts, castings, tubular goods and other drilling equipment are likely to slow down projected growth. One company based in the Mid-west reported that it is virtually out of the rig manufacturing business because it cannot get steel castings. Much of the shortage of castings stems from reduced foundry capacity around the country. Derricks and masts appear to be among the most critical items in the near term. A spokesman for one rig manufacturer predicted that "without some significant expansion, there is no way manufacturers of derricks and masts can meet the industry's demand in the next two to three years."¹

Even drilling-mud is hard to obtain, because minerals such as barite are in short supply. The shortage is so severe for some pieces of equipment, that manufacturers have been reported using old casings from abandoned wells. Most operators agree that shortages of steel and drilling equipment are the chief factor limiting further expansion of operations. One operator reported that he could double his well completion tally if rigs and equipment were available.²

Administration officials believe that the tight supply of oil-country tubular goods is easing up and should be solved by the beginning of next year. William A. Vogely, Acting Assistant Secretary for Energy and Materials of the Department of the Interior testified at a recent hearing of the Senate Committee on Interior and Insular Affairs that he believed that the present supply shortages will have no long-term adverse effect on rig construction: ". . . it is a problem that will be solved by people placing orders for rigs and those rigs being built. I have every assurance that these orders will be placed—in fact have been placed—and the rigs will be built."³

Testifying before the same committee, John Sawhill, Administrator of the FEA, however, admitted that "our work to date indicates that the availability of steel plate, structural, and other shapes may limit expansion plans of rig manufacturers," and, "some rig manufacturers indicate that they are potentially 25-35 percent short of their needs".⁴

Even if the current shortage of tubular goods would ease by the end of the year, further drilling activity in the United States could still be hampered by a lack of rigs. It has been estimated that if exploratory

¹ *The Oil and Gas Journal*, June 10, 1974, p. 24.

² *The Oil and Gas Journal*, July 29, 1974, p. 128.

³ *National Journal Reports*, April 20, 1974, p. 596.

⁴ *The Oil and Gas Journal*, August 5, 1974, p. 44.

and development incentives remain high, worldwide rig supply will lag behind demand for at least the next two to three years.⁵

The slowdown in the expansion of rig manufacturing due to material shortages may not be felt immediately in the United States. At the present time there does not appear to be a significant shortage of drilling rigs. A shortage for special mobile rigs that can operate in deeper waters and under adverse environmental conditions, may soon develop. This shortage could increase when more deep-water tracts in the Gulf of Mexico are offered, and when leases off the Atlantic and California are awarded. Industry is not likely to be able to respond rapidly to increased demand, because there are lead-times approximately two years for construction of drilling rigs or production platforms. In addition, failure to expand now will create a shortage in the future, C. R. Delay, president of Storm Drilling Co. said in an interview with *Ocean Industry*: "We cannot build enough rigs, we do not have sufficient facilities, steel and yard space at our disposal today to catch up and then keep up with demand. We may not have a current rig shortage in this country, but we are sure fixing to have one."⁶

A drilling contractor who studied the rig supply outlook agreed that it will be hard to increase the number of active domestic rigs much beyond the present level for the next 2 or 2½ years. Since industry is presently operating close to capacity, any increase in rig availability will only occur several years after manufacturers start accelerated expansion programs, and they are not likely to invest that much additional capital for expansion unless they are assured of a continued high level of rig demand for some years to come. On the basis of their projections of future availability of drilling rigs, the Intec research company of Chicago has concluded that new rig construction cannot possibly match the industry's spoken commitment to increase offshore exploratory drilling.⁷ Companies are hesitant to expand production facilities, because the advent of new competitive fuels are a change in Arab policies of restraining oil supplies could cause demand to fall off markedly, leaving manufacturers with surplus capacity and heavy debts.

To further complicate matters, rapidly increasing demand for drilling rigs abroad where prices tend to be higher than in the United States, has boosted exports of American manufactured rigs, platforms, and equipment. Manufacturing plans call for 50 offshore mobile rigs per year, with the export market expected to claim 40 in 1974, 35 in 1975, and 30 in 1976.⁸

Manufacturers claim that exports are more profitable, and foreign purchases of rigs have been financed with low-interest loans (6½ percent) from the Eximbank. Spokesmen for the Export-Import Bank have stated that low-interest loans were extended for balance of payment reasons and in order to maintain the American lead in this industry. It should be noted that at present virtually all of the world's rigs are designed and manufactured by American firms and U.S. overseas affiliates.

Exports, shortages and other factors are expected to hold the gain in rigs available for domestic work between 1974 and 1976 to only 5

⁵ *The Oil and Gas Journal*, op. cit., p. 24.

⁶ *Ocean Industry*, January 12, 1974.

⁷ *National Journal Reports*, op. cit., p. 583.

⁸ *The Oil and Gas Journal*, June 10, 1974, p. 22.

percent. Contrary to the shortage of steel and tubular goods which has showed-down oil-company exploration plans, the world-wide rig shortage does not appear to have had an immediate effect on U.S. offshore activities. Disruption in government leasing policy, however, could upset drilling plans and future availability of rigs. Testifying before the NOPS hearings, Henry W. Wright of the Western Oil and Gas Association said that if the industry can rely on the Interior Department's earlier decision to put up tracts for sale off Southern California, then they do not expect any shortages of equipment, because there will be sufficient lead-time to arrange for it.⁹

Mr. Wright felt that equipment shortages on the West Coast were primarily due to the lack of consistent Interior Department policy with respect to the development of the Santa Barbara Channel. After the 1969 Santa Barbara spill, the government imposed a moratorium on offshore drilling, and leases sold in 1968 remained essentially underdeveloped. The companies assigned the available equipment to long-term commitments overseas, and it cannot now be returned to the United States. New equipment will either have to be constructed or as contracts expire elsewhere in the world will have to be brought back at considerable expense to the West Coast.¹⁰ Mr. Wright testified that any serious delay in leasing of those California offshore areas as projected by the Department of the Interior for 1975, could again upset company planning and cause rig shortages later.

Some observers have indicated that a potential rig shortage in the United States could be lessened if oil industry and drilling contractors were to co-ordinate their efforts better to ensure full utilization of available rigs. It has been reported that in early 1974, 19 out of 75 available rigs in the United States were idle, primarily due to lack of "direction and communication" between producers and drilling contractors. Others have argued that there are not any units sitting around idle any more.¹¹

Oil companies have also reported a shortage of skilled and professional manpower. Manpower shortages created by the recent increase in exploratory activities are expected to ease by the end of the year.¹² Most of the skilled personnel is trained on-the-job, and company officials have indicated that there is no real substitute for this kind of training. Training schools, such as the blow-out prevention school in Louisiana are only supplementary to company efforts. Shortages of professional manpower are said to be related to uncertain leasing policy of the government, which did not create incentives for students to major in petroleum and other relevant areas of engineering.

Several major factors can be identified as contributing to shortages of manpower and material. These include:

1. World-wide increase in demand for offshore oil and gas caused by the energy crisis and the quest to broaden sources of supply. Recent increases in the price of foreign and domestic crude has resulted in an upsurge of exploratory activities around the world. Only few nations have the technology to produce offshore drilling rigs and

⁹ NOPS Hearings, *op. cit.*

¹⁰ *Ibid.*

¹¹ See: *National Journal Reports*, April 20, 1974, p. 593, and *Christian Science Monitor*, August 20, 1974.

¹² Testimony of Mr. Wright, NOPS Hearings, *op. cit.*

platforms, and it appears that existing production capacity is fully utilized.

2. Commitments to foreign drilling contractors. About 50-60 percent of all drilling rigs produced in the United States are committed for the export market where higher returns on investment can be obtained. Some contractors are moving rigs out of the Gulf of Mexico to foreign waters where daily contracting fees run 40 or 50 percent higher than in the United States (*Christian Science Monitor*, August 21, 1974).

3. World-wide steel shortage caused by the lack of finishing and rolling mills, heat-treatment facilities, coal and other items. Steel shortages have caused delays in the supply of steel plate, derricks, masts, castings, drilling pipe, bearings, and so on. A spokesman for Youngstown Steel recently cited forecasts projecting a continuation of the shortage through the rest of the decade.¹³

4. Indecision over the level of OCS leasing. A spokesman for the Exxon Corporation has said that the oil industry can handle the proposed 10 million acre per year expansion if expansion is pursued without interruption.¹⁴ Other organizations seriously doubt that with the present material shortages and projected delays in rig and platform deliveries, leasing 10 million acres per year is a realistic figure. With fewer than 60 big mobile rigs stationed in the Gulf industry observers estimate that the already large backlog of undrilled properties will increase dramatically. The result would be a slowdown in oil and gas development.

5. Stockpiling by major drilling contractors has contributed to the present shortages of tubular goods, and has delayed delivery time of drilling rigs and platforms. Fears of further inflation and growing shortages has caused inventory demand to rise to 1.1-1.5 million tons (more than half the yearly production of oil-country goods in the United States), according to one source.¹⁵

Government sources have indicated that inventory stockpiling is expected to slow down significantly in the near future.¹⁶

However, a shortage of deep-water drilling equipment, as well as the trained manpower to run them, could pose a serious problem in exploring and developing offshore plats.¹⁷

¹³ *The Oil and Gas Journal*, May 6, 1974, p. 110.

¹⁴ *National Journal Reports*, April 20, 1974, p. 569.

¹⁵ *The Oil and Gas Journal*, May 6, 1974, p. 110.

¹⁶ *The Oil and Gas Journal*, August 5, 1974, p. 54.

¹⁷ *Christian Science Monitor*, op. cit.

APPENDIXES

A. OCS LANDS ACT OF 1953

(Public Law 212, Aug. 7, 1953, 67 Stat. 462, 43 U.S.C. 1331 et. seq.)

AN ACT to provide for the jurisdiction of the United States over the submerged lands of the outer Continental Shelf, and to authorize the Secretary of the Interior to lease such lands for certain purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Outer Continental Shelf Lands Act."

Sec. 2. Definitions.—When used in this Act—

(a) The term "outer Continental Shelf" means all submerged lands lying seaward and outside of the area of lands beneath navigable waters as defined in section 2 of the Submerged Lands Act (Public Law 31, Eighty-third Congress, first session), and of which the subsoil and seabed appertain to the United States and are subject to its jurisdiction and control;

(b) The term "Secretary" means the Secretary of the Interior;

(c) The term "mineral lease" means any form of authorization for the exploration for, or development or removal of deposits of, oil, gas, or other minerals; and

(d) The term "person" includes, in addition to a natural person, an association, a State, a political subdivision of a State, or a private, public, or municipal corporation.

Sec. 3. Jurisdiction Over Outer Continental Shelf.—(a) It is hereby declared to be the policy of the United States that the subsoil and seabed of the outer Continental Shelf appertain to the United States and are subject to its jurisdiction, control, and power of disposition as provided in this Act.

(b) This Act shall be construed in such manner that the character as high seas of the waters above the outer Continental Shelf and the right to navigation and fishing therein shall not be affected.

Sec. 4. Laws Applicable to Outer Continental Shelf.—(a) (1) The Constitution and laws and civil and political jurisdiction of the United States are hereby extended to the subsoil and seabed of the outer Continental Shelf and to all artificial island and fixed structures which may be erected thereon for the purpose of exploring for, developing, removing, and transporting resources therefrom, to the same extent as if the outer Continental Shelf were an area of exclusive Federal jurisdiction located within a State: *Provided, however, That mineral leases on the outer Continental Shelf shall be maintained or issued only under the provisions of this Act.*

(2) To the extent that they are applicable and not inconsistent with this Act or with other Federal laws and regulations of the Secretary now in effect or hereafter adopted, the civil and criminal laws of

such adjacent State as of the effective date of this Act are hereby declared to be the law of the United States for that portion of the subsoil and seabed of the outer Continental Shelf, and artificial islands and fixed structures erected thereon, which would be within the area of the State if its boundaries were extended seaward to the outer margin of the outer Continental Shelf, and the President shall determine and publish in the Federal Register such projected lines extending seaward and defining each such area. All of such applicable laws shall be administered and enforced by the appropriate officers and courts of the United States. State taxation laws shall not apply to the outer Continental Shelf.

(3) The provisions of this section for adoption of State law as the law of the United States shall never be interpreted as a basis for claiming any interest in or jurisdiction on behalf of any State for any purpose over the seabed and subsoil of the outer Continental Shelf, or the property and natural resources thereof or the revenues therefrom.

(b) The United States district courts shall have original jurisdiction of cases and controversies arising out of or in connection with any operations conducted on the outer Continental Shelf for the purpose of natural resources, or involving rights to the natural resources of the exploring for, developing, removing or transporting by pipeline the subsoil and seabed of the outer Continental Shelf, and proceedings with respect to any such case or controversy may be instituted in the judicial district in which any defendant resides or may be found, or in the judicial district of the adjacent State nearest where the cause of action arose.

(c) With respect to disability or death of any employee resulting from any injury occurring as the result of operations described in subsection (b), compensation shall be payable under the provisions of the Longshoremen's and Harbor Workers' Compensation Act. For the purposes of the extension of the provisions of the Longshoremen's and Harbor Workers Compensation Act under this section—

1. The term "employee" does not include a master or member of a crew of any vessel, or an officer or employee of the United States or any agency thereof or of any State or foreign government, or of any political subdivision thereof;
2. The term "employer" means an employer any of whose employees are employed in such operations; and
3. The term "United States" when used in a geographical sense includes the outer Continental Shelf and artificial islands and fixed structures thereon.

(d) For the purposes of the National Labor Relations Act, as amended, any unfair labor practice, as defined in such Act, occurring upon any artificial island or fixed structure referred to in subsection (a) shall be deemed to have occurred within the judicial district of the adjacent State nearest the place of location of such island or structure.

(e)(1) The head of the Department in which Coast Guard is operating shall have authority to promulgate and enforce such reasonable regulations with respect to lights and other warning devices, safety equipment, and other matters relating to the promotion of safety of life and property on the islands and structures referred to in subsection (a) or on the waters adjacent thereto, as he may deem necessary.

(2) The head of the Department in which the Coast Guard is operating may mark for the protection of navigation any such island or structure whenever the owner has failed suitably to mark the same in accordance with regulations issued hereunder, and the owner shall pay the cost thereof. Any person, firm, company, or corporation who shall fail or refuse to obey any of the lawful rules and regulations issued hereunder shall be guilty of a misdemeanor and shall be fined not more than \$100 for each offense. Each day during which such violation shall continue shall be considered a new offense.

(f) The authority of the Secretary of the Army to prevent obstruction to navigation in the navigable waters of the United States is hereby extended to artificial islands and fixed structures located on the outer Continental Shelf.

(g) The specific application by this section of certain provisions of law to the subsoil and seabed of the outer Continental Shelf and the artificial islands and fixed structures referred to in subsection (a) or to acts or offenses occurring or committed thereon shall not give rise to any inference that the application to such islands and structures, acts, or offenses of any other provision of law is not intended.

Sec. 5. Administration of Leasing of the Outer Continental Shelf.—(a) (1) The Secretary shall administer the provisions of this Act relating to the leasing of the outer Continental Shelf, and shall prescribe such rules and regulations as may be necessary to carry out such provisions. The Secretary may at any time prescribe and amend such rules and regulations as he determines to be necessary and proper in order to provide for the prevention of waste and conservation of the natural resources of the outer Continental Shelf, and the protection of correlative rights therein, and, notwithstanding any other provisions herein, such rules and regulations shall apply to all operations conducted under a lease issued or maintained under the provisions of this Act. In the enforcement of conservation laws, rules, and regulations the Secretary is authorized to cooperate with the conservation agencies of the adjacent States. Without limiting the generality of the foregoing provisions of this section, the rules and regulations prescribed by the Secretary thereunder may provide for the assignment or relinquishment of leases, for the sale of royalty oil and gas accruing or reserved to the United States at not less than market value, and, in the interest of conservation, for unitization, pooling, drilling agreements, suspension of operations or production, reduction of rentals or royalties, compensatory royalty agreements, subsurface storage of oil or gas in any of said submerged lands, and drilling or other easements necessary for operations or production.

(2) Any person who knowingly and willfully violates any rule or regulation prescribed by the Secretary for the prevention of waste, the conservation of the natural resources, or the protection of correlative rights shall be deemed guilty of a misdemeanor and punishable by a fine of not more than \$2,000 or by imprisonment for not more than six months, or by both such fine and imprisonment, and each day of violation shall be deemed to be a separate offense. The issuance and continuance in effect of any lease, or of any extension, renewal, or replacement of any lease under the provisions of this Act shall be conditioned upon compliance with the regulations issued under this Act and in force and effect on the date of the issuance of the lease if the

lease is issued under the provisions of section 8 hereof, or with the regulations issued under the provisions of section 6(b), clause (2), hereof if the lease is maintained under the provisions of section 6 hereof.

(b) (1) Whenever the owner of a nonproducing lease fails to comply with any of the provisions of this Act, or of the lease, or of the regulations issued under this Act and in force and effect on the date of the issuance of the lease if the lease is issued under the provisions of section 8 hereof, or of the regulations issued under the provisions of section 6(b), clause (2), hereof, if the lease is maintained under the provisions of section 6 hereof, such lease may be canceled by the Secretary, subject to the right of judicial review as provided in section 8(j), if such default continues for the period of thirty days after mailing of notice by registered letter to the lease owner at his record post office address.

(2) Whenever the owner of any producing lease fails to comply with any of the provisions of this Act, or of the lease, or of the regulations issued under this Act and in force and effect on the date of the issuance of the lease if the lease is issued under the provisions of section 8 hereof, or of the regulations issued under provisions of section 6(b), clause (2), hereof, if the lease is maintained under the provisions of section 6 hereof, such lease may be forfeited and canceled by an appropriate proceeding in any United States district court having jurisdiction under the provisions of section 4(b) of this Act.

(c) Rights-of-way through the submerged lands of the outer Continental Shelf, whether or not such lands are included in a lease maintained or issued pursuant to this Act, may be granted by the Secretary for pipeline purposes for the transportation of oil, natural gas, sulphur, or other mineral under such regulations and upon such conditions as to the application therefor and the survey, location and width thereof as may be prescribed by the Secretary, and upon the express condition that such oil or gas pipelines shall transport or purchase without discrimination, oil or natural gas produced from said submerged lands in the vicinity of the pipeline in such proportionate amounts as the Federal Power Commission, in the case of gas, and the Interstate Commerce Commission, in the case of oil, may, after a full hearing with due notice thereof to the interested parties, determine to be reasonable, taking into account, among other things, conservation and the prevention of waste. Failure to comply with the provisions of this section or the regulations and conditions prescribed thereunder shall be ground for forfeiture of the grant in an appropriate judicial proceeding instituted by the United States in any United States district court having jurisdiction under the provisions of section 4(b) of this Act.

Sec. 6. Maintenance of Leases on Outer Continental Shelf.—(a) The provisions of this section shall apply to any mineral lease covering submerged lands of the outer Continental Shelf issued by any State (including any extension, renewal, or replacement thereof heretofore granted pursuant to such lease or under the laws of such State) if—

1. Such lease, or a true copy thereof, is filed with the Secretary by the lessee or his duly authorized agent within ninety days from the effective date of this Act, or within such further

- period or periods as provided in section 7 hereof or as may be fixed from time to time by the Secretary ;
2. Such lease was issued prior to December 21, 1948, and would have been on June 5, 1950, in force and effect in accordance with its terms and provisions and the law of the State issuing it had the State had authority to issue such lease ;
 3. There is filed with the Secretary, within the period or periods specified in paragraph (1) of this subsection, (A) a certificate issued by the State official or agency having jurisdiction over such lease stating that it would have been in force and effect as required by the provisions of paragraph (2) of this subsection, or (B) in the absence of such certificate, evidence in the form of affidavits, receipts, canceled checks, or other documents that may be required by the Secretary, sufficient to prove that such lease would have been so in force and effect ;
 4. Except as otherwise provided in section 7 hereof, all rents, royalties, and other sums payable under such lease between June 5, 1950, and the effective date of this Act, which have not been paid in accordance with the provisions thereof, or to the Secretary or to the Secretary of the Navy, are paid to the Secretary within the period or periods specified in paragraph (1) of this subsection and all rents, royalties, and other sums payable under such lease after the effective date of this Act, are paid to the Secretary, who shall deposit such payments in the Treasury in accordance with section 9 of this Act ;
 5. The holder of such lease certifies that such lease shall continue to be subject to the overriding royalty obligations existing on the effective date of this Act ;
 6. Such lease was not obtained by fraud or misrepresentation ;
 7. Such lease, if issued on or after June 23, 1947, was issued upon the basis of competitive bidding ;
 8. Such lease provides for a royalty to the lessor on oil and gas of not less than 12½ per centum and on sulphur of not less than 5 per centum in amount or value of the production saved, removed, or sold from the lease, or, in any case in which the lease provides for a lesser royalty, the holder thereof consents in writing, filed with the Secretary, to the increase of the of the royalty to the minimum herein specified ;
 9. The holder thereof pays to the Secretary within the period or periods specified in paragraph (1) of this subsection an amount equivalent to any severance, gross production, or occupation taxes imposed by the State issuing the lease on the production from the lease, less the State's royalty interest in such production, between June 5, 1950, and the effective date of this Act and not heretofore paid to the State, and thereafter pays to the Secretary as an additional royalty on the production from the lease, less the United States' royalty interest in such production, a sum of money equal to the amount of the severance, gross production, or occupation taxes which would have been payable on such production to the State issuing the lease under its laws as they existed on the effective date of this Act ;

10. Such lease will terminate within a period of not more than five years from the effective date of this Act in the absence of production or operations for drilling, or, in any case in which the lease provides for a longer period, the holder thereof consents in writing, filed with the Secretary, to the reduction of such period so that it will not exceed the maximum period herein specified; and
11. The holder of such lease furnishes such surety bond, if any, as the Secretary may require and complies with such other reasonable requirements as the Secretary may deem necessary to protect the interests of the United States.

(b) Any person holding a mineral lease, which as determined by the Secretary meets the requirements of subsection (a) of this section, may continue to maintain such lease, and may conduct operations thereunder, in accordance with (1) its provisions as to the area, the minerals covered, rentals and, subject to the provisions of paragraphs (8), (9) and (10) of subsection (a) of this section, as to royalties and as to the term thereof and of any extensions, renewals, or replacements authorized therein or heretofore authorized by the laws of the State issuing such lease, or, if oil or gas was not being produced in paying quantities from such lease on or before December 11, 1950, or if production in paying quantities has ceased since June 5, 1950, or if the primary term of such lease has expired since December 11, 1950, then for a term from the effective date hereof equal to the term remaining unexpired on December 11, 1950, under the provisions of such lease or any extensions, renewals, or replacements authorized therein, or heretofore authorized by the laws of such State, and (2) such regulations as the Secretary may under section 5 of this Act prescribe within ninety days after making his determination that such lease meets the requirements of subsection (a) of this section: *Provided, however,* That any rights to sulphur under any lease maintained under the provisions of this subsection shall not extend beyond the primary term of such lease or any extension thereof under the provisions of such subsection (b) unless sulphur is being produced in paying quantities or drilling, well reworking, plant construction, or other operations for the production of sulphur, as approved by the Secretary, are being conducted on the area covered by such lease on the date of expiration of such primary term or extension: *Provided further,* That if sulphur is being produced in paying quantities on such date, then such rights shall continue to be maintained in accordance with such lease and the provisions of this Act: *Provided further,* That, if the primary term of a lease being maintained under subsection (b) hereof has expired prior to the effective date of this Act and oil or gas is being produced in paying quantities on such date, then such rights to sulphur as the lessee may have under such lease shall continue for twenty-four months from the effective date of this Act and as long thereafter as sulphur is produced in paying quantities, or drilling, well working, plant construction, or other operations for the production of sulphur, as approved by the Secretary, are being conducted on the area covered by the lease.

(c) The permission granted in subsection (b) of this section shall not be construed to be a waiver of such claims, if any, as the United States may have against the lessor or the lessee or any other person

respecting sums payable or paid for or under the lease, or respecting activities conducted under the lease, prior to the effective date of this Act.

(d) Any person complaining of a negative determination by the Secretary of the Interior under this section may have such determination reviewed by the United States District Court for the District of Columbia by filing a petition for review within sixty days after receiving notice of such action by the Secretary.

(e) In the event any lease maintained under this section covers lands beneath navigable waters, as that term is used in the Submerged Lands Act, as well as lands of the outer Continental Shelf, the provisions of this section shall apply to such lease only insofar as it covers lands of the outer Continental Shelf.

Sec. 7. Controversy Over Jurisdiction.—In the event of a controversy between the United States and a State as to whether or not lands are subject to the provisions of this Act, the Secretary is authorized, notwithstanding the provisions of subsections (a) and (b) of section 6 of this Act, and with the concurrence of the Attorney General of the United States, to negotiate and enter into agreements with the State, its political subdivision or grantee or a lessee thereof, respecting operations under existing mineral leases and payment and impounding of rents, royalties, and other sums payable thereunder, or with the State, its political subdivision or grantee, respecting the issuance or nonissuance of new mineral leases pending the settlement or adjudication of the controversy. The authorization contained in the preceding sentence of this section shall not be construed to be a limitation upon the authority conferred on the Secretary in other sections of this Act. Payments made pursuant to such agreement, or pursuant to any stipulation between the United States and a State, shall be considered as compliance with section 6 (a) (4) hereof. Upon the termination of such agreement or stipulation by reason of the final settlement or adjudication of such controversy, if the lands subject to any mineral lease are determined to be in whole or in part lands subject to the provisions of this Act, the lessee, if he has not already done so, shall comply with the requirements of section 6 (a), and thereupon the provisions of section 6 (b) shall govern such lease. The notice concerning "Oil and Gas Operations in the Submerged Coastal Lands of the Gulf of Mexico" issued by the Secretary on December 11, 1950 (15 F. R. 8835), as amended by the notice dated January 26 1951 (16 F. R. 953), and as supplemented by the notices dated February 2, 1951 (16 F. R. 1203), March 5, 1951 (16 F. R. 2195), April 23, 1951 (16 F. R. 3623), June 25, 1951 (16 F. R. 6404), August 22, 1951 (16 F. R. 8720), October 24, 1951 (16 F. R. 10998), December 21, 1951 (17 F. R. 43), March 25, 1952 (17 F. R. 2821), June 26, 1952 (17 F. R. 5833), and December 24, 1952 (18 F. R. 48), respectively, is hereby approved and confirmed.

Sec. 8. Leasing of Outer Continental Shelf.—(a) In order to meet the urgent need for further exploration and development of the oil and gas deposits of the submerged lands of the outer Continental Shelf, the Secretary is authorized to grant to the highest responsible qualified bidder by competitive bidding under regulations promulgated in advance, oil and gas leases on submerged lands of the outer Continental Shelf which are not covered by leases meeting the requirements of subsection (a) of section 6 of this Act. The bidding shall be (1) by sealed

bids, and (2) at the discretion of the Secretary, on the basis of a cash bonus with a royalty fixed by the Secretary at not less than 12½ per centum in amount or value of the production saved, removed or sold, or on the basis of royalty, but at not less than the per centum above mentioned, with a cash bonus fixed by the Secretary.

(b) An oil and gas lease issued by the Secretary pursuant to this section shall (1) cover a compact area not exceeding five thousand seven hundred and sixty acres, as the Secretary may determine, (2) be for a period of five years and as long thereafter as oil or gas may be produced from the area in paying quantities, or drilling or well reworking operations as approved by the Secretary are conducted thereon, (3) require the payment of a royalty of not less than 12½ per centum, in the amount or value of the production saved, removed, or sold from the lease, and (4) contain such rental provisions and such other terms and provisions as the Secretary may prescribe at the time of offering the area for lease.

(c) In order to meet the urgent need for further exploration and development of the sulphur deposits in the submerged lands of the outer Continental Shelf, the Secretary is authorized to grant to the qualified persons offering the highest cash bonuses on a basis of competitive bidding sulphur leases on submerged lands of the outer Continental Shelf, which are not covered by leases which include sulphur and meet the requirements of subsection (a) of section 6 of this Act, and which sulphur leases shall be offered for bid by sealed bids and granted on separate leases from oil and gas leases, and for a separate consideration, and without priority or preference accorded to oil and gas lessees on the same area.

(d) A sulphur lease issued by the Secretary pursuant to this section shall (1) cover an area of such size and dimensions as the Secretary may determine, (2) be for a period of not more than ten years and so long thereafter as sulphur may be produced from the area in paying quantities or drilling, well reworking, plant construction, or other operations of the production of sulphur, as approved by the Secretary, are conducted thereon, (3) require the payment to the United States of such royalty as may be specified in the lease but not less than 5 per centum of the gross production or value of the sulphur at the well-head, and (4) contain such rental provisions and such other terms and provisions as the Secretary may by regulation prescribe at the time of offering the area for lease.

(e) The Secretary is authorized to grant to the qualified persons offering the highest cash bonuses on a basis of competitive bidding leases of any mineral other than oil, gas and sulphur in any area of the outer Continental Shelf not then under lease for such mineral upon such royalty, rental, and other terms and conditions as the Secretary may prescribe at the time of offering the area for lease.

(f) Notice of sale of leases, and the terms of bidding, authorized by this section shall be published at least thirty days before the date of sale in accordance with rules and regulations promulgated by the Secretary.

(g) All moneys paid to the Secretary for or under leases granted pursuant to this section shall be deposited in the Treasury in accordance with section 9 of this Act.

(h) The issuance of any lease by the Secretary pursuant to this Act, or the making of any interim arrangements by the Secretary pursuant

to section 7 of this Act shall not prejudice the ultimate settlement or adjudication of the question as to whether or not the area involved is in the outer Continental Shelf.

(i) The Secretary may cancel any lease obtained by fraud or misrepresentation.

(j) Any person complaining of a cancellation of a lease by the Secretary may have the Secretary's action reviewed in the United States District Court for the District of Columbia by filing a petition for review within sixty days after the Secretary takes such action.

Sec. 9. Disposition of Revenues.—All rentals, royalties, and other sums paid to the Secretary or the Secretary of the Navy under any lease on the outer Continental Shelf for the period from June 5, 1950, to date, and thereafter shall be deposited in the Treasury of the United States and credited to miscellaneous receipts.

Sec. 10. Refunds.—(a) Subject to the provisions of subsection (b) hereof, when it appears to the satisfaction of the Secretary that any person has made a payment to the United States in connection with any lease under this Act in excess of the amount he was lawfully required to pay, such excess shall be repaid without interest to such person or his legal representative, if a request for repayment of such excess is filed with the Secretary within two years after the making of the payment, or within ninety days after the effective date of this Act. The Secretary shall certify the amounts of all such repayments to the Secretary of the Treasury, who is authorized and directed to make such repayments out of any money in the special account established under section 9 of this Act and to issue his warrant in settlement thereof.

(b) No refund of or credit for such excess payment shall be made until after the expiration of thirty days from the date upon which a report giving the name of the person to whom the refund or credit is to be made, the amount of such refund or credit, and a summary of the facts upon which the determination of the Secretary was made is submitted to the President of the Senate and the Speaker of the House of Representatives for transmittal to the appropriate legislative committee of each body, respectively: *Provided*, That if the Congress shall not be in session on the date of such submission or shall adjourn prior to the expiration of thirty days from the date of such submission, then such payment or credit shall not be made until thirty days after the opening day of the next succeeding session of Congress.

Sec. 11. Geological and Geophysical Explorations.—Any agency of the United States and any person authorized by the Secretary may conduct geological and geophysical explorations in the outer Continental Shelf, which do not interfere with or endanger actual operations under any lease maintained or granted pursuant to this Act, and which are not unduly harmful to aquatic life in such area.

Sec. 12. Reservations.—(a) The President of the United States may, from time to time, withdraw from disposition any of the unleased lands of the outer Continental Shelf.

(b) In time of war, or when the President shall so prescribe, the United States shall have the right of first refusal to purchase at the market price all or any portion of any mineral produced from the outer Continental Shelf.

(c) All leases issued under this Act, and leases the maintenance and operation of which are authorized under this Act, shall contain or be

construed to contain a provision whereby authority is vested in the Secretary, upon a recommendation of the Secretary of Defense, during a state of war or national emergency declared by the Congress or the President of the United States after the effective date of this Act, to suspend operations under any lease; and all such leases shall contain or be construed to contain provisions for the payment of just compensation to the lessee whose operations are thus suspended.

(d) The United States reserves and retains the right to designate by and through the Secretary of Defense, with the approval of the President, as areas restricted from exploration and operation that part of the outer Continental Shelf needed for national defense; and so long as such designation remains in effect no exploration or operations may be conducted on any part of the surface of such area except with the concurrence of the Secretary of Defense; and if operations or production under any lease theretofore issued on lands within any such restricted area shall be suspended, any payment of rentals, minimum royalty, and royalty prescribed by such lease likewise shall be suspended during such period of suspension of operation and production, and the term of such lease shall be extended by adding thereto any such suspension period, and the United States shall be liable to the lessee for compensation as is required to be paid under the Constitution of the United States.

(e) All uranium, thorium, and all other materials determined pursuant to paragraph (1) of subsection (b) of section 5 of the Atomic Energy Act of 1946, as amended, to be peculiarly essential to the production of fissionable material, contained, in whatever concentration, in deposits in the subsoil or seabed of the outer Continental Shelf are hereby reserved for the use of the United States.

(f) The United States reserves and retains the ownership of and the right to extract all helium, under such rules and regulations as shall be prescribed by the Secretary, contained in gas produced from any portion of the outer Continental Shelf which may be subject to any lease maintained or granted pursuant to this Act, but the helium shall be extracted from such gas as to cause no substantial delay in the delivery of gas produced to the purchaser of such gas.

Sec. 13. Naval Petroleum Reserve Executive Order Repealed.—Executive Order Numbered 10426, dated January 16, 1953, entitled "Setting Aside Submerged Lands of the Continental Shelf as a Naval Petroleum Reserve," is hereby revoked.

Sec. 14. Prior Claims Not Affected.—Nothing herein contained shall affect such rights, if any, as may have been acquired under any law of the United States by any person in lands subject to this Act and such rights, if any, shall be governed by the law in effect at the time they may have been acquired: *Provided, however,* That nothing herein contained is intended or shall be construed as a finding, interpretation, or construction by the Congress that the law under which such rights may be claimed in fact applies to the lands subject to this Act or authorizes or compels the granting of such rights in such lands, and that the determination of the applicability or effect of such law shall be unaffected by anything herein contained.

Sec. 15. Report by Secretary.—As soon as practicable after the end of each fiscal year, the Secretary shall submit to the President of the Senate and the Speaker of the House of Representatives a report

detailing the amounts of all moneys received and expended in connection with the administration of this Act during the preceding fiscal year.

Sec. 16. Appropriations.—There is hereby authorized to be appropriated such sums as may be necessary to carry out the provisions of this Act.

Sec. 17. Separability.—If any provision of this Act, or any section, subsection, sentence, clause, phrase or individual word, or the application thereof to any person or circumstance is held invalid, the validity of the remainder of the Act and of the application of any such provision, section, subsection, sentence, clause, phrase or individual word to other persons and circumstances shall not be affected thereby.

Approved August 7, 1953.

B. COASTAL ZONE MANAGEMENT ACT OF 1972

(P.L. 92-583, 86 Stat. 1281, 10 U.S.C. 1451 *et. seq.*)

AN ACT To establish a national policy and develop a national program for the management, beneficial use, protection, and development of the land and water resources of the Nation's coastal zones, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act entitled "An Act to provide for a comprehensive, long-range, and coordinated national program in marine science, to establish a National Council on Marine Resources and Engineering Development, and a Commission on Marine Science, Engineering and Resources, and for other purposes", approved June 17, 1966 (80 Stat. 203), as amended (33 U.S.C. 1101-1124), is further amended by adding at the end thereof the following new title:

TITLE III—MANAGEMENT OF THE COASTAL ZONE

SHORT TITLE

SEC. 301. This title may be cited as the "Coastal Zone Management Act of 1972".

CONGRESSIONAL FINDINGS

SEC. 302. The Congress finds that—

(a) There is a national interest in the effective management, beneficial use, protection, and development of the coastal zone;

(b) The coastal zone is rich in a variety of natural, commercial, recreational, industrial, and esthetic resources of immediate and potential value to the present and future well-being of the Nation;

(c) The increasing and competing demands upon the lands and waters of our coastal zone occasioned by population growth and economic development, including requirements for industry, commerce, residential development, recreation, extraction of mineral resources and fossil fuels, transportation and navigation, waste disposal, and harvesting of fish, shellfish, and other living marine resources, have resulted in the loss of living marine resources, wildlife, nutrient-rich areas, permanent and adverse changes to ecological systems, decreasing open space for public use, and shoreline erosion;

(d) The coastal zone, and the fish, shellfish, other living marine resources, and wildlife therein, are ecologically fragile and consequently extremely vulnerable to destruction by man's alterations;

(e) Important ecological, cultural, historic, and esthetic values in the coastal zone which are essential to the well-being of all citizens are being irretrievably damaged or lost;

(f) Special natural and scenic characteristics are being damaged by ill-planned development that threatens these values;

(g) In light of competing demands and the urgent need to protect and to give high priority to natural systems in the coastal one, present state and local institutional arrangements for planning and regulating land and water uses in such areas are inadequate; and

(h) The key to more effective protection and use of the land and water resources of the coastal zone is to encourage the states to exercise their full authority over the lands and waters in the coastal zone by assisting the states, in cooperation with Federal and local governments and other vitally affected interests, in developing land and water use programs for the coastal zone, including unified policies, criteria, standards, methods, and processes for dealing with land and water use decisions of more than local significance.

DECLARATION OF POLICY

SEC. 303. The Congress finds and declares that it is the national policy (a) to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations, (b) to encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone giving full consideration to ecological, cultural, historic, and esthetic values as well as to needs for economic development, (c) for all Federal agencies engaged in programs affecting the coastal zone to cooperate and participate with state and local governments and regional agencies in effectuating the purposes of this title, and (d) to encourage the participation of the public, of Federal, state, and local governments and of regional agencies in the development of coastal zone management programs. With respect to implementation of such management programs, it is the national policy to encourage cooperation among the various state and regional agencies including establishment of interstate and regional agreements, cooperative procedures, and joint action particularly regarding environmental problems.

DEFINITIONS

SEC. 304. For the purposes of this title—

(a) "Coastal zone" means the coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder), strongly influenced by each other and in proximity to the shorelines of the several coastal states, and includes transitional and intertidal areas, salt marshes, wetlands, and beaches. The zone extends, in Great Lakes waters, to the international boundary between the United States and Canada and, in other areas, seaward to the outer limit of the United States territorial sea. The zone extends

inland from the shorelines only to the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters. Excluded from the coastal zone are lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal Government, its officers or agents.

(b) "Coastal waters" means (1) in the Great Lakes area, the waters within the territorial jurisdiction of the United States consisting of the Great Lakes, their connecting waters, harbors, roadsteads, and estuary-type areas such as bays, shallows, and marshes and (2) in other areas, those waters, adjacent to the shorelines, which contain a measurable quantity or percentage of sea water, including, but not limited to, sounds, bays, lagoons, bayous, ponds, and estuaries.

(c) "Coastal state" means a state of the United States in, or bordering on, the Atlantic, Pacific, or Arctic Ocean, the Gulf of Mexico, Long Island Sound, or one or more of the Great Lakes. For the purposes of this title, the term also includes Puerto Rico, the Virgin Islands, Guam, and American Samoa.

(d) "Estuary" means that part of a river or stream or other body of water having unimpaired connection with the open sea, where the sea water is measurably diluted with fresh water derived from land drainage. The term includes estuary-type areas of the Great Lakes.

(e) "Estuarine sanctuary" means a research area which may include any part or all of an estuary, adjoining transitional areas, and adjacent uplands, constituting to the extent feasible a natural unit, set aside to provide scientists and students the opportunity to examine over a period of time the ecological relationships within the area.

(f) "Secretary" means the Secretary of Commerce.

(g) "Management program" includes, but is not limited to, a comprehensive statement in words, maps, illustrations, or other media of communication, prepared and adopted by the state in accordance with the provisions of this title, setting forth objectives, policies, and standards to guide public and private uses of lands and waters in the coastal zone.

(h) "Water use" means activities which are conducted in or on the water; but does not mean or include the establishment of any water quality standard or criteria or the regulation of the discharge or runoff of water pollutants except the standards, criteria, or regulations which are incorporated in any program as required by the provisions of section 307 (f).

(i) "Land use" means activities which are conducted in or on the shorelands within the coastal zone, subject to the requirements outlined in section 307 (g).

MANAGEMENT PROGRAM DEVELOPMENT GRANTS

SEC. 305. (a) The Secretary is authorized to make annual grants to any coastal state for the purpose of assisting in the development of a management program for the land and water resources of its coastal zone.

(b) Such management program shall include:

(1) an identification of the boundaries of the coastal zone subject to the management program;

(2) a definition of what shall constitute permissible land and water uses within the coastal zone which have a direct and significant impact on the coastal waters;

(3) an inventory and designation of areas of particular concern within the coastal zone;

(4) an identification of the means by which the state purposes to exert control over the land and water uses referred to in paragraph (2) of this subsection, including a listing of relevant constitutional provisions, legislative enactments, regulations, and judicial decisions;

(5) broad guidelines on priority of uses in particular areas, including specifically those uses of lowest priority;

(6) a description of the organizational structure proposed to implement the management program, including the responsibilities and interrelationships of local, areawide, state, regional, and interstate agencies in the management process.

(c) The grants shall not exceed 66⅔ per centum of the costs of the program in any one year and no state shall be eligible to receive more than three annual grants pursuant to this section. Federal funds received from other sources shall not be used to match such grants. In order to qualify for grants under this section, the state must reasonably demonstrate to the satisfaction of the Secretary that such grants will be used to develop a management program consistent with the requirements set forth in section 306 of this title. After making the initial grant to a coastal state, no subsequent grant shall be made under this section unless the Secretary finds that the state is satisfactorily developing such management program.

(d) Upon completion of the development of the state's management program, the state shall submit such program to the Secretary for review and approval pursuant to the provisions of section 306 of this title, or such other action as he deems necessary. On final approval of such program by the Secretary, the state's eligibility for further grants under this section shall terminate, and the state shall be eligible for grants under section 306 of this title.

(e) Grants under this section shall be allocated to the states based on rules and regulations promulgated by the Secretary: *Provided, however,* That no management program development grant under this section shall be made in excess of 10 per centum nor less than 1 per centum of the total amount appropriated to carry out the purposes of this section.

(f) Grants or portions thereof not obligated by a state during the fiscal year for which they were first authorized to be obligated by the state, or during the fiscal year immediately following, shall revert to the Secretary, and shall be added by him to the funds available for grants under this section.

(g) With an approval of the Secretary, the state may allocate to a local government, to an areawide agency designated under section 204 of the Demonstration Cities and Metropolitan Development Act of 1966, to a regional agency, or to an interstate agency, a portion of the grant under this section, for the purpose of carrying out the provisions of this section.

(h) The authority to make grants under this section shall expire on June 30, 1977.

ADMINISTRATIVE GRANTS

SEC. 306. (a) The Secretary is authorized to make annual grants to any coastal state for not more than 66 $\frac{2}{3}$ per centum of the costs of administering the state's management program, if he approves such program in accordance with subsection (c) hereof. Federal funds received from other sources shall not be used to pay the state's share of costs.

(b) Such grants shall be allocated to the states with approved programs based on rules and regulations promulgated by the Secretary which shall take into account the extent and nature of the shoreline and area covered by the plan, population of the area, and other relevant factors: *Provided, however,* That no annual administrative grant under this section shall be made in excess of 10 per centum nor less than 1 per centum of the total amount appropriated to carry out the purposes of this section.

(c) Prior to granting approval of a management program submitted by a coastal state, the Secretary shall find that:

(1) The state has developed and adopted a management program for its coastal zone in accordance with rules and regulations promulgated by the Secretary, after notice, and with the opportunity of full participation by relevant Federal agencies, state agencies, local governments, regional organizations, port authorities, and other interested parties, public and private, which is adequate to carry out the purposes of this title and is consistent with the policy declared in section 303 of this title.

(2) The state has:

(A) coordinated its program with local, areawide, and interstate plans applicable to areas within the coastal zone existing on January 1 of the year in which the state's management program is submitted to the Secretary, which plans have been developed by a local government, an areawide agency designated pursuant to regulations established under section 204 of the Demonstration Cities and Metropolitan Development Act of 1966, a regional agency, or an interstate agency; and

(B) established an effective mechanism for continuing consultation and coordination between the management agency designated pursuant to paragraph (5) of this subsection and with local governments, interstate agencies, regional agencies, and areawide agencies within the coastal zone to assure the full participation of such local governments and agencies in carrying out the purposes of this title.

(3) The state has held public hearings in the development of the management program.

(4) The management program and any changes thereto have been reviewed and approved by the Governor.

(5) The Governor of the state has designated a single agency to receive and administer the grants for implementing the management program required under paragraph (1) of this subsection.

(6) The state is organized to implement the management program required under paragraph (1) of this subsection.

(7) The state has the authorities necessary to implement the program, including the authority required under subsection (d) of this section.

(8) The management program provides for adequate consideration of the national interest involved in the siting of facilities necessary to meet requirements which are other than local in nature.

(9) The management program makes provision for procedures whereby specific areas may be designated for the purpose of preserving or restoring them for their conservation, recreational, ecological, or esthetic values.

(d) Prior to granting approval of the management program, the Secretary shall find that the state, acting through its chosen agency or agencies, including local governments, areawide agencies designated under section 204 of the Demonstration Cities and Metropolitan Development Act of 1966, regional agencies, or interstate agencies, has authority for the management of the coastal zone in accordance with the management program. Such authority shall include power—

(1) to administer land and water use regulations, control development in order to ensure compliance with the management program, and to resolve conflicts among competing uses; and

(2) to acquire fee simple and less than fee simple interests in lands, waters, and other property through condemnation or other means when necessary to achieve conformance with the management program.

(e) Prior to granting approval, the Secretary shall also find that the program provides:

(1) for any one or a combination of the following general techniques for control of land and water uses within the coastal zone:

(A) State establishment of criteria and standards for local implementation, subject to administrative review and enforcement of compliance;

(B) Direct state land and water use planning and regulation; or

(C) State administrative review for consistency with the management program of all development plans, projects, or land and water use regulations, including exceptions and variances thereto, proposed by any state or local authority or private developer, with power to approve or disapprove after public notice and an opportunity for hearings.

(2) for a method of assuring that local land and water use regulations within the coastal zone do not unreasonably restrict or exclude land and water uses of regional benefit.

(f) With the approval of the Secretary, a state may allocate to a local government, an areawide agency designated under section 204 of the Demonstration Cities and Metropolitan Development Act of 1966, a regional agency, or an interstate agency, a portion of the grant under this section for the purpose of carrying out the provisions of this section: *Provided*, That such allocation shall not relieve the state of the responsibility for ensuring that any funds so allocated are applied in furtherance of such state's approved management program.

(g) The state shall be authorized to amend the management program. The modification shall be in accordance with the procedures required under subsection (c) of this section. Any amendment or modification of the program must be approved by the Secretary before additional administrative grants are made to the state under the program as amended.

(h) At the discretion of the state and with the approval of the Secretary, a management program may be developed and adopted in segments so that immediate attention may be devoted to those areas within the coastal zone which most urgently need management programs: *Provided*, That the state adequately provides for the ultimate coordination of the various segments of the management program into a single unified program and that the unified program will be completed as soon as is reasonably practicable.

INTERAGENCY COORDINATION AND COOPERATION

SEC. 307. (a) In carrying out his functions and responsibilities under this title, the Secretary shall consult with, cooperate with, and, to the maximum extent practicable, coordinate his activities with other interested Federal agencies.

(b) The Secretary shall not approve the management program submitted by a state pursuant to section 306 unless the views of Federal agencies principally affected by such program have been adequately considered. In case of serious disagreement between any Federal agency and the state in the development of the program the Secretary, in cooperation with the Executive Office of the President, shall seek to mediate the differences.

(c) (1) Each Federal agency conducting or supporting activities directly affecting the coastal zone shall conduct or support those activities in a manner which is, to the maximum extent practicable, consistent with approved state management programs.

(2) Any Federal agency which shall undertake any development project in the coastal zone of a state shall insure that the project is, to the maximum extent practicable, consistent with approved state management programs.

(3) After final approval by the Secretary of a state's management program, any applicant for a required Federal license or permit to conduct an activity affecting land or water uses in the coastal zone of that state shall provide in the application to the licensing or permitting agency a certification that the proposed activity complies with the state's approved program and that such activity will be conducted in a manner consistent with the program. At the same time, the applicant shall furnish to the state or its designated agency a copy of the certification, with all necessary information and data. Each coastal state shall establish procedures for public notice in the case of all such certifications and, to the extent it deems appropriate, procedures for public hearings in connection therewith. At the earliest practicable time, the state or its designated agency shall notify the Federal agency concerned that the state concurs with or objects to the applicant's certification. If the state or its designated agency fails to furnish the required notification within six months after receipt of its copy of the applicant's certification, the state's concurrence with the certification shall be conclusively presumed. No license or permit shall be granted by the Federal agency until the state or its designated agency has concurred with the applicant's certification or until, by the state's failure to act, the concurrence is conclusively presumed, unless the Secretary, on his own initiative or upon appeal by the applicant, finds, after providing a reasonable opportunity for detailed comments from the Federal agency involved and from the state, that the activity is consistent

with the objectives of this title or is otherwise necessary in the interest of national security.

(d) State and local governments submitting applications for Federal assistance under other Federal programs affecting coastal zone shall indicate the views of the appropriate state or local agency as to the relationship of such activities to the approved management program for the coastal zone. Such applications shall be submitted and coordinated in accordance with the provisions of title IV of the Intergovernmental Coordination Act of 1968 (82 Stat. 1098). Federal agencies shall not approve proposed projects that are inconsistent with a coastal state's management program, except upon a finding by the Secretary that such project is consistent with the purposes of this title or necessary in the interest of national security.

(e) Nothing in this title shall be construed—

(1) to diminish either Federal or state jurisdiction, responsibility, or rights in the field of planning, development, or control of water resources, submerged lands, or navigable waters; nor to displace, supersede, limit, or modify any interstate compact or the jurisdiction or responsibility of any legally established joint or common agency of two or more states or of two or more states and the Federal Government; nor to limit the authority of Congress to authorize and fund projects:

(2) as superseding, modifying, or repealing existing laws applicable to the various Federal agencies; nor to affect the jurisdiction, powers, or prerogatives of the International Joint Commission, United States and Canada, the Permanent Engineering Board, and the United States operating entity or entities established pursuant to the Columbia River Basin Treaty, signed at Washington, January 17, 1961, or the International Boundary and Water Commission, United States and Mexico.

(f) Notwithstanding any other provision of this title, nothing in this title shall in any way affect any requirement (1) established by the Federal Water Pollution Control Act, as amended, or the Clean Air Act, as amended, or (2) established by the Federal Government or by any state or local government pursuant to such Acts. Such requirements shall be incorporated in any program developed pursuant to this title and shall be the water pollution control and air pollution control requirements applicable to such program.

(g) When any state's coastal zone management program, submitted for approval or proposed for modification pursuant to section 306 of this title, includes requirements as to shorelands which also would be subject to any Federally supported national land use program which may be hereafter enacted, the Secretary, prior to approving such program, shall obtain the concurrence of the Secretary of the Interior, or such other Federal official as may be designated to administer the national land use program, with respect to the portion of the coastal zone management program affecting such inland areas.

PUBLIC HEARINGS

SEC. 308. All public hearings required under this title must be announced at least thirty days prior to the hearing date. At the time of the announcement, all agency materials pertinent to the hearings,

including documents, studies and other data, must be made available to the public for review and study. As similar materials are subsequently developed, they shall be made available to the public as they become available to the agency.

REVIEW OF PERFORMANCE

SEC. 309. (a) The Secretary shall conduct a continuing review of the management programs of the coastal states and of the performance of each state.

(b) The Secretary shall have the authority to terminate any financial assistance extended under section 306 and to withdraw any unexpended portion of such assistance if (1) he determines that the state is failing to adhere to and is not justified in deviating from the program approved by the Secretary; and (2) the state has been given notice of the proposed termination and withdrawal and given an opportunity to present evidence of adherence or justification for altering its program.

RECORDS

SEC. 310. (a) Each recipient of a grant under this title shall keep such records as the Secretary shall prescribe, including records which fully disclose the amount and disposition of the funds received under the grant, the total cost of the project or undertaking supplied by other sources, and such other records as will facilitate an effective audit.

(b) The Secretary and the Comptroller General of the United States, or any of their duly authorized representatives, shall have access for the purpose of audit and examination to any books, documents, papers, and records of the recipient of the grant that are pertinent to the determination that funds granted are used in accordance with this title.

ADVISORY COMMITTEE

SEC. 311. (a) The Secretary is authorized and directed to establish a Coastal Zone Management Advisory Committee to advise, consult with, and make recommendations to the Secretary on matters of policy concerning the coastal zone. Such committee shall be composed of not more than fifteen persons designated by the Secretary and shall perform such functions and operate in such a manner as the Secretary may direct. The Secretary shall insure that the committee membership as a group possesses a broad range of experience and knowledge relating to problems involving management, use, conservation, protection, and development of coastal zone resources.

(b) Members of the committee who are not regular full-time employees of the United States, while serving on the business of the committee, including traveltime, may receive compensation at rates not exceeding \$100 per diem; and while so serving away from their homes or regular places of business may be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5703 of title 5, United States Code, for individuals in the Government service employed intermittently.

ESTUARINE SANCTUARIES

SEC. 312. The Secretary, in accordance with rules and regulations promulgated by him, is authorized to make available to a coastal state grants of up to 50 per centum of the costs of acquisition, development, and operation of estuarine sanctuaries for the purpose of creating natural field laboratories to gather data and make studies of the natural and human processes occurring within the estuaries of the coastal zone. The Federal share of the cost for each such sanctuary shall not exceed \$2,000,000. No Federal funds received pursuant to section 305 or section 306 shall be used for the purpose of this section.

ANNUAL REPORT

SEC. 313. (a) The Secretary shall prepare and submit to the President for transmittal to the Congress not later than November 1 of each year a report on the administration of this title for the preceding fiscal year. The report shall include but not be restricted to (1) an identification of the state programs approved pursuant to this title during the preceding Federal fiscal year and a description of those programs; (2) a listing of the states participating in the provisions of this title and a description of the status of each state's programs and its accomplishments during the preceding Federal fiscal year; (3) an itemization of the allocation of funds to the various coastal states and a breakdown of the major projects and areas on which these funds were expended; (4) an identification of any state programs which have been reviewed and disapproved or with respect to which grants have been terminated under this title, and a statement of the reasons for such action; (5) a listing of all activities and projects which, pursuant to the provisions of subsection (c) or subsection (d) of section 307, are not consistent with an applicable approved state management program; (6) a summary of the regulations issued by the Secretary or in effect during the preceding Federal fiscal year; (7) a summary of a coordinated national strategy and program for the Nation's coastal zone including identification and discussion of Federal, regional, state, and local responsibilities and functions therein; (8) a summary of outstanding problems arising in the administration of this title in order of priority; and (9) such other information as may be appropriate.

(b) The report required by subsection (a) shall contain such recommendations for additional legislation as the Secretary deems necessary to achieve the objectives of this title and enhance its effective operation.

RULES AND REGULATIONS

SEC. 314. The Secretary shall develop and promulgate, pursuant to section 553 of title 5, United States Code, after notice and opportunity for full participation by relevant Federal agencies, state agencies, local governments, regional organizations, port authorities, and other interested parties, both public and private, such rules and regulations as may be necessary to carry out the provisions of this title.

AUTHORIZATION OF APPROPRIATIONS

SEC. 315. (a) There are authorized to be appropriated—

(1) the sum of \$9,000,000 for the fiscal year ending June 30, 1973, and for each of the fiscal years 1974 through 1977 for grants under section 305, to remain available until expended;

(2) such sums, not to exceed \$30,000,000, for the fiscal year ending June 30, 1974, and for each of the fiscal years 1975 through 1977, as may be necessary, for grants under section 306 to remain available until expended; and

(3) such sums, not to exceed \$6,000,000 for the fiscal year ending June 30, 1974, as may be necessary, for grants under section 312, to remain available until expended.

(b) There are also authorized to be appropriated such sums, not to exceed \$3,000,000, for fiscal year 1973 and for each of the four succeeding fiscal years, as may be necessary for administrative expenses incident to the administration of this title.

Approved October 27, 1972.

C. WITNESS LISTS FROM SENATE HEARINGS ON OCS DEVELOPMENT

SENATE COMMERCE COMMITTEE NATIONAL OCEAN POLICY STUDY WITNESS LIST¹

HEARINGS ON OUTER CONTINENTAL SHELF OIL AND GAS EXTRACTION AND ENVIRONMENTAL, ECONOMIC AND SOCIAL IMPACT UPON THE COASTAL ZONE

Thursday, May 2, 1974, Room 5110, Dirksen Senate Office Building, 10 a.m.

The Honorable Lawrence J. Hogan, U.S. Representative, 5th District of Maryland

The Honorable Robert E. Bauman, U.S. Representative, 1st District of Maryland

Mr. Daniel J. Haughton, Chairman, Lockheed Aircraft Corporation accompanied by Mr. Elmer P. Wheaton, Vice President and General Manager, Research and Development Division, Lockheed Aircraft Corporation

The Honorable Philip H. Hoff, Chairman, American/Canadian Energy Consortium

Mr. Henry W. Wright, Manager, Land and Water Department, Western Oil and Gas Association

Mr. A. P. Jaffe, Vice President, Marketing (SEAL) Subsea Equipment Associates, Ltd., Westinghouse Electric Corporation

Mr. Joseph Foster, Senior Vice President, Exploration Operations, Tenneco Oil Company (Houston, Texas) accompanied by Mr. L. P. Haxby, Manager Environmental Affairs, Shell Oil Company (Houston, Texas)

¹ Not necessarily in order of appearance.

WITNESS LIST ¹HEARINGS ON OUTER CONTINENTAL SHELF OIL AND GAS EXTRACTION
AND ENVIRONMENTAL, ECONOMIC AND SOCIAL IMPACT UPON THE COASTAL
ZONE

Wednesday, May 22, 1974, Room 5110, Dirksen Senate Office Building, 10 a.m.

The Honorable Michael Harrington, U.S. Representative, 6th District of Massachusetts

Mr. Thomas Stoel, Attorney at law, Natural Resources Defense Council and Mr. Leonard Mecker, Attorney at law, Center for Law and Social Policy

Mr. Charles D. Matthews, President, National Ocean Industries Association accompanied by Mr. Charles Savit, Senior Vice President, Western Geophysical Company (Houston, Texas) and Vice Chairman, National Ocean Industries Association

Mr. Eugene Luntz, Executive Vice President, Brooklyn Union Gas and Chairman, Atlantic Action Program

Mr. Louis Clapper, Conservation Director, National Wildlife Federation

WITNESS LIST ¹HEARINGS ON OUTER CONTINENTAL SHELF OIL AND GAS EXTRACTION
AND ENVIRONMENTAL, ECONOMIC, AND SOCIAL IMPACT UPON THE
COASTAL ZONE

Tuesday, April 23, 1974, Room 5110, Dirksen Senate Office Building, 10 a.m.

The Honorable Russell Peterson, Chairman, Council on Environmental Quality

Mr. Bruce C. Rashkow, Chief, Marine Resources Section, Department of Justice, accompanied by Mr. Edward S. Lazowski, Legislative Assistant, Land and Natural Resources Division

Mr. Jared G. Carter, Deputy Under Secretary, Department of the Interior, accompanied by Dr. V. E. McKelvey, Director, U.S. Geological Survey

Dr. Robert M. White, Administrator, National Oceanic and Atmospheric Administration

Wednesday, April 24, 1974, Room 5110, Dirksen Senate Office Building, 10 a.m.

The Honorable William D. Hathaway, U.S. Senator (Maine)

Mr. Al Alm, Assistant Administrator, Planning and Management, Environmental Protection Agency

Dr. Thomas Grigalunas, Department of Resource Economics, University of Rhode Island, Kingston

¹ Not necessarily in order of appearance.

Dr. William Hargis, Virginia Institute of Marine Sciences, Gloucester Point

Dr. Irvin L. White, Science and Public Policy Program, University of Oklahoma, Norman, accompanied by Dr. R. Leon Leonard

Dr. William Gaither, President, The Sea Grant Association, and Dean, College of Marine Studies, University of Delaware

Thursday, April 25, 1974, Room 5110, Dirksen Senate Office Building, 10 a.m.

The Honorable John V. Tunney, U.S. Senator (California)

Dr. John W. Devaney, Department of Ocean Engineering, Massachusetts Institute of Technology, Cambridge

Ms. Barbara Heller, National Environmental Policy Center, Chicago

Mr. William Futrell, Chairman, Sierra Club, Offshore Task Force, Tuscaloosa, Alabama

INTERIOR COMMITTEE OCS HEARINGS

MAY 6

The Honorable John V. Tunney, United States Senator from California.

The Honorable John Whitaker, Undersecretary of Interior, accompanied by V. E. McKelvey, Director, United States Geological Survey, Jared G. Carter, Deputy Undersecretary of Interior, and Darius Gaskins, Acting Director, Office of Mineral Policy Development,

MAY 7

Dr. Walter Mead, Professor of Economics, University of California at Santa Barbara.

Robert Kreuger, Attorney at law, Los Angeles, California.

The Honorable Lloyd Bentsen, United States Senator from Texas.

David Standley, Massachusetts New England Coalition on Oil, accompanied by Ms. Barbara Heller, Environmental Policy Center, and Ms. Ellen Winchester, Florida League of Women Voters.

D. G. Couvillon, Western Operations, Standard Oil of California, representing Western Oil and Gas Association, accompanied by J. B. Hundley, Chairman, Western Oil and Gas and Offshore Operations Committee, and Henry Wright, Manager, Western Oil and Gas Association Land and Water Department.

MAY 8

The Honorable Alan Cranston, United States Senator from California.

Dr. Don E. Kash, Professor of Political Science and Director of the Science and Public Policy Program, University of Oklahoma.

Frank Ikard, President, American Petroleum Institute.

The Honorable Russell Long, United States Senator from Louisiana.

Edward W. Stagg, Executive Director, Council for a Better Louisiana.

George W. Healy, Retired Editor, New Orleans *Times-Picayune*, accompanied by Dr. Jan Duggar, Professor of Economics, Louisiana State University.

Monte Canfield, Deputy Director, Energy Policy Project of the Ford Foundation.

Leonard Meeker, Center for Law and Social Policy, representing the Sierra Club, the Natural Resources Defense Council, and Friends of the Earth.

MAY 10

The Honorable Russell W. Peterson, Chairman, Council on Environmental Quality.

The Honorable Ted Stevens, United States Senator from Alaska.

The Honorable William J. Guste, Attorney General of Louisiana, representing the National Association of Attorneys General, accompanied by the Honorable Gerald L. Baliles, Deputy Attorney General of Virginia.

Gene Lundy, Executive Vice President, Brooklyn Union Gas Company, representing the American Gas Association.

Carl H. Savit, Senior Vice President, Western Geophysical Corporation of America.

Dean William S. Jaither, Dean and Professor, College of Marine Studies, University of Delaware, representing the Sea Grant Association.

Melvin Hill, Vice President for Exploration, Gulf Oil Corporation.

COMMITTEE ON COMMERCE/NOPS JUDICIARY/SUBCOMMITTEE ON
ADMINISTRATIVE PRACTICES AND PROCEDURES

WITNESS LIST FOR JOINT HEARINGS ON IMPACT ON MASSACHUSETTS OF
PROPOSED OFFSHORE OIL & GAS DRILLING, AUGUST 5, 1974, BOSTON

Dr. John Devanney, Massachusetts Institute of Technology, Project Leader, Georges Bank Petroleum Study.

Thomas A. Norris, President, New England Fisheries Steering Committee.

Michael J. Frucci, Director, Cape Cod Chamber of Commerce; Chairman, Governor's Advisory Committee on Travel and Tourism.

Robert A. Chadbourne, President, Associated Industries of Massachusetts.

Dr. Bostwick Ketchum, Woods Hole Oceanographic Institution.

Barbara Heller, Environmental Policy Center.

Paul Swatek, New England Sierra Club.

Norman J. Faramelli, Massachusetts Oil Coalition.

Barbara Feegan, Association for the Preservation of Cape Cod.

Henry Lee, Director, Governor Sargent's Energy Office.

Leo Allen, Special Legislative Commission on Marine Boundaries and Resources of the Massachusetts Legislature.

Thomas Fitzpatrick, Energy Program Director, New England Regional Commission.

D. THE ENERGY SUPPLY ACT OF 1974, S. 3221, AS PASSED BY THE
SENATE

S. 3221

An act to increase the supply of energy in the United States from the Outer Continental Shelf; to amend the Outer Continental Shelf Lands Act; and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Energy Supply Act of 1974".

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TITLE I—FINDINGS AND PURPOSES

FINDINGS

Sec. 101. The Congress finds and declares that—

(1) the demand for energy in the United States is increasing and will continue to increase for the foreseeable future;

(2) domestic production of oil and gas has declined in recent years;

(3) the United States has become increasingly dependent upon imports of oil from foreign nations to meet domestic energy demand:

(4) increasing reliance on imported oil is not inevitable, but is rather subject to significant reduction by increasing domestic sources of energy supply.

(5) consumption of natural gas in the United States has greatly exceeded additions to domestic reserves in recent years, so that currently available supplies are less than demand;

(6) technology is or can be made available which will allow sufficient production and consumption of domestic energy supply to meet demands consistent with national environmental policies.

(7) The Outer Continental Shelf contains significant quantities of petroleum and natural gas, which are a vital national reserve that must be carefully managed in the public interest; and

(8) there presently exists a variety of technological, economic, environmental, administrative, and legal problems which tend to retard the development of the oil and natural gas resources of the Outer Continental Shelf:

(9) it is the national policy to preserve, protect, and develop the resources of this Nation's coastal zone, and to provide for the orderly siting of energy facilities therein;

(10) the development, processing, and distribution of the oil and gas resources of the Outer Continental Shelf, and the siting of related energy facilities, may cause adverse impacts on the coastal zones of the various coastal States: and

(11) the Coastal Zone Management Act of 1972 provides policy, procedures, and programs designed to anticipate such adverse impacts and in part prevent them by appropriate planning and management of land and water resources in the coastal zone.

PURPOSES

Sec. 102. The purposes of this Act are to—

(1) increase domestic production of oil and natural gas in order to assure material prosperity and national security, reduce dependence on unreliable foreign sources, and assist in maintaining a favorable balance of payments;

(2) make oil and natural gas resources in the Outer Continental Shelf available as rapidly as possible consistent with the need for orderly resources development, and protection of the environmental, in a manner consistent with the Mining and Mineral Policy Act of 1970 and designed to insure the public a fair market return on disposition of public resources;

(3) encourage development of new and improved technology for energy resource production that will increase human safety and eliminate or reduce risk of damage to the environment; and

(4) provide States which are directly impacted by Outer Continental Shelf oil and gas exploration and development with comprehensive assistance in order to assure adequate protection of the onshore social, economic, and environmental conditions of the coastal zone.

TITLE II—INCREASED PRODUCTION OF OUTER CONTINENTAL SHELF ENERGY RESOURCES

NATIONAL POLICY FOR OUTER CONTINENTAL SHELF

SEC. 201. Section 3 of the Outer Continental Shelf Lands Act is revised by adding the following new subsection (c) and (d):

“(c) It is hereby declared that the Outer Continental Shelf is a vital national resource reserve held by the Federal Government for all the people, which should be made available for orderly development, subject to environmental safeguards, consistent with and when necessary to meet national needs.

“(d) It is hereby recognized that development of the oil and gas resources of the Outer Continental Shelf will have significant impact on coastal zone areas of adjacent States and that, in view of the national interest in the effective management of the coastal zone, such States may require assistance in protecting their coastal zone insofar as possible from the adverse effects of such impact.”

NEW SECTIONS OF OUTER CONTINENTAL SHELF LANDS ACT

SEC. 202. The Outer Continental Shelf Lands Act is hereby amended by adding the following new sections:

“DEVELOPMENT OF OUTER CONTINENTAL SHELF LEASING PROGRAM

“SEC. 18. (a) Congress declares that it is the policy of the United States that Outer Continental Shelf lands determined to be both geologically favorable for the accumulation of oil and gas and capable of supporting oil and gas development without undue environmental hazard or damage should be made available for leasing as soon as practicable in accordance with subsection (b) of this section.

“(b) The Secretary is authorized and directed to prepare and maintain a leasing program to implement the policy set forth in subsection (a). The leasing program shall indicate as precisely as possible the size, timing, and location of leasing activity that will best meet national energy needs for the ten-year period following its approval or reapproval in a manner consistent with subsection (a) above and with the following principles:

“(1) management of the Outer Continental Shelf in a manner which considers all its resource values and the potential impact of oil and gas exploration and development on other resource values of the Outer Continental Shelf and the marine environment;

“(2) timing and location of leasing to distribute exploration, development, and production of oil and gas among various areas of the Outer Continental Shelf, considering:

“(A) existing information concerning their geographical, geological, and ecological characteristics;

“(B) their location with respect to, and relative needs of, regional energy markets;

“(C) their location with respect to other uses of the sea and seabed including but not limited to fishing areas, access to ports by vessels, and existing or proposed sea lanes;

“(D) interest by potential oil and gas producers in exploration and development as indicated by tract nominations and other representations;

“(E) an equitable sharing of developmental benefits and environmental risks among various regions of the United States;

“(3) timing and location of leasing so that to the maximum extent practicable areas with less environmental hazard are leased first; and

“(4) receipt of fair market return for public resources,

“(c) The program shall include estimates of the appropriations and staffing required of all existing Federal programs necessary to prepare the required environmental impact statements, obtain resource data and any other information needed to decide the order in which areas are to be scheduled for lease, to make the analyses required prior to offering tracts for lease, and to supervise operations under every lease in the manner necessary to assure compliance with the requirements of the law, the regulations, and the lease.

“(d) The environmental impact statement on the leasing program prepared in accordance with section 102(2)(C) of the National Environmental Policy Act of 1969, shall include, but shall not be limited to, an assessment by the Secretary of the relative significance of the probable oil and gas resources of each area proposed to be offered for lease in meeting national demands, the most likely rate of exploration and development that is expected to occur if the areas are leased, and the relative environmental hazard of each area. Such environmental impact statement shall be based on consideration of the following factors, without being limited thereto: geological and geophysical conditions, biological data on existing animal, marine, and plant life, and commercial and recreational uses of nearby land and water areas.

“(e) The Secretary shall, by regulation, establish procedures for receipt and consideration of nominations for areas to be offered for lease or to be excluded from leasing, for public notice of and participation in development of the leasing program, for review by State and local governments which may be impacted by the proposed leasing, and for coordination of the program with management program being developed by any State for approval pursuant to section 305 of the Coastal Zone Management Act of 1972 and with the management program of any State which has been approved pursuant to section 306 of such Act. These procedures shall be applicable to any revision or reapproval of the leasing program.

“(f) The Secretary shall publish a proposed leasing program in the Federal Register and submit it to the Congress within two years after enactment of this section.

“(g) After the leasing program has been approved by the Secretary or after January 1, 1978, whichever comes first, no leases under this Act may be issued unless they are for areas included in the approved leasing program.

“(h) The Secretary may revise and reapprove the leasing program at any time and he must review and reapprove that leasing program at least once each year.

“(i) The Secretary is authorized to obtain from public sources, or to purchase from private sources, any surveys, data, reports, or other information (excluding interpretations of such data, surveys, reports, or other information) which may be necessary to assist him in preparing environment impact statements and making other evaluations required by this Act. The Secretary shall maintain the confidentiality of all proprietary data or information for such period of time as is agreed to by the parties.

“(j) The heads of all Federal departments or agencies are authorized and directed to provide the Secretary with any nonproprietary information he requests to assist him in preparing the leasing program. In addition, the Secretary is authorized and directed to utilize the existing capabilities and resources of other Federal departments and agencies by appropriate agreement.

“(k) The program developed pursuant to this section shall include the reservation of an appropriate area or areas as a National Strategic Energy Reserve. The Secretary shall confer with appropriate Federal officials to determine the extent and locations of such reserves. The Secretary shall study the most appropriate means of developing and maintaining such reserves in the national interest. The Secretary shall consult with other Federal agencies and departments and non-governmental authorities in conducting such study. The Secretary shall report to the Congress by January 1, 1976 the results of such study.

“FEDERAL OUTER CONTINENTAL SHELF OIL AND GAS SURVEY PROGRAM

“SEC. 19. (a) The Secretary is authorized and directed to conduct a survey program regarding oil and gas resources of the Outer Continental Shelf. This program shall be designed to provide information about the probable location, extent, and characteristics of such resources in order to provide a basis for (1) development and revision of the leasing program required by section 18 of this Act (2) greater and better informed competitive interest by potential producers in the oil and gas resources of the Outer Continental Shelf, (3) more informed decisions regarding the value of public resources and revenues to be expected from leasing them, and (4) the mapping program required by subsection (c) of this section.

“(b) The Secretary is authorized to contract for, or purchase the results of or, where the required information is not available from commercial sources, conduct seismic, geomagnetic, gravitational, geophysical, or geochemical investigations, and to contract for or purchase the results of stratigraphic drilling, needed to implement the provisions of this section.

“(c) The Secretary, in cooperation with the Secretary of Commerce, is directed to prepare and publish and keep current a series of detailed bathymetric, geological, and geophysical maps of and reports about the Outer Continental Shelf, based on nonproprietary data, which shall include, but not necessarily be limited to, the results of seismic, gravitational, and magnetic surveys on an appropriate grid spacing to define the general bathymetry, geology, and geophysical characteristics of the area. Such maps shall be prepared and published no later than six months prior to the last day for submission of bids

for any areas of the Outer Continental Shelf scheduled for lease on or after January 1, 1978.

“(d) Within six months after enactment of this section, the Secretary shall develop and submit to Congress a plan for conducting the survey and mapping programs required by this section. This plan shall include an identification of the areas to be surveyed and mapped during the first five years of the programs and estimates of the appropriations and staffing required to implement them.

“(e) The Secretary shall include in the annual report required by section 15 of this Act, information concerning the carrying out of his duties under this section, and shall include as a part of each such report a summary of the current data for the period covered by the report.

“(f) No action taken to implement this section shall be considered a major Federal action for the purposes of section 102(2) (C) of the National Environmental Policy Act of 1969.

“(g) There are hereby authorized to be appropriated such sums as are necessary to carry out the purposes of this section during fiscal years 1975 and 1976, to the Secretary and to appropriate Federal agencies having responsibilities under this section.

“(h) The Secretary shall, by regulation, require that any person holding a lease issued pursuant to this Act for oil or gas exploration or development on the Outer Continental Shelf shall provide the Secretary with any existing data (excluding interpretation of such data) about the oil or gas resources in the area subject to the lease. The Secretary shall maintain the confidentiality of all proprietary data or information until such time as he determines that public availability of such proprietary data or information would not damage the competitive position of the lessee.

“SAFETY REGULATIONS FOR OIL AND GAS OPERATIONS

“SEC. 20. (a) POLICY.—It is the policy of this section to insure, through improved techniques, maximum precautions, and maximum use of the best available technology by well-trained personnel, the safest possible operations in the Outer Continental Shelf. Safe operations are those which minimize the likelihood of blowouts, loss of well control, fires, spillages, or other occurrences which may cause damage to the environment, or to property, or endanger human life or health.

“(b) REGULATIONS; STUDY.—(1) (A) The Secretary, with the concurrence and advice of the Administrator of the Environmental Protection Agency and the Secretary of the Department in which the Coast Guard is operating, shall develop, from time to time revise, and promulgate safety regulations for operations in the Outer Continental Shelf, to implement as fully as possible the policy of subsection (a) of this section. Within one year after the enactment of this section, the Secretary shall complete a review of existing safety regulations, consider the results and recommendations of the study authorized in paragraph (2) of this subsection, and promulgate a complete set of safety regulations (which may include Outer Continental Shelf orders) applicable to operations in the Outer Continental Shelf or any region thereof. Any safety regulations in effect

on the date of enactment of this section which the Secretary finds should be retained shall be repromulgated according to the terms of this section, but shall remain in effect until so repromulgated. No safety regulations (other than field orders) promulgated pursuant to this subsection shall reduce the degree of safety or protection to the environment afforded by safety regulations previously in effect.

“(B) In promulgating regulations under this section, the Secretary shall require on all new drilling and production operations and, wherever practicable on already existing operations, the use of the best available technology wherever failure of equipment would have a substantial effect on public health, safety, or the environment.

“(2) Upon the enactment of this section, the National Academy of Engineering shall conduct a study of the adequacy of existing safety regulations and technology, equipment, and techniques for operations in the Outer Continental Shelf, including but not limited to the subjects listed in subsection (a) of this section. Not later than nine months after the enactment of this section, the results of the study and recommendations for improved safety regulations shall be submitted to the Congress and to the Secretary.

“RESEARCH AND DEVELOPMENT

“SEC. 21. (a) The Secretary is authorized and directed to carry out a research and development program designed to improve technology related to development of the oil and gas resources of the Outer Continental Shelf where similar programs are not presently being conducted by any Federal department or agency and where he determines that such research and development is not being adequately conducted by any other public or private entity including but not limited to—

“(1) downhole safety devices.

“(2) methods for reestablishing control of blowing out or burning wells,

“(3) methods for containing and cleaning up oil spills,

“(4) improved drilling bits,

“(5) improved flaw detection systems for undersea pipelines,

“(6) new or improved methods of development in water depths over six hundred meters, and

“(7) subsea production systems.

“(b) The Secretary, with the concurrence of the Secretary of the department in which the Coast Guard is operating, shall establish equipment and performance standards for oil spill cleanup plans and operations. Such standards shall be coordinated with the National Oil and Hazardous Substances Pollution Contingency Plan, and reviewed by the Administrator of the Environmental Protection Agency, and the Administrator of the National Oceanic and Atmospheric Administration.

“(c) The Secretary of Commerce, in cooperation with the Secretary of the Navy, the Secretary of the department in which the Coast Guard is operating, and the Director of the National Institutes of Occupational Safety and Health, shall conduct studies of underwater diving techniques and equipment suitable for protection of human safety.

"ENFORCEMENT OF SAFETY REGULATIONS; INSPECTIONS

"Sec. 22. (a) (1) The Secretary and the Secretary of the department in which the Coast Guard is operating shall jointly enforce the safety and environmental protection regulations promulgated under this Act. They shall regularly inspect all operations authorized pursuant to this Act and strictly enforce safety regulations promulgated pursuant to this Act and other applicable laws and regulations relating to public health, safety, or environmental protection. All holders of leases under this Act shall allow promptly access at the site of any operations subject to safety regulations to any inspector, and provide such documents and records that are pertinent to public health, safety, or environmental protection, as such Secretaries or their designees may request.

"(2) The Secretary, with the concurrence of the Secretary of the department in which the Coast Guard is operating, shall promulgate regulations within ninety days of the enactment of this section to provide for—

(A) physical observation at least once each year by an inspector of the installation or testing of all safety equipment designed to prevent or ameliorate blowouts, fires, spillages, or other major accidents; and

"(B) periodic on site inspection without advance notice to the lessee to assure compliance with public health, safety, or environmental protection regulations.

"(3) The Secretary of the department in which the Coast Guard is operating shall make an investigation and public report on all major fires and major oil spillage occurring as a result of operations pursuant to this Act. For the purposes of this subsection, a major oil spillage is any spillage in one instance of more than two hundred barrels of oil over a period of thirty days: *Provided*, That he may, in his discretion, make an investigation and report of lesser oil spillages. All holders of leases under this Act shall cooperate with him in the course of such investigations.

"(4) For the purposes of carrying out their responsibilities under this section, the Secretary or the Secretary of the department in which the Coast Guard is operating may by agreement utilize with or without reimbursement the services, personnel, or facilities of any Federal agency.

"(b) The Secretary shall include in his annual report to Congress required by section 15 of this Act the number of violations of safety regulations found, the names of the violators, and the action taken thereon.

"(c) The Secretary shall consider any allegation from any person of the existence of a violation of any safety regulations issued under this Act. The Secretary shall answer such allegation no later than ninety days after receipt thereof, stating whether or not such alleged violations exist and, if so, what action has been taken.

"(d) In any investigation directed by this section the Secretary or the Secretary of the department in which the Coast Guard is operating shall have power to summon before them or their designee witnesses and to require the production of books, papers, documents, and any other evidence. Attendance of witnesses or the production of

books, papers, documents, or any other evidence shall be compelled by a similar process as in the United States district court. In addition, they or their designees shall administer all necessary oaths to any witnesses summoned before said investigation.

"LIABILITY FOR OIL SPILLS

"SEC. 23. (a) Any person in charge of any operations in the Outer Continental Shelf, as soon as he has knowledge of a discharge or spillage of oil from an operation, shall immediately notify the appropriate agency of the United States Government of such discharge.

"(b) (1) Notwithstanding the provisions of any other law, the holder of a lease or right-of-way issued or maintained under this Act and the Offshore Oil Pollution Settlements Fund (hereinafter referred to as "the fund") established by this subsection shall be strictly liable without regard to fault and without regard to ownership of any adversely affected lands, structures, fish, wildlife, or biotic or other natural resources relied upon by any damaged party for subsistence or economic purposes, in accordance with the provisions of this subsection for all damages sustained by any person as a result of discharges of oil or gas from any operation authorized under this Act if such damages occurred (A) within the territory of the United States, Canada, or Mexico or (B) in or on waters within two hundred nautical miles of the baseline of the United States, Canada, or Mexico from which the territorial sea of the United States, Canada, or Mexico is measured, or (C) within one hundred nautical miles of any operation authorized under this Act. Claims for such injury or damages may be determined by arbitration or judicial proceedings.

"(2) Strict liability shall not be imposed under this subsection on the holder or the fund if the holder or the fund proves that the damage was caused by an act of war. Strict liability shall not be imposed under this subsection on the holder if the holder proves that the damage was caused by the negligence of the United States or other governmental agency. Strict liability shall not be imposed under this subsection with respect to the claim of a damaged person if the holder or the fund proves that the damage was caused by the negligence or intentional act of such person.

"(3) Strict liability for all claims arising out of any one incident shall not exceed \$100,000,000. The holder shall be liable for the first \$7,000,000 of such claims that are allowed. The fund shall be liable for the balance of the claims that are allowed up to \$100,000,000. If the total claims allowed exceed \$100,000,000, they shall be reduced proportionately. The unpaid portion of any claim may be asserted and adjudicated under other applicable Federal or State law.

"(4) In any case where liability without regard to fault is imposed pursuant to this subsection, the rules of subrogation shall apply in accordance with the laws of the State in which such damages occurred: *Provided, however,* That in the event such damages occurred outside the jurisdiction of any State, the rules of subrogation shall apply in accordance with the laws applicable pursuant to section 4 of this Act.

"(5) The Offshore Oil Pollution Settlements Fund is hereby established as a nonprofit corporate entity that may sue and be sued in its

own name. The fund shall be administered by the holders of leases issued under this Act under regulations prescribed by the Secretary. The fund shall be subject to an annual audit by the Comptroller General, and a copy of the audit shall be submitted to the Congress. Claims allowed against the fund shall be paid only from moneys deposited in the fund.

“(6) There is hereby imposed on each barrel of oil produced pursuant to any lease issued or maintained under this Act a fee $2\frac{1}{2}$ of cents per barrel. The fund shall collect the fee from the lessees or their assignees. Costs of administration shall be paid from the money collected by the fund, and all sums not needed for administration and the satisfaction of claims shall be invested prudently in income producing securities approved by the Secretary. Income from such securities shall be added to the principal of the fund.

“(7) Subject to the limitation contained in subparagraph (3) of this subsection, if the fund is unable to satisfy a claim asserted and finally determined under this subsection, the fund may borrow the money needed to satisfy the claim from any commercial credit source, at the lowest available rate of interest, subject to the approval of the Secretary.

“(8) No compensation shall be paid under this subsection unless notice of the damage is given to the Secretary within three years following the date on which the damage occurred.

“(9) Payment of compensation for any damage pursuant to this subsection shall be subject to the holder or the fund acquiring by subrogation all rights of the claimant to recover from such damages from any other person.

“(10) The collection of amounts for the fund shall cease when \$100,000,000 has been accumulated, but shall be renewed when the accumulation in the fund falls below \$85,000,000. The fund shall insure that collections are equitable to all holders of a lease or right-of-way.

“(11) The several district courts of the United States shall have jurisdiction over claims against the fund.

“(c) If any area within or without a lease granted or maintained under this Act is polluted by any discharge or spillage of oil from operations conducted by or on behalf of the holder of such lease, and such pollution damages or threatens to damage aquatic life, wildlife, or public or private property, the control and removal of the pollutant shall be at the expense of such holder, including administrative and other costs incurred by the Secretary or any other Federal or State officer or agency. Upon failure of such holder to adequately control and remove such pollutant, the Secretary in cooperation with other Federal, State, or local agencies, or in cooperation with such holder, or both, shall have the right to accomplish the control and removal at the expense of the holder.

“(d) The Secretary shall establish requirements that all holders of leases issued or maintained under this Act shall establish and maintain evidence of financial responsibility of not less than \$7 million. Financial responsibility may be established by any one of, or a combination of, the following methods acceptable to the Secretary: (A) evidence of insurance, (B) surety bonds, (C) qualification as a self-insurer, or (D) other evidence of financial responsibility. Any bond filed shall be issued by a bonding company authorized to do business in the United States.

“(e) The provisions of this section shall not be interpreted to supersede section 311 of the Federal Water Pollution Control Act Amendments of 1972 or preempt the field of strict liability or to enlarge or diminish the authority of any State to impose additional requirements.

“NEGOTIATIONS WITH STATES

“SEC. 24. The Secretary is authorized and directed to negotiate with those coastal States which are asserting jurisdiction over the Outer Continental Shelf with a view to developing interim agreements which will allow energy resource development prior to final judicial resolution of the dispute.

“DETERMINATION OF BOUNDARIES

“SEC. 25. Within one year following the date of enactment of this section, the President may establish procedures for settling any outstanding boundary disputes, including international boundaries between the United States and Canada and between the United States and Mexico, and establish boundaries between adjacent States, as directed in section 4 of this Act.

“COASTAL STATE FUND

“SEC. 26. (a) There is hereby established in the Treasury of the United States the Coastal State Fund (hereinafter referred to as the ‘fund’). The Secretary shall manage and make grants from the fund according to the regulations established pursuant to subsections (b) and (c) to the coastal States impacted by anticipated or actual oil and gas production.

“(b) The purpose of such grants shall be to assist coastal States impacted by anticipated or actual oil and production to ameliorate adverse environmental effects and control secondary social and economic impacts associated with the development of Federal energy resources in, or on the Outer Continental Shelf adjacent to the submerged lands of such States. Such grants may be used for planning, construction of public facilities, and provision of public services, and such other activities as may be prescribed by regulations promulgated pursuant to subsection (c) of this section. Such regulations shall, at a minimum, (1) provide that such regulations be directly related to such environmental effects and social and economic impacts; (2) take into consideration the acreage leased or proposed to be leased and the volume of production of oil and gas from the Outer Continental Shelf off the adjacent coastal State; and (3) require each coastal State, as a requirement of eligibility for grants from the fund, to establish pollution containment and cleanup systems for pollution from oil and gas development activities on the submerged lands of each such State.

“(c) The Secretary of Commerce, in accordance with the provisions of subsection (b), and this subsection, shall, by regulation, establish requirements for grant eligibility: *Provided*, That it is the intent of this section that grants shall be made to impacted coastal States to the maximum extent permitted by subsection (d) of this section and that grants shall be made to impacted coastal States in proportion to the effects and impacts of offshore oil and gas exploration, development

and production on such States. Such grants shall not be on a matching basis but shall be adequate to compensate impacted coastal States for the full costs of any environmental effects and social and economic impacts of offshore oil and gas exploration, development, and production. The Secretary shall coordinate all grants with management programs established pursuant to the Coastal Zone Management Act of 1972.

“(d) Notwithstanding any other provision of law, 10 per centum of the Federal revenues from the Outer Continental Shelf Lands Act, as amended by this Act, or the equivalent of forty (\$.40) cents per barrel from the Federal revenues from the Outer Continental Shelf Act, whichever is greater, shall be paid into the fund: *Provided*, That the total amount paid into the fund shall not exceed \$200,000,000 per year for fiscal 1976 and 1977.

“(e) There is hereby authorized to be appropriated to the fund \$100,000,000.

“(f) For the purpose of this Act, ‘coastal State’ means a State of the United States in, or bordering on, the Atlantic, Pacific, or Arctic Ocean, the Gulf of Mexico, or Long Island Sound, including Puerto Rico, the Virgin Islands, Guam, and American Samoa.

“CITIZEN SUITS

“Sec. 27. (a) Except as provided in subsection (b) of this section, any person having an interest which is or may be adversely affected may commence a civil action on his own behalf—

“(1) against any person including—

“(A) the United States, and

“(B) any other governmental instrumentality or agency to the extent permitted by the eleventh amendment to the Constitution who is alleged to be in violation of the provisions of this Act or the regulation promulgated thereunder, or any permit or lease issued by the Secretary; or

“(2) against the Secretary where there is alleged a failure of the Secretary to perform any act or duty under this Act which is not discretionary with the Secretary.

“(b) No action may be commenced—

“(1) under subsection (a) (1) of this section—

“(A) prior to sixty days after the plaintiff has given notice in writing under oath of the violation (i) to the Secretary, and (ii) to any alleged violator of the provisions of this Act or any regulations promulgated thereunder, or any permit or lease issued thereunder;

“(B) if the Secretary has commenced and is diligently prosecuting a civil action in a court of the United States to require compliance with the provisions of this Act or the regulations thereunder, or the lease, but in any such action in a court of the United States any person may intervene as a matter of right; or

“(2) Under subsection (a) (2) of this section prior to sixty days after the plaintiff has given notice in writing under oath of such action to the Secretary, in such manner as the Secretary shall by regulation prescribe, except that such action may be brought immediately after such notification in the case where the violation complained of, constitutes an imminent threat to the health or safety of the plaintiff or would immediately affect a legal interest of the plaintiff.

“(c) In any action under this section, the Secretary, if not a party, may intervene as a matter of right.

“(d) The court, in issuing any final order in any action, brought pursuant to subsection (a) of this section, may award costs of litigation including reasonable attorneys fees to any party, whenever the court determines such award is appropriate. The court may, if a temporary restraining order or preliminary injunction is sought, require the filing of a bond or equivalent security in accordance with the Federal Rules of Civil Procedure.

“(e) Nothing in this section shall restrict any right which any person or class of persons may have under this or any statute or common law to seek enforcement of any of the provisions of this Act and the regulations thereunder, or to seek any other relief, including relief against the Secretary.

“PROMOTION OF COMPETITION

“SEC. 28. Within one year after the date of enactment of this section, the Secretary shall prepare and publish a report with recommendations for promoting competition and maximizing production and revenues from the leasing of Outer Continental Shelf lands, and shall include a plan for implementing recommended administrative changes and drafts of any proposed legislation. Such report shall include consideration of the following—

“(1) other competitive bidding systems permitted under present law as compared to the bonus bidding system;

“(2) evaluation of alternative bidding systems not permitted under present law;

“(3) measures to ease entry of new competitors; and

“(4) measures to increase supply to independent refiners and distributors.

“ENFORCEMENT AND PENALTIES

“SEC. 29. (a) At the request of the Secretary, the Attorney General may institute a civil action in the district court of the United States for the district in which the affected operation is located for a restraining order or injunction or other appropriate remedy to enforce any provision of this Act or any regulation or order issued under the authority of this Act.

“(b) If any person shall fail to comply with any provision of this Act, or any regulation or order issued under the authority of this Act, after notice of such failure and expiration of any period allowed for corrective action, such person shall be liable for a civil penalty of not more than \$5,000 for each and every day of the continuance of such failure. The Secretary may assess, collect, and compromise any such penalty. No penalty shall be assessed until the person charged with a violation shall have been given an opportunity for a hearing on such charge.

“(c) Any person who knowingly and willfully violates any provision of this Act, or any regulation or order issued under the authority of this Act designed to protect public health, safety, or the environment or conserve natural resources or knowingly and willfully makes any false statement, representation, or certification in any application, record, report, plan, or other document filed or

required to be maintained under this Act, or who knowingly and willfully falsifies, tampers with, or renders inaccurate any monitoring device or method of record required to be maintained under this Act or knowingly and willfully reveals any data or information required to be kept confidential by this Act, shall, upon conviction, be punished by a fine of not more than \$100,000, or by imprisonment for not more than one year, or both. Each day that a violation continues shall constitute a separate offense.

“(d) Whenever a corporation or other entity violates any provision of this Act, or any regulation or order issued under the authority of this Act, any officer, or agent of such corporation or entity who knowingly and willfully authorized, ordered, or carried out such violation shall be subject to the same fines or imprisonment as provided for under subsection (c) of this section.

“(e) The remedies prescribed in this section shall be concurrent and cumulative and the exercise of one does not preclude the exercise of the others. Further, the remedies prescribed in this section shall be in addition to any other remedies afforded by any other law or regulation.

“ENVIRONMENT BASELINE AND MONITORING STUDIES

“SEC. 30. (a) Prior to permitting oil and gas drilling on any area of the Outer Continental Shelf not previously leased under this Act, the Secretary, in consultation with the Administrator of the National Oceanic and Atmospheric Administration of the Department of Commerce, shall make a study of the area involved to establish a baseline of those critical parameters of the Outer Continental Shelf environment which may be affected by oil and gas development. The study shall include, but need not be limited to, background levels of hydrocarbons in water, sediment, and organisms; background levels of trace metals in water, sediments, and organisms; characterization of benthic and planktonic communities; description of sediments and relationships between organisms and abiotic parameters; and standard oceanographic measurements such as salinity, temperature, micro-nutrients, dissolved oxygen.

“(b) Subsequent to development of any area studied pursuant to subsection (a) of this section, the Secretary shall monitor the areas involved in a manner designed to provide time-series data which can be compared with previously collected data for the purpose of identifying any significant changes.

“(c) In carrying out the provisions of this section, the Secretary is directed to give preference to the use of Government owned and Government operated vessels, to the maximum extent practicable, in contracting for work in connection with such environmental baseline and monitoring studies. In order to avoid needless duplications, the Secretary shall coordinate all such activities with the Administrator of the National Oceanic and Atmospheric Administration and shall, whenever possible, utilize Government owned and Government operated marine research laboratories in conducting research authorized by this section”.

REVISION OF LEASE TERMS

SEC. 203. Section 8 of the Outer Continental Shelf Lands Act is amended by revising subsections (a) and (b) to read as follows:

“(a) The Secretary is authorized to grant to the highest responsible qualified bidder by competitive bidding under regulations promulgated in advance, oil and gas leases on submerged lands of the Outer Continental Shelf which are not covered by leases meeting the requirements of subsection (a) of section 6 of this Act. The bidding shall be by sealed bids and, at the discretion of the Secretary, shall be either (1) on the basis of a cash bonus bid with a royalty fixed by the Secretary at not less than 12½ per centum in amount or value of the production saved, removed, or sold, (2) on the basis of a cash bonus bid with a fixed share of the net profits derived from operation of the tract of no less than 30 per centum reserved to the United States, or (3) on the basis of a fixed cash bonus with the net profit share reserved to the United States as the bid variable. The United States net profit share shall be calculated on the basis of the value of the production saved, removed, or sold, less those capital and operating costs directly assignable to the development and operation (but not acquisition) of each individual oil and gas lease issued under this Act to the lessee under a net profit sharing arrangement. No capital or operating charges for materials or labor services not actually used on an area leased for oil or gas under this Act under a net profit-sharing arrangement; allocation of income taxes; or expenditure for materials or labor services used prior to lease acquisition shall be permitted as a deduction in the calculation of net income. The Secretary shall by regulation establish accounting procedures and standards to govern the calculation of net profits. In the event of any dispute between the United States and a lessee concerning the calculation of the net profits, the burden of proof shall be on the lessee. That part of the net profit share due the United States which is attributable to oil production may be taken in kind in the form of oil and disposed of as provided in subsection (k) of this section. That part of the net profit share due in kind shall be determined by dividing the net profit due the United States attributable to the product or products taken in kind by the fair market value at the wellhead of the oil and/or gas (as the case may be) saved, removed or sold. In determining the attribution of profits as between oil and gas, costs shall be allocated proportionately to the value of their respective shares of production.

“(b) An oil and gas lease issued by the Secretary pursuant to this section shall (1) cover a compact area not exceeding five thousand seven hundred and sixty acres, as the Secretary may determine, (2) be for a period of (i) in five years or (ii) for up to ten years where the Secretary deems such longer period necessary to encourage exploration and development in areas of unusually deep water or adverse weather conditions, and as long thereafter as oil or gas may be produced from the area in paying quantities, or drilling or well reworking operations as approved by the Secretary are conducted thereon, and (3) contain such rental provisions and such other terms and provisions as the Secretary may prescribe at the time of offering the area for lease.”

DISPOSITION OF FEDERAL ROYALTY OIL

SEC. 204. Section 8 of the Outer Continental Shelf Lands Act as amended by this Act is further amended by adding a new subsection (k) to read as follows:

“(k) Upon commencement of production of oil from any lease issued after the effective date of this subsection, the Secretary shall offer to the public and sell by competitive bidding for not less than its fair market value, in such amounts and for such terms as he determines, that proportion of the oil produced from said lease which is due to the United States as royalty or net profit share oil. The Secretary shall limit participation in such sales where he finds such limitation necessary to assure adequate supplies of oil at equitable prices to independent refiners. In the event that the Secretary limits participation in such sales, he shall sell such oil at an equitable price. The lessee shall take any such royalty oil for which no acceptable bids are received and shall pay to the United States a cash royalty equal to its fair market value, but in no event shall such royalty be less than the highest bid.”.

ANNUAL REPORT

SEC. 205. Section 15 of the Outer Continental Shelf Lands Act is amended to read as follows:

“ANNUAL REPORT BY SECRETARY TO CONGRESS

“SEC. 15. (a) Within six months after the end of each fiscal year, the Secretary shall submit to the President of the Senate and the Speaker of the House of Representatives a report on the leasing and production program in the Outer Continental Shelf during such fiscal year, including a detailing of all moneys received and expended, and of all leasing, development, and production activities; a summary of management, supervision, and enforcement activities; a summary of grants made from the Coastal State Fund; and recommendations to the Congress for improvements in management, safety and amount of production in leasing and operations in the Outer Continental Shelf and for resolution of jurisdictional conflicts or ambiguities.

“(b) Section 313(a) of the Coastal Zone Management Act of 1972 (86 Stat. 1280) is amended by striking the word ‘and’ after the word ‘priority’ in subsection (8); renumbering existing subsection (9) as subsection (10); and inserting the following new subsection (9): ‘an assessment of the onshore social, economic, and environmental impacts in those coastal areas affected by Outer Continental Shelf oil and gas exploration and exploitation: and’.”.

INSURING MAXIMUM PRODUCTION FROM OIL AND GAS LEASES

SEC. 206. Section 5 of the Outer Continental Shelf Lands Act is amended by adding the following new subsections:

“Insuring Maximum Production From Oil and Gas Leases

“(d) (1) After enactment of this section no oil and gas lease may be issued pursuant to this Act unless the lease requires that development be carried out in accordance with a development plan which has been

approved by the Secretary, and provides that failure to comply with such development plan will terminate the lease.

“(2) The development plan will set forth, in the degree of detail established in regulations issued by the Secretary, specific work to be performed, environmental protection and health and safety standards to be met, and a time schedule for performance. The development plan may apply to all leases included within a production unit.

“(3) With respect to permits and leases outstanding on the date of enactment of this section, a proposed development plan must be submitted to the Secretary within six months after the date of enactment of his section. Failure to submit a development plan or to comply with an approved development plan shall terminate the permit or lease.

“(4) The Secretary may approve revisions of development plans if he determines that revision will lead to greater recovery of the oil and gas, improve the efficiency of the recovery operation, or is the only means available to avoid substantial economic hardship on the lessee or permittee.

“(e) After the date of enactment of this section, holders of oil and gas leases issued to this Act shall not be permitted to flare natural gas from any well unless the Secretary finds that there is no practicable way to obtain production or to conduct testing or workover operations without flaring.”.

GEOLOGICAL AND GEOPHYSICAL EXPLORATION

SEC. 207. Section 11 of the Outer Continental Shelf Lands Act is hereby amended to read as follows:

“SEC. 11. No person shall conduct any type of geological or geophysical explorations in the Outer Continental Shelf without a permit issued by the Secretary. Each such permit shall contain terms and conditions designed to (1) prevent interference with actual operations under any lease maintained or granted pursuant to the Act; (2) prevent or minimize environmental damage; and (3) require the permittee to furnish the Secretary with copies of all data (including geological, geophysical, and geochemical data, well logs, and drill core analyses) obtained during such exploration. The Secretary shall maintain the confidentiality of all data so obtained until after the areas involved have been leased under this Act or until such time as he determines that making the data available to the public would not damage the competitive position of the permittee, whichever comes later.”.

ENFORCEMENT

SEC. 208. Subsection 5(a)(2) of the Outer Continental Shelf Lands Act is hereby amended by deleting the first sentence.

LAWS APPLICABLE TO OUTER CONTINENTAL SHELF

SEC. 209. Paragraph (2) of subsection (a) of section 4 of the Outer Continental Shelf Lands Act is amended by deleting the following words: “as of the effective date of this Act”.

AUTHORITY OF GOVERNOR OF ADJACENT STATE TO REQUEST POSTPONEMENT
OF LEASE SALES

SEC. 210. Section 8 of the Outer Continental Shelf Lands Act, as amended by this Act, is further amended by inserting at the end thereof the following:

“(i) (1) The Secretary shall give notice of the sale of each lease pursuant to this Act to the Governor of the adjacent State. At any time prior to such sale the Governor may request the Secretary to postpone such sale for a period of not to exceed three years following the date proposed in such notice if he determines that such sale will result in adverse environmental or economic impact or other damage to the State or the residents thereof. In the event of any such request, the Secretary shall postpone the sale until proceedings under this subsection are completed.

“(2) The Secretary shall, not later than thirty days from the receipt of such request:

“(A) grant the request for postponement;

“(B) provide for a shorter postponement than requested provided that such period of time is adequate for study and provision to ameliorate any adverse economic or environmental effects or other damage and for controlling secondary social or economic impact associated with the development of Federal energy resources in, or on, the Outer Continental Shelf adjacent to the submerged lands of such State; or

“(C) deny the request for postponement if he finds that such postponement would not be consistent with the national policy as expressed in section 3 of this Act.

“(3) The Governor of a State aggrieved by the action of the Secretary shall have ten days to appeal directly to the National Coastal Resources Appeals Board established pursuant to paragraph (4) of this subsection. Such Board shall hear the appeal within fifteen days of its receipt and shall render a final decision within forty-five days of such hearing. The Board shall overrule the action of the Secretary if he finds that (A) the State is not adequately protected from adverse environmental and economic impacts and other damages pursuant to subparagraph (3) of paragraph (2) of this subsection; or (B) the request of the Governor for postponement is consistent with the national policy as expressed in section (3) of this Act.

“(4) (a) There is hereby established, in the Executive Office of the President, the National Coastal Resources Appeals Board (hereinafter called the ‘Board’), which shall be composed of the following, or their designees—the Vice President, who shall be Chairman of the Board, the Secretary of the Interior, the Administrator of the National Oceanic and Atmospheric Administration, the Administrator of the Environmental Protection Agency, and the Chairman of the Council on Environmental Quality.

“(b) The Board shall—

“(1) transmit a written report to the appropriate committees of Congress as to the basis for any decision rendered; and

“(2) conduct such hearings pursuant to section 554 of title 5, United States Code.

“(5) For the purposes of this section, an aggrieved State is defined as being one which has requested a postponement of a lease sale but has been denied such postponement or provided a shorter

period of time in which to ameliorate adverse impacts associated with development of the Outer Continental Shelf and the Governor has determined that such period of time is not adequate.

“(6) This section shall take effect immediately upon enactment of this Act.”

TITLE III—MISCELLANEOUS PROVISIONS

PIPELINE SAFETY AND OPERATION

SEC. 301. (a) The Secretary of Transportation, in cooperation with the Secretary of the Interior, is authorized and directed to report to the Congress within sixty days after enactment of this Act on appropriations and staffing needed to monitor pipelines on Federal lands and the Outer Continental Shelf so as to assure that they meet all applicable standards for construction, operation, and maintenance.

(b) The Secretary of Transportation, in cooperation with the Secretary of the Interior, is authorized and directed to review all laws and regulations relating to the construction, operation, and maintenance of pipelines on Federal lands and the Outer Continental Shelf and report to Congress within one year after enactment of this Act on administrative changes needed and recommendations for new legislation.

(c) One year after the date of the enactment of this Act, the Interstate Commerce Commission and the Secretary of Transportation shall submit to the President and the Congress a report on the adequacy of existing transport facilities and regulations to facilitate distribution of oil and gas resources of the Outer Continental Shelf. The report shall include recommendations for changes in existing legislation or regulations to facilitate such distribution.

REVIEW OF SHUT-IN OR FLARING WELLS

SEC. 302. (a) Within six months after enactment of this Act the Secretary shall submit a report to Comptroller General and the Congress listing all shut-in oil and gas wells and wells flaring natural gas on leases issued under the Outer Continental Shelf Lands Act. The report shall indicate why each well is shut-in or flaring natural gas, and whether the Secretary intends to require production or order cessation of flaring.

(b) Within six months after receipt of the Secretary's report, the Comptroller General shall review and evaluate the reasons for allowing the wells to be shut-in or to flare natural gas and submit his findings and recommendations to the Congress.

OIL SPILL LIABILITY STUDY

SEC. 303. (a) The Attorney General, in consultation with the Administrative Conference of the United States and the Office of Technology Assessment, is authorized and directed to study methods and procedures for implementing a uniform law providing liability for damage from oil spills from Outer Continental Shelf operations, tankers, deepwater ports, and other sources. The study shall give particular attention to methods of adjudicating and settling claims as rapidly, economically, and equitably as possible.

(b) The Attorney General shall report the results of his study to the Congress within six months after the date of enactment of this Act.

FUEL STAMP STUDY

SEC. 304. The Administrator of the Federal Energy Administration and the Secretary of the Department of Health, Education, and Welfare are authorized and directed to carry out a study to determine the feasibility of establishing a fuel stamp program. The program would utilize coupons to assist those on low and fixed incomes in purchasing home heating fuels in the winter months. The Administrator of the Federal Energy Administration and the Secretary of Health, Education, and Welfare are directed to report to the Congress the results of such study, together with their recommendations with respect thereto, within sixty days of the effective date of this Act.

RELATIONSHIP TO EXISTING LAW

SEC. 305. Except as otherwise expressly provided herein, nothing in this Act shall be construed to amend, modify, or repeal any provision of the Coastal Zone Management Act of 1972.

SEVERABILITY

SEC. 306. If any provision of this Act, or the application of any such provision to any person or circumstance, shall be held invalid, the remainder of this Act, or the application of such provision to persons or circumstances other than those as to which it is held invalid, shall not be affected thereby.

E. LETTER TO THE PRESIDENT OF OCS OIL AND GAS DEVELOPMENT,
OCTOBER 7, 1974

U.S. SENATE.

Washington, D.C., October 7, 1974.

THE PRESIDENT
The White House,
Washington, D.C.

DEAR MR. PRESIDENT: We wish to express our surprise and dismay on learning that the Department of Interior is proceeding toward the 1975 leasing of 10 million acres for offshore oil and gas development—including acreage in the Atlantic, the Pacific and the Gulf of Alaska—at a time when environmental baseline studies and state coastal zone management efforts are at a very early stage.

We recognize and support the need to expedite development of the nation's domestic energy resources, including outer continental shelf oil and gas, but we have not been informed of any factual basis for Interior's judgment that 10 million acres in 1975 is the magic number needed by the nation. Moreover, we do not believe it wise to lease in hitherto undeveloped areas before environmental and coastal planning needs are met.

We are particularly concerned that the Interior leasing program is moving ahead with apparent disregard for the inter-agency effort to gather environmental baseline data on the proposed new areas, and similar disregard for state efforts to develop coastal zone management

programs in accordance with the Coastal Zone Management Act of 1972.

We have serious doubts about the oil and gas industries' financial and technical capability to develop such a large number of acres in a single year, and about the rational basis for selecting this level of leasing as appropriate or necessary for the nation's energy needs. We understand that the Department of Interior is in the early preparatory stages of an environmental impact statement on the 10-million acre program, as required by the National Environmental Policy Act of 1969. Hopefully, the Interior Department EIS will set forth the rationale behind the program. It seems most untimely, therefore, for lease sales to be planned before the completion of environmental impact studies or the determination of whether 10 million acres is a realistic or reasonable level for 1975 leasing.

The Senate recently passed S. 3221, the Energy Supply Act of 1974, which provides for several notable improvements in OCS leasing policies and practices. However, the House of Representatives has not yet acted on OCS legislation, and the deliberations of both Houses are expected to continue into the next Congress. We believe that OCS leasing in new areas should await the outcome of that legislative process.

The National Ocean Policy Study of the Senate is currently analyzing OCS issues. Preliminary analysis by the Study supports our belief that offshore leasing programs should proceed only as rapidly as the state and federal programs for coastal planning and environmental data gathering can proceed.

You will recall that the Council on Environmental Quality, in reporting to former President Nixon on its environmental assessment of OCS oil and gas in the Atlantic and the Gulf of Alaska, stated several principles which should guide federal leasing programs. These principles included: a policy of "very high priority on environmental protection" in regard to OCS exploration and development; a leasing program in which the location and phases of lease sales are "designed to achieve the energy supply objectives . . . at a minimum environmental risk"; use of the "best commercially available technology . . . to minimize environmental risk"; federal regulations for environmental protection that are "fully implemented and requirements strictly enforced"; federal consultation with state and local authorities to provide affected areas with "complete information as early as possible so that planning can precede and channel the inevitable development pressures"; a "major advisory role" for the interested public in OCS management and regulation.

We suggest, Mr. President, that unless given higher federal priority, environmental and coastal planning measures cannot possibly be fully implemented in time for 1975 leasing in all new areas of the Atlantic and the Gulf of Alaska, and premature leasing in these new areas cannot possibly adhere to the principle of expanding energy supplies with minimum environmental risk.

We urge you to revise the federal leasing program to ensure the concurrent progress of environmental baseline studies, impact assessment, and federal assistance to state coastal zone management programs. The 1975 program should, in our view, also await a factual justification for leasing 10 million acres, some in new areas, includ-

ing a determination that the oil and gas industries can cope with this high level of development.

When leasing does take place in new areas, we believe the areas chosen should reflect the results of environmental studies, and should begin with those areas found to hold the lowest level of risk to the marine and coastal environments. If we are to avoid undue delay in developing the outer continental shelf, we must step up federal funding of environmental baseline studies and federal assistance to coastal states as they develop their coastal zone management programs. This way, the OCS leasing program will clearly conform to the findings of the CEQ study, the views of the coastal states many of us represent, and the spirit of the Coastal Zone Management Act of 1972, which requires federal programs affecting the coastal zones to be consistent with state coastal zone management programs.

We were most heartened by your inaugural address to the Congress, in which you expressed your desire to build a good marriage with Congress and work together to solve the critical problems before us. We applaud your sincerity and we certainly share your goal. For this reason, we urge you to make it possible for us to work together toward a rational policy for development of the outer continental shelf. The Interior Department's unilateral decision to go ahead with a hasty and ill-conceived 1975 leasing schedule at this time represents a serious impediment to our cooperative efforts. We hope you will heed and share our views on this vital matter.

Sincerely yours,

ERNEST HOLLINGS, EDWARD KENNEDY, EDWARD W. BROOKE,
ALAN CRANSTON, MARK O. HATFIELD, CHARLES MCC. MATHIAS,
JR., CLAIBORNE PELL, JOHN TUNNEY, JOSEPH BIDEN, THOMAS J.
MCINTYRE, LOWELL WEICKER, CLIFFORD P. CASE, HARRISON A.
WILLIAMS, JR., LAWTON CHILES, BILL HATHAWAY, EDMUND S.
MUSKIE, JACOB K. JAVITS, JOHN O. PASTORE, BOB PACKWOOD,
HUBERT H. HUMPHREY.

F. SUMMARY OF CEQ REPORT

OCS OIL AND GAS—AN ENVIRONMENTAL ASSESSMENT. A REPORT TO
THE PRESIDENT BY THE COUNCIL ON ENVIRONMENTAL QUALITY,
APRIL 1974

CHAPTER 1—SUMMARY OF FINDINGS AND RECOMMENDATIONS

This is a report about energy development and the environment. It was prepared by the Council on Environmental Quality in response to the President's April 18, 1973, request to "study the environmental impact of oil and gas production on the Atlantic Outer Continental Shelf and in the Gulf of Alaska." (1)

This report, and the studies that contribute to it, take on great importance in view of the pressures of the energy crisis and the drive toward self-sufficiency. In his January 23, 1974, Energy Message, for example, the President directed the Secretary of the Interior to triple leasing originally planned on the OCS to 10 million acres in 1975. However, recognizing the complex environmental issues involved, he reiterated his commitment that leasing on the Atlantic OCS and in the Gulf of Alaska would not go forward pending the results of this study.

This report presents the results. It squarely faces the issues of energy development and environmental protection. And it concludes that these objectives are not mutually exclusive. It does not give the drillers a green light. Nor does it call for a freeze on development. Instead, it assesses the relative environmental vulnerabilities of the areas studied and recommends procedures, requirements, and stipulations for protection and for development. The recommendations attempt to provide environmental guidance on alternative OCS development decisions.

The report establishes an agenda for action to improve OCS technology, tighten regulation and enforcement of OCS operations, and untangle the bewildering web of institutional interests between the states and the Federal Government and among the Federal agencies. It provides information and methods of analysis that should be useful to the Department of the Interior and other Federal agencies in considering environmental aspects when determining those sites to hold back from lease sale and those to offer for lease and in integrating environmental factors into the design of an optimum leasing schedule. The data and methodology provided here will also help states and localities to anticipate and plan for the onshore impacts of OCS development. And, of course, it will aid in preparing environmental impact statements for individual lease sales.

SCOPE OF STUDY

This study assesses the potential environmental impacts of oil and gas development on the Atlantic and Gulf of Alaska outer continental shelves:

Chapter 2, *Oil and Gas Resources*, examines estimates of potential oil and gas resources in the Atlantic and Gulf of Alaska.

Chapter 3, *Perspectives on Energy Growth*, projects potential energy needs and evaluates the environmental impacts of fuels that can be used to meet these needs.

Chapter 4, *Technology for Developing Oil and Gas Resources Offshore*, reviews the basic steps of offshore oil and gas exploration and presents estimates of oil spill probabilities.

Chapter 5, *Natural Phenomena and OCS Development*, explores the unusual physical conditions facing operations in the Atlantic and in Alaska.

Chapter 6, *Offshore Effects of OCS Development*, concentrates on the environmental impact of operations in the ocean, on the shelf, and along the coast resulting from the exploration, production, and transportation of oil and gas.

Chapter 7, *Onshore Effects of OCS Development*, analyzes the economic, social, and environmental impacts of onshore development—oil refining, gas processing, petrochemical manufacturing, and support services—induced by development offshore.

Chapter 8, *Technology and Environmental Protection*, examines the extent to which oil and gas exploration and production technology and practices protect the environment.

Chapter 9, *Institutional and Legal Mechanisms for Managing OCS Development*, looks into the effectiveness of Federal regulatory and enforcement processes and the broader issues of government coordination and planning.

Witnesses at the Council's public hearings on OCS development suggested many areas of study oriented toward modifying the current OCS management system. Proposals ranged from fundamentally changing the roles of government and industry in developing resources on public lands to alternative methods of bidding on OCS leases. They included suggestions to set up a public corporation for oil and gas exploration and development in new OCS areas, to authorize the U.S. Geological Survey or a public corporation to conduct all exploratory drilling, to adopt a new leasing system based on royalty bidding rather than on bonus bidding, and to establish an exploration leasing system which would precede issuance of development leases.

While these and other such proposals merit consideration within the context of an evolving national energy policy, they involve extremely complex technical and financial issues not directly related to the environmental impacts of OCS oil and gas operations and thus do not fall within the scope of this study. For similar reasons, this report does not include economic analyses of alternative OCS management arrangements or of alternative energy supplies.

BACKGROUND

The Outer Continental Shelf Lands Act of 1953 (2) is the basic charter governing exploration for the development of the minerals and other resources under the OCS. In essence, it is a statute designed to promote development, enacted well before the major environmental legislation of the past few years: the National Environmental Policy Act of 1969 (NEPA) (3) and three 1972 laws—the Coastal Zone Management Act, (4) the Federal Water Pollution Control Act Amendments, (5) and the Marine Protection, Research and Sanctuaries Act. (6) This new legislation has in effect "amended" the OCS Lands Act by requiring incorporation of more stringent environmental values and needs in its administration.

Oil and gas development on the Gulf of Mexico and California OCS began with exploration in shallow state waters nearshore. The first offshore platform was constructed in 1897 off Santa Barbara. Fifty years later, the first platform out of sight of land began operating off Louisiana. Today's multibillion dollar offshore oil industry was well established before the Federal Government began selling leases on the Gulf of Mexico OCS nearly 20 years ago. Since then the industry has grown dramatically, advancing into deeper waters. Until recently Federal supervision was primarily concerned with volume of resources produced and operation of leases; from 1954 to 1968, over 7,300 wells were started on the OCS. In 1969, however, the blowout of a Union Oil Company platform in the Santa Barbara Channel focused national attention on the hazards of offshore operations. Subsequent accidents accompanied by fires in the Gulf of Mexico underscored questions about the adequacy of OCS technology and practices.

Since then, more stringent Federal regulations for OCS operations have been issued and the Federal enforcement effort has been strengthened. However, environmental groups and individual citizens continue to express concern, not only about massive oil spills and fires, but also about discharges of oily water, drilling mud, and drill cuttings—the "housekeeping" operations of an offshore facility—and about the changes that result on land from industrial and other development.

generated to support offshore drilling operations. As CEQ heard time and again at the public hearings, particularly along the Atlantic, the public is concerned about the overall impact of offshore oil production on the oceans, beaches, and wetlands and on the shoreside communities where the oil is landed and processed or which serve as bases for servicing offshore operations.

STATEMENT OF PRINCIPLES

Whether to open specific frontier areas in the Atlantic and Gulf of Alaska OCS is a critical public policy issue because of the importance of these resources to our Nation's energy needs, the possible risk of damage to the environment, and the potential impact on the economy and social structure of communities onshore resulting from construction of refineries and other support facilities. Such an issue must be approached with caution, intelligence, and judgment.

On the basis of its year-long study, the Council on Environmental Quality has concluded that leasing undertaken in these waters must be conducted under carefully stipulated and controlled conditions, and that the Federal Government must be guided by and committed to the following principles in choosing areas to lease and in administering environmentally safe offshore operations:

Exploration and development of the OCS must take place under a policy which puts very high priority on environmental protection.

The location and phasing of OCS leasing should be designed to achieve the energy supply objectives of the leasing program at minimum environmental risk.

The best commercially available technology must be used to minimize environmental risks in new OCS areas.

Regulatory authorities available to Federal agencies must be fully implemented and requirements strictly enforced to minimize environmental risks in new OCS areas.

Planning at all phases of OCS oil and gas operations must respect the dynamic relationship between initial Federal leasing decisions and subsequent state and local community action. The states and the communities affected must be given complete information as early as possible so that planning can precede and channel the inevitable development pressures. Experience must be continuously integrated into the management process.

The interested public must be given the opportunity to participate and play a major advisory role in the Federal management and regulation of the OCS.

These principles, if applied consistently by responsible government and industry decisionmakers at all stages of the development of new OCS areas for oil and gas, will provide the basis for policies and programs that can significantly reduce risk to every element of the environment.

Development of OCS oil and gas in accordance with these principles poses major challenges to Federal management and regulatory agencies, to the states affected by the offshore activities, and to the oil industry. Risk of damage to the human and natural environment is an inseparable part of almost any development, including the OCS. The guiding principles must be to keep risks at an acceptable level

and to balance risks with benefits. When a risk—based on the current state of knowledge and technology—appears to outweigh that of an available alternative for meeting the same objectives, we should not move ahead until we know more and can do better. When the risk is acceptable, we should proceed with caution and with a commitment to prevent or minimize damage. This means that the oil industry must have adequate technology and must use it safely, that Federal agencies must exercise their management and regulatory responsibilities to ensure that the oil industry meets its obligations, and that Federal, state, and local agencies must coordinate their efforts to minimize disruption of coastal communities and environments by those facilities and other development required to support offshore operations.

MAJOR FINDINGS AND RECOMMENDATIONS

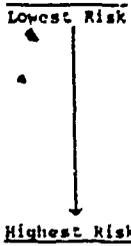
This section presents the major findings and recommendations of the Council study.

Relative Ranking of Environmental Risk of OCS Areas

In the April 18, 1973, Energy Message announcing this study, the President said that “[n]o drilling will be undertaken . . . until its environmental impact is determined.” Thus the major questions that the Council attempts to answer here are: What are the relative risks of development in these OCS areas? What can be done to reduce these risks? In what ways is our knowledge too little to answer these questions?

To provide a framework for answering these questions, CEQ identified 23 hypothetical locations of potential oil and gas accumulations in the Atlantic OCS and in the Gulf of Alaska and 8 sample onshore areas where the induced industrial development from oil and gas production could occur. For the Atlantic, four resource locations were identified in the Georges Bank Trough off New England, five locations in the Baltimore Canyon Trough off the Middle Atlantic, and five locations in the Southeast Georgia Embayment off the coast from northern Florida to South Carolina. The sample onshore sites studied were Bristol County, Mass.; Cumberland/Cape May Counties, N.J.; Charleston, S.C.; and Jacksonville, Fla. (see Figure 1-1). For the Gulf of Alaska, nine resource locations were identified, and potential onshore effects were examined at Cordova and Valdez and in the Puget Sound and San Francisco Bay areas (see Figure 1-2). Chapter 2 discusses in detail the methodology for selecting these hypothetical resource locations, and Chapter 7 deals with the sample onshore site selections.

The Council believes that the following order of relative environmental risk applies to development of the Atlantic and Alaskan outer continental shelves.



- Eastern Georges Bank (East of 68° W; EDS 1 and 2)
- Southern Baltimore Canyon (South of 37° N; EDS 9)
- Western Georges Bank (West of 68° W; EDS 3 and 4)
- Central Baltimore Canyon (Between 37° and 39.5° N; EDS 6, 7, and 8)
- Northern Baltimore Canyon (North of 39.5° N; EDS 5)
- Southeast Georgia Embayment (EDS 10, 11, 12, 13, and 14)
- Western Gulf of Alaska (West of 150° W; ADS 7, 8, and 9)
- Eastern Gulf of Alaska (East of 150° W; ADS 1, 2, 3, 4, 5, and 6).

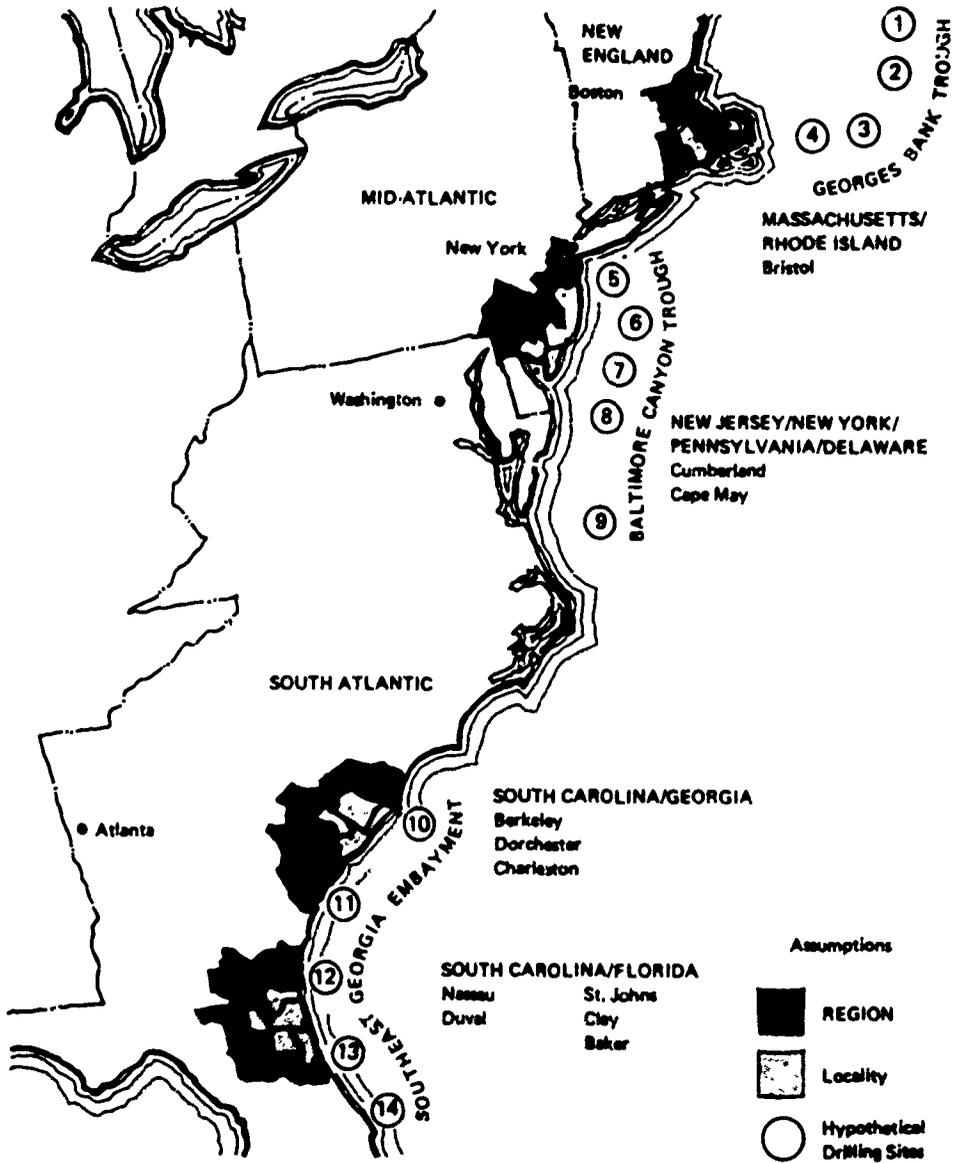


Figure 1-1. Atlantic Hypothetical Drilling Sites and Hypothetical Onshore Development Areas

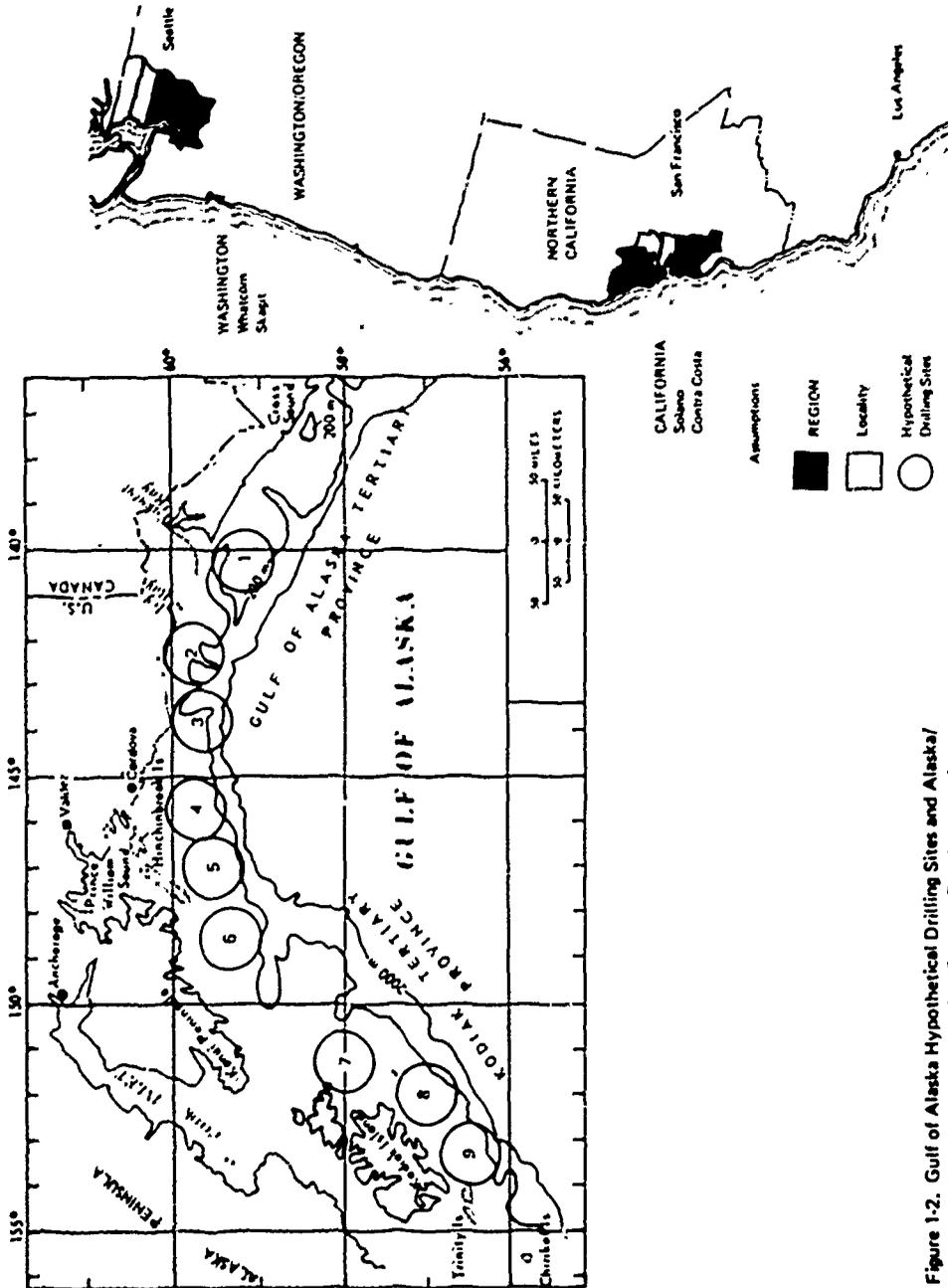


Figure 1-2. Gulf of Alaska Hypothetical Drilling Sites and Alaska/ West Coast Hypothetical Onshore Development Areas

This ranking represents CEQ's best estimate of the overall relative degree of risk to the marine, coastal, and human environment resulting from OCS oil and gas development. Of course, the risk must be balanced against the value and benefits of the oil and gas to be recovered. The ranking is based on an assessment and integration of the findings of this study with respect to the effects of development onshore as well as of oil spills offshore, the incidence of unusual phenomena in potential development areas, the state of technology, and projections of regional energy needs.

CEQ believes that high environmental risk is involved in the development of the Northern Baltimore Canyon, the Southeast Georgia

Embayment, and the Gulf of Alaska. Less risk would face development of the Central and Southern Baltimore Canyon and Georges Bank. The risk of damage from offshore operations can be decreased by strict requirements for environmentally protective technology and improved practices. The timing, magnitude, and location of onshore development must be controlled by state and local land use plans and regulations.

Studies of oil spill probabilities show that the size range of individual spills is extremely large, from a fraction of a barrel to over 150,000 barrels, although most spills are at the low end of the range. For example, three spills each year accounted for two-thirds of all the oil spilled from 1970 and 1972. Amounts can vary by a factor of 1 million, and a single large spill distorts the statistical distribution of spill magnitudes. For an oil field find of medium size (2 billion barrels in place), there is about a 70 percent chance that at least one platform spill over 1,000 barrels will occur during the life of the field; for a small oil field find (500 million barrels in place), the chance is about 25 percent. If a large platform spill does occur, there is an 80 percent chance that it will exceed 2,380 barrels and a 35 percent chance that it will exceed 23,800 barrels.

It should be noted that in view of the lack of scientific data on the effects of oil spills and discharges on offshore fisheries, the Council's ranking of offshore damages relies heavily on the probability of oil spills impacting biologically productive coastal wetlands and estuaries and intensively used recreational beaches. This does not mean that oil spills do not cause damage enroute to shore or at sea. It simply reflects the fact that we know something about the effects of oil on wetlands and beaches but considerably less about its effect on the offshore marine environment. Indeed, for many Atlantic areas and particularly for Gulf of Alaska areas, there is a scarcity of information on which to base projections of the impacts of oil on most marine life.

Carefully designed baseline environmental studies should be initiated immediately in potential leasing areas and should be an essential and continuing part of OCS management. Such studies should be closely monitored and coordinated so that information can be integrated into ongoing operations and the results applied to decisions on leasing and regulating new areas. Special attention should be focused on determining long-term or synergistic effects of oil and other pollutants, if any, on marine organisms so that corrective actions can be taken as soon as possible.

Georges Bank. In the Georges Bank, the thick section of sediments with the greater likelihood of oil and gas accumulation lies farther from shore than in any of the other OCS areas considered. Should oil spills occur, the probabilities of oil reaching shore from hypothetical drilling sites located in the eastern part of the Bank (EDS 1 and 2) are generally low—a maximum of 15 to 20 percent in the spring and near zero in the winter (see Table 1-1). The average time required for the oil to reach shore from these sites ranges from 80 to 150 days, with oil from the more remote site (EDS 1) taking the longest time. This is important because oil that has been exposed to long periods at sea, i.e., that is weathered, is less toxic than freshly spilled oil. Even if such oil should come ashore, it is likely to damage organisms severely in the biologically fragile nearshore and estuarine areas.

TABLE 1-1.—PROBABILITIES OF OIL SPILLS COMING ASHORE FROM HYPOTHETICAL DRILLING SITES

Hypothetical spill site	Percent ashore worst season	Percent ashore best season	Hypothetical spill site	Percent ashore worst season	Percent ashore best season
Atlantic coast:			Gulf of Alaska:		
EDA 1.....	15	(1)	ADS 1.....	95	40
EDA 2.....	20	(1)	ADS 2.....	95-100	75
EDS 3.....	35	(1)	ADS 3.....	95-100	55
EDS 4.....	50	5-10	ADS 4.....	95-100	55
EDS 5.....	10	(1)	ADS 5.....	95	60
EDS 6.....	20	0-5	ADS 6.....	95-100	60
EDS 7.....	20	5	ADS 7.....	45	5
EDS 8.....	20	0-5	ADS 8.....	5	0-5
EDS 9.....	(1)	(1)	ADS 9.....	5-10	(1)
EDS 10.....	95	(1)			
EDS 11.....	95-100	5			
EDS 12.....	90	15			
EDS 13.....	50	(1)			

Source: Massachusetts Institute of Technology Department of Ocean Engineering, 1974, "Oil Spill Trajectory Studies for Atlantic Coast and Gulf of Alaska," prepared for the Council on Environmental Quality under contract No. EOC330.

¹ Near zero.

In the western part of the Bank (EDS 3 and 4), where the probability of a spring oil spill or discharge reaching shore is 35 to 50 percent and the average time to shore ranges from 40 to 120 days, the physical persistence of oil on the rocky shores of New England would, in general, be less damaging than in the salt marshes and wetlands of the Middle and South Atlantic.

Little is known about the potential biological impacts of oil spills and discharges to fisheries on the Bank itself. These fisheries, however, are valuable and must be protected by stringent controls on discharges.

Analysis of the onshore effects of OCS development in the Georges Bank indicates that there would be significant net economic benefits to New England. Heavily dependent on oil and natural gas, New England could possibly obtain 30 percent of its crude oil and 70 percent of its natural gas requirements from the Bank by 1985, assuming medium energy demand growth and average Georges Bank production estimates.

The Council believes that economic activity induced onshore by offshore oil and gas operations would not unmanageably burden the socio-economic structure or the natural environment. Locally, up to 19,000 new jobs could be created by 1985 (see Table 1-2); regionally, employment could increase 1 to 3 percent and economic output, largely from refining, could increase 1 to 5 percent. Local impacts on land use and social and physical systems due to refinery siting could be severe, although regional impacts would be slight. Adverse impacts could be lessened by directing onshore development activities toward the older cities, like Fall River and New Bedford which need economic stimulants, and away from smaller towns whose social and physical structure could be overwhelmed by large-scale development. Increases in both air and water pollutants can be expected in local areas, even assuming best available control technology, and care must be taken that ambient standards are not violated. The time required for oil to come ashore from these central sites is from 2 to 3 months on the average, with minimum times in the range of 46 days. There appears to be little seasonal dependence in the time to shore, although the probability of impacting ashore is strongly season dependent.

TABLE 1-2.—SUMMARY OF ONSHORE IMPACTS, EAST COAST: HIGH DEVELOPMENT¹

Key Impacts	New England				Mid-Atlantic			
	1985		2000		1985		2000	
	Local	Region	Local	Region	Local	Region	Local	Region
Primary impacts:								
Number of offshore platforms (25,000 barrels per day).....	38	38	68	68	38	38	68	68
Number of refinery equivalents (200,000 barrels per day).....	1.4	2.8	2.8	5.6	1.9	4.2	2.8	7.2
Number of gas processing plants (500,000,000 ft ³ per day).....	2	2	4	8	2	2	4	8
Number of petrochemical complex equivalents (1,000,000,000 lb per year olefins).....	0	0.5	0.8	2.4	1.0	2.2	1.9	6.0
Value of incremental construction (millions of 1970 dollars).....	196	387	79	155	118	332	7	84
Aggregate impacts:								
Employment (thousands).....	19.0	76.7	17.3	83.1	28.8	100.2	31.9	120.8
Percent.....	(9)	(3)	(7)	(3)	(19-30)	(2)	(20-39)	(2)
Population (thousands).....	43.6	188.8	38.8	191.7	59.4	227.0	66.0	268.6
Percent.....	(9)	(3)	(7)	(3)	(19-27)	(2)	(19-26)	(2)
Acres required (thousands).....	7.0	24.3	8.0	26.9	32.4	49.3	35.3	57.0
Percent.....	(8-9)	(3)	(9)	(3)	(18-26)	(4)	(18-25)	(4)
Hydrocarbon loadings (thousand tons per year).....	16.6	36.6	34.6	71.9	27.3	57.3	40.2	103.6
Percent.....	(592)	(6-8)	(1116)	(87-134)	(41-273)	(7-14)	(14-338)	(11-27)
Biological oxygen demand (million tons per year).....	0.9	3.2	1.8	5.7	1.6	4.3	2.4	7.8
Percent.....	(14)	(5)	(23)	(6)	(29-86)	(4)	(30-104)	(6)
Primary impacts:								
Number of offshore platforms (25,000 barrels per day).....	38	33	68	68	38	38	68	68
Number of refinery equivalents (200,000 barrels per day).....	1.4	2.8	2.8	5.6	1.4	1.4	2.8	4.2
Number of gas processing plants (500,000,000 ft ³ per day).....	2	2	4	8	2	2	4	8
Number of petrochemical complex equivalents (1,000,000,000 lb per year olefins).....	1.2	2.4	4.2	7.4	0	0	4.2	5.8
Value of incremental construction (millions of 1970 dollars).....	228	405	91	162	271	434	108	174
Aggregate impacts:								
Employment (thousands).....	59.2	87.9	75.8	109.9	37.0	53.9	58.7	84.6
Percent.....	(29-41)	(19-24)	(28-38)	(20-25)	(9-10)	(11-12)	(12-13)	(14-16)
Population (thousands).....	137.5	250.8	145.4	272.9	82.3	142.8	111.2	202.4
Percent.....	(27-34)	(20-25)	(24-31)	(20-25)	(9)	(12-13)	(10)	(15-16)
Acres required (thousands).....	26.0	64.6	29.6	75.4	25.4	43.2	33.3	64.9
Percent.....	(24-29)	(16-18)	(23-29)	(17-20)	(7-8)	(9-10)	(8-9)	(11-14)
Hydrocarbon loadings (thousand tons per year).....	24.5	48.4	47.6	94.9	17.6	21.2	43.2	71.8
Percent.....	(75-150)	(44-111)	(11-24)	(62-175)	(73-149)	(43-64)	(111-294)	(73-156)
Biological oxygen demand (million tons per year).....	2.1	5.6	4.3	10.8	2.8	3.8	8.1	11.7
Percent.....	(53-78)	(28-34)	(81-120)	(37-60)	(13-15)	(15-17)	(25-31)	(28-38)

¹ All impacts are over base case conditions. The numbers in parentheses represent percentages over base case conditions, the 1st over base case 2 and the 2d over base case 1; where there is only 1 number, the percentage increase is the same for either base case. See ch. 7 for a detailed description of cases and impacts.

Source: Resource Planning Associates, Inc., and David M. Dornbusch & Co., 1974, "Potential Onshore Effects of Oil and Gas Production on the Atlantic and Gulf of Alaska Outer Continental Shelf," prepared for the Council on Environmental Quality under contract No. EQ4AC002.

Baltimore Canyon. In the Baltimore Canyon, the thickest sections of sediments parallel the coast 50 to 75 miles out. Should oil spills occur, the probability of their reaching shore from hypothetical drilling sites in the central part of the region (EDS 6 to 8) is generally small, although slightly higher than from EDS 1 and 2 in the Georges Bank. The maximum probability for EDS 6 to 8 is 20 to 25 percent in the spring; during the winter the probability is 0 to 5 percent.

At the northern end of the Baltimore Canyon, the movement of oil spills from hypothetical drilling sites is markedly different. Although there is only a 10 percent chance that oil spilled 50 miles south of Long Island (EDS 5) would come ashore on Long Island during the spring, this probability increases dramatically as the hypothetical oil release point moves north toward Long Island. Oil released 25 miles south of Long Island in the spring would come ashore 75 percent of the time; oil released 10 miles south would come ashore 95 to 100 percent of the time during that season. The probabilities are considerably lower in winter.

The potential sites in the Baltimore Canyon are near coastal wetlands and salt marshes which are biologically valuable and serve as prime nesting and feeding areas for waterfowl. Oil reaching these salt marshes would persist in marsh biota and fine sediments for a number of years. In addition, oil spills in the northern part of Baltimore Canyon would tend to beach in northern New Jersey and Long Island, impacting some of the Nation's most intensively used recreational areas.

The northern part of the Middle Atlantic region is one of the most densely populated and industrialized areas in the country. This region contains nearly all of the 1.6 million barrels per day refining capacity now located on the east coast. Because of the larger population and existing industrial base, the regional economic benefits from OCS oil and gas development would be less significant than in New England. Potential oil and gas production from the Baltimore Canyon would provide about 10 percent of regional oil and natural gas requirements by 1985 (assuming medium demand and average production). This production would represent an important contribution to the region's energy needs but would not substantially offset the expanded need for supplemental energy supplies in the region.

As in New England, economic activity induced by OCS development would not appear to cause unacceptable socioeconomic or environmental pressures provided that development is directed to appropriate locations, is adequately planned well in advance, and is controlled. Adverse impacts would be more significant in the southern part of the region, less so in already industrialized areas, but minor in the region as a whole.

If production from the Baltimore Canyon is low, then the oil is likely to be transported by tanker and processed in existing or expanded refineries in the industrial belt between Wilmington and New York City. Although local environmental impacts may result from refinery expansion, the onshore impacts of low Baltimore Canyon production would be little noticed either positively or negatively. However, if oil production is high, it is likely that new refinery capacity would be required and much of the oil piped to new refineries which are likely to be sited in relatively rural areas in the southern part of the region, such as Cumberland and Cape May Counties in

New Jersey. By 1985, up to 30,000 new jobs could be created, increasing local employment 30 percent. Local economic output could increase 56 percent, but only 3 to 4 percent in the region. The associated population growth could place great stress on public facilities such as schools, hospitals, and water supplies in the local area. Induced industrial development might cause significant pressures on available unused land.

The southern part of the region could also experience major socio-economic impacts. Resort industries, agriculture, and light manufacturing are the primary sources of employment now. OCS development could significantly transform the economic structure of the southern part of the region to a petroleum industry base, thus substantially changing the lifestyle and environment of the area.

Southeast Georgia Embayment. The Southeast Georgia Embayment area with the greatest potential for OCS oil and gas accumulation is very near shore, and the probabilities are high that oil spills from this area would come ashore in a very short time. In the spring and summer months, should a spill occur from EDS 10, 11, or 12, there is a 90 to 100 percent probability of its coming ashore, but the probability diminishes to 15 percent or lower during the fall. Spills at these sites appear more sensitive to distance from shore than at any other OCS location considered in this study. From EDS 11 a spill occurring in April could come ashore in as little as 6 days (spring average, 36 days). A spill occurring at EDS 12 during summer could come ashore in only 18 days (summer average, 60 days). This site is the one farthest from shore.

The South Atlantic experiences more severe storm conditions than those prevalent in either the Gulf of Alaska or the North Sea.

Hurricanes are frequent and the highest waves in any of the OCS areas are found here; a wave of 87 feet was recorded off Georgia, and 60 to 70 foot waves are common off Cape Hatteras.

The South Atlantic coastline, particularly from Myrtle Beach nearly to Jacksonville, is unusually diverse and is largely undeveloped. Large estuaries alternate with beautiful sandy beaches and highly productive grass flats. Any OCS development affecting this exceptional section of coast must be carefully integrated with existing ecosystems. Onshore industrial sites should be directed inland—away from the biologically fragile coastal wetlands. Resort and recreational uses of beaches are also of prime importance; a spill at EDS 12, for example, would probably come ashore at St. Augustine.

Onshore effects of OCS development could be of greater magnitude in the Southeast Georgia Embayment region than in any other OCS area. However, the potential production of oil and gas from the Southeast Georgia Embayment could provide approximately 15 percent of the South Atlantic region's needs (assuming medium demand and average production).

Economic and social changes will be particularly significant in this region but will differ in magnitude between the Charleston and Jacksonville areas. For the Charleston region, most industrial and commercial activity in support of the refining and petrochemical industry would be expected to locate in or near the city because it is the only major metropolitan area within the surrounding region. As such, under high impact conditions the population of the immediate Charles-

ton area could as much as double by 1985 and 59,000 new jobs could be created. This expansion can be equated with development of a new city: up to 37,000 new dwellings (demanding over \$1 billion in mortgage financing) along with schools, public services, and utilities. Cultural, natural, and historic resources could be threatened. The surrounding region could experience a similar employment growth rate—up to 88,000 new jobs by 1985 and 110,000 by 2000.

The region comprising Jacksonville and its surroundings could accommodate high OCS impacts more readily than Charleston. Jacksonville is already undergoing extensive growth, and the existing infrastructure is better equipped to plan for and assimilate population increases. With OCS development, employment could increase by up to 37,000 by 1985 and 57,000 in 2000. Population could increase by up to 50 percent in 1985. Impact on regional growth would be about the same as those for the local area.

Air and water pollution could be a significant problem. BOD could double in both the Charleston and Jacksonville areas, and hydrocarbon emissions would rise as a result of refinery and petrochemical development. Care must be taken to avoid violating ambient air and water quality standards.

Land requirements could easily be met in both areas, but the many swamps, salt marshes, and wetlands would require careful industrial, commercial, and residential siting.

Gulf of Alaska. The Gulf of Alaska hypothetical drilling sites are dispersed along the coastline, but they can be separated into eastern and western areas at 150°W longitude. Should a spill occur, it would have a lower probability of coming ashore in the western than in the eastern area (see Table 1-1). For instance, the maximum probability from the ADS 7 is 45 percent in summer but less than 10 percent in all other seasons, and the probabilities of a spill coming ashore from ADS 8 to 9 are no greater than 10 percent in any season. The situation is considerably worse in the eastern Gulf area where the probabilities for a spill coming ashore from all sites (ADS 1 through 6) are no lower than 40 percent in winter and exceed 95 percent in the summer. In the eastern area, the minimum time to reach shore could be as little as 3 days from ADS, but more representative is the 7 or 8 days from the other sites. The average times to shore are typically in the 20- to 30-day range, with seasonal variation. A critical factor is the retardation of oil weathering in northern regions due to cold water. Further, due to the reduced sunlight in winter, weathering can be expected to be slowest in the Gulf of Alaska.

Biological data are scant on the Gulf of Alaska, but fish spawning and bird nesting in coastal areas are known to be of vital ecological importance, particularly in the eastern Gulf area. If an oil spill should occur, there is a high probability of its coming ashore in the eastern Gulf in the summer months. This is the time of prime nesting for migratory birds and of the early larval life of newly spawned fish.

Storms are more frequent in the Gulf of Alaska than anywhere else in the Northern Hemisphere. The storms generally move west to southwest and then southeast. Icing could be a problem in February. The impact of earthquakes and tsunamis is another matter—major earthquakes of Richter 7 magnitude are common every 3 to 5 years, and severe Richter 8 earthquakes can be expected every 25 years.

Tsunamis also are frequent and would not only create damage at fixed berth tanker sites, but in conjunction with earthquakes they can severely stress underwater storage facilities.

The OCS production of oil and gas from the Gulf of Alaska would provide more supplemental supplies of oil and gas than are needed on the west coast and in Alaska itself. This would probably mean that present patterns of oil distribution would be changed, with more oil being shifted to the Midwest and east coast.

Onshore impacts are considered for Alaska and the west coast together because no significant new refining or petrochemical development is expected in Alaska (see Table 1-3). There a significant proportion of the economic and social effects would be felt in Anchorage, the center of present Alaskan development and the likely base for much of the commerce servicing offshore operations. However, a number of coastal communities could feel the effects of OCS development in addition to the impacts of Trans-Alaska Pipeline construction and operation. These sparsely populated towns and villages could expect to undergo boomtown conditions with multifold increases in employment and populations as early as 1985. OSC-related employment in Alaska as a whole could grow 20 percent by 1985.

TABLE 1-3
SUMMARY OF ONSHORE IMPACTS, WEST COAST: HIGH DEVELOPMENT¹

Key impacts	Alaska						Washington/Oregon						Northern California					
	1985		2000		1985		2000		1985		2000		1985		2000			
	Local	Region	Local	Region	Local	Region	Local	Region	Local	Region	Local	Region	Local	Region	Local	Region		
Primary impacts:	19	19	60	60	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Number of offshore platforms (25,000 barrels per day).....	0	0	0	0	0.1	0.1	1.3	1.3	0.1	0.1	1.3	1.3	0.1	0.1	1.3	1.3	0	
Number of refinery equivalents (200,000 barrels per day).....	1	2	5	16	0	0	0	0	0	0	0	0	0	0	0	0	0	
Number of gas processing plants (500,000,000 ft ³ per day).....	0	0	0	0	0	0	3.0	3.0	0	0	3.0	3.0	0.5	0.5	2.9	2.9	0	
Number of petrochemical complex equivalents (1,000,000,000 lb. per year olefins).....	16	55	6	21	214	214	86	86	214	214	86	86	194	194	78	78	0	
Value of incremental construction (millions of 1970 dollars).....	1.1	4.4	0.8	3.7	11.0	17.3	16.5	32.2	11.0	17.3	16.5	32.2	16.4	28.3	22.0	42.7	0	
Aggregate impacts:	(36)	(2)	(12)	(1)	(17)	(2)	(19)	(2)	(17)	(2)	(19)	(2)	(6)	(1)	(5)	(1)	(1)	
Employment (thousands).....	4.2	16.0	3.4	12.9	22.0	39.0	31.4	71.0	22.0	39.0	31.4	71.0	33.7	67.3	42.4	97.0	0	
Population (thousands).....	(43)	(4)	(13)	(2)	(15)	(2)	(17)	(2)	(15)	(2)	(17)	(2)	(3)	(1)	(3)	(1)	(1)	
Percent.....	n.a.	n.a.	n.a.	n.a.	8.1	10.8	13.2	18.5	8.1	10.8	13.2	18.5	5.2	7.3	7.8	10.9	0	
Acres required (thousands).....	n.a.	n.a.	n.a.	n.a.	(12)	(2)	(16)	(3)	(12)	(2)	(16)	(3)	(3)	(1)	(4)	(2)	(2)	
Percent.....	n.a.	n.a.	n.a.	n.a.	1.7	1.8	23.4	23.6	1.7	1.8	23.4	23.6	15.1	15.5	43.3	43.7	0	
Hydrocarbon loadings (thousand tons per year).....	n.a.	n.a.	n.a.	n.a.	(3)	(2)	(42)	(18)	(3)	(2)	(42)	(18)	(21)	(1)	(48)	(25)	0	
Percent.....	n.a.	n.a.	n.a.	n.a.	0.2	0.7	2.2	3.7	0.2	0.7	2.2	3.7	1.3	1.8	3.8	4.6	0	
Biological oxygen demand (million tons per year).....	n.a.	n.a.	n.a.	n.a.	(7)	(1)	(53)	(4)	(7)	(1)	(53)	(4)	(15)	(2)	(12)	(3)	0	

¹ All imports are over base case conditions. The numbers in parentheses represent percentages over base case conditions, the first over base case 2 and the second over base case 1; where there is only 1 number, the percentage increase is the same for either base case.

Source: Resource Planning Associates, Inc. and David M. Dornbusch & Co., 1974, "Potential Onshore Effects of Oil and Gas Production on the Atlantic and Gulf of Alaska Outer Continental Shelf," prepared for the Council on Environmental Quality under contract No. EQAC002.

The Puget Sound and San Francisco Bay areas can be expected to be focal points of economic and social impacts related to refining Alaskan OCS oil on the west coast. Puget Sound now has refining capacity; under OCS development, employment in this region could increase up to 20 percent by 1985 and the population up to 15 percent. Land availability will be restricted by the mountainous terrain. Air and water pollution, however, is not expected to be critical.

The San Francisco Bay area also has refining capacity. With OCS development, employment in the region could increase up to 6 percent and population to 3 percent. Land availability is restricted due to the vast amounts of wetlands and marsh along the Bay. Air pollutant emissions could increase up to 40 percent, and care must be taken to avoid violating ambient standards. Water pollution is not expected to be a problem.

The West Coast analyses assume that all Gulf of Alaska OCS crude oil going to the Puget Sound and San Francisco regions would require additional refining capacity beyond that constructed for North Slope or imported crude—construction that is likely to take place earlier than Alaskan OCS development. Thus, to the extent that Gulf of Alaska crude is not needed to meet west coast demand and is shifted to other parts of the country, the impacts described above are overestimated.

OCS Technology and Practices

The technology and practices used in locating and exploiting OCS oil and gas resources continue to evolve. Past experience must be balanced with future expectations in judging the adequacy of OCS technology and the ability of industry to use it safely in new OCS areas. Following the Santa Barbara blowout, the U.S. Geological Survey modified OCS regulations in several significant ways. Further, industry appears to be responding in other areas not directly covered by changes in the OCS orders.

In general, the Council believes that OCS oil and gas technology can operate safely under conditions similar to those in the Gulf of Mexico and the North Sea. However, storm conditions in the Atlantic and storm and seismic conditions in the Gulf of Alaska present more severe threats to personnel safety and environmental protection than the petroleum industry has faced before. Industry's ability to use technology safely is an essential element in minimizing environmental damage from oil and gas operations in new OCS areas. Careful attention to human factors, systems analysis, and personnel training are very important.

Chapter 8 assesses OCS technology and practices in detail. The following recommendations for improvement are based on that assessment:

The continuing search for better technology must build upon an improved understanding of the role of human factors in equipment design and must be coupled with thorough training of the equipment operators. The Council recommends that human factors engineering be employed to the fullest extent in the design of OCS oil and gas equipment. The Department of the Interior should review proposed designs for facilities to be used in new OCS areas and encourage the incorporation of man-machine engineering principles.

Training programs may not be required for all types of jobs, but certainly for the most critical, curriculum standardization and personnel certification should be required. The Council recommends that the Department of the Interior establish minimum Federal standards for critical OCS operator personnel and certify or provide for appropriate accreditation of the training programs.

Rapid, accurate measurement of downhole pressure appears important in improving the ability to maintain well control and to reduce the possibility of blowouts. The Council recommends that the Department of the Interior determine which technologies could improve the measurement of the formation pressure near the drill bit and incorporate them into the OCS orders.

Serious consideration must be given to postponing leasing in an OCS region where oil cannot be safely produced and safely transported to markets because of significant threats of earthquakes, tsunamis, and severe storms. The Council recommends that the Departments of the Interior and Transportation coordinate their evaluation and approval procedures for drilling platforms for new OCS areas. They should prepare detailed performance requirements for such platforms, considering fully the natural hazards in these areas.

The Council recommends that the Department of the Interior, in coordination with the Environmental Protection Agency, develop more detailed guidelines for the disposal of drilling muds, drill cuttings, and other materials, considering fully the results of the Bureau of Land Management monitoring studies of ocean disposal of these materials in new OCS areas.

The Council recommends that the Department of the Interior develop and incorporate in OCS orders detailed performance requirements for production platforms and associated equipment to be used in new OCS areas, with full consideration of natural hazards. The Department should develop in-house capability, or should contract with a qualified independent firm, to evaluate the adequacy of the proposed designs to guarantee structural integrity subject to natural and manmade forces.

The Council recommends that subsea production equipment be used in new OCS areas where it would provide a higher degree of environmental protection and reduce conflict between oil and gas operations and competing uses of the Ocean.

The Council recommends that the Department of the Interior develop detailed performance requirements for a surface-actuated subsurface safety valves and require their use on all production wells in new OCS areas where technically feasible. The Department should encourage the development of such valves with higher pressure ratings and with improved reliability of operation over the life of the devices.

In undeveloped areas like the Atlantic and Gulf of Alaska OCS, environmental loadings of oil and other materials should be kept at the lowest levels possible at least until environmental baseline studies such as those recently initiated by the Bureau of Land Management determine the environmental risk from such materials. The Council recommends that the Department of the Interior and the Environmental Protection Agency, in cooperation establish effluent standards for waste water discharge from OCS drilling, production,

and associated operations. Strong consideration should be given to requiring installation of the best commercially available control technology for oil-water separation in new OSC areas.

The Council recommends that the Department of the Interior develop detailed performance requirements for safety practices for well workover and servicing operations on production platforms and incorporate them in OCS orders for the new areas. The Department should consider regulations encouraging the use of improved technology to minimize the threat of blowouts during workover and service operations.

The Council recommends that the Departments of the Interior and Transportation and the Environmental Protection Agency develop and implement a common reporting system for all accidents associated with OCS operations. This improved system should provide complete unambiguous reporting, with special attention to the analysis of cause-effect relationships.

The Council recommends that the Departments of the Interior and Transportation develop detailed performance requirements for OCS pipeline protection and undertake the development of pipeline integrity monitors to detect incipient failures in OCS pipelines.

The Council recommends that the Department of the Interior, in cooperation with other Federal agencies and the affected states, undertake advanced planning for pipeline corridor siting as soon as the location of potentially producing OCS areas is known and designate corridors which avoid or minimize, to the maximum extent possible, intrusion into environmentally sensitive areas in the marine and coastal regions of new OCS areas.

The Council recommends that the Coast Guard require that new tankers in the U.S. coastal trade (which would include tankers used to carry OCS oil to shore) be constructed with segregated ballast capacity preferably with double bottoms where ship safety would not be jeopardized. Existing tankers used to carry OCS oil to shore should be prohibited from discharging oily ballast water to the oceans. In addition, the Coast Guard should seriously consider requiring new and existing ships to employ advanced accident prevention technologies to improve vessel maneuverability and communications.

Decisions on offshore oil storage in the Atlantic and Gulf of Alaska OCS must fully consider the potential impacts of severe storm and seismic conditions. The Council recommends that the Departments of the Interior and Transportation develop detailed performance standards for offshore storage facilities and incorporate them into OCS orders for the new areas.

The Council recommends that the Federal Government and industry continue efforts to improve oil spill containment and cleanup. The Council recommends further that the Departments of the Interior and Commerce and the Environmental Protection Agency cooperatively consider the identification of critical environmental regions in new OCS areas and the incorporation of appropriate measures into the National Oil and Hazardous Substances Pollution Contingency Plan.

Planning, Coordination, and Regulation

Effective planning for and regulation of OCS activities involve a number of elements: a rational allocation of regulatory rights and responsibilities and an efficient means of coordination among entities

sharing the authority; provision for ensuring that necessary information is obtained and analyzed prior to regulatory actions and that the public has enough information to allow informed participation in the process; ongoing systematic evaluation of OCS technologies and practices and incorporation into OCS regulations specific requirements necessary for environmentally sound operations; enforcement of the requirements through effective inspections and sanctions for noncompliance; and means for compensation of injured parties when mishaps occur.

These elements are discussed in detail in Chapter 9 and are the basis for the following recommendations:

The Council recommends that states affected by new OCS development strengthen their coastal zone management programs by developing special technical expertise on all phases of OCS development and its onshore and offshore impacts. Such augmented state coastal zone management agencies should attempt to ensure that state interests and regulatory authorities are fully coordinated with Federal OCS technical and management activities. Federal agencies should make every effort to cooperate with state coastal zone management agencies on an ongoing basis and at all stages of the management process.

The NEPA process can be an important focus of Federal-state coordination concerning OCS development. The Council recommends that state coastal zone management agencies be given the opportunity to cooperate with Federal agencies in designing and preparing environmental studies used as input to the environmental review process, in addition to commenting on draft environmental impact statement.

The Coastal Zone Management Act provides a framework for Federal-state cooperation in planning for onshore development induced by OCS operations, particularly siting of pipelines, refineries, and other facilities in the coastal zone. The Council recommends that the Secretary of Commerce require that state coastal zone plans consider refineries, transfer and conversion facilities, pipelines, and related development as a condition of approval. State coastal zone management agencies and concerned Federal agencies should jointly participate in developing these portions of the plans.

Many Federal agencies, each with specific missions, have regulatory and operating authority affecting the OCS. There is no formal mechanism for coordinating the exercise of their responsibilities. The Council recommends that the proposed Department of Energy and Natural Resources be established. This centralization of authority would increase the effectiveness of Federal efforts in achieving closely related regulatory objectives in the OCS.

The Council recommends that impact statements on environmentally significant OCS activities include in the discussion of "the range of potential uses of the environment" analyses of possible alternative uses of specific OCS, nearshore, and onshore areas. In addition, the statements should include discussions of onshore impacts. In commenting on draft statements, Federal agencies, states, and interested parties should give particular emphasis to those issues.

OCS decisionmaking could also be enhanced through regional, programmatic impact statements. The Council recommends that programmatic statements should be prepared on a regional basis by all Federal agencies proposing environmentally significant activities on

the OCS. Comprehensive OCS planning could be approached through reconciling various agency statements in the circulation and comment process.

The Council recommends that the Department of the Interior, in consultation with other appropriate Federal agencies, determine the kinds of information and analyses necessary for adequate assessment of environmental factors at all stages of leasing and development. The Department should take measures to obtain such information, including acquisition and analysis of high-resolution, near-surface seismic reflection data for the purpose of determining the nature and magnitude of geologic hazards prior to tract selection.

The Council recommends that the Department of the Interior consider the competitive consequences of requiring disclosure of certain industry data and analyses. The Department should weigh those consequences against the benefits to be obtained and develop standards for governing such disclosures. In making that balance, it should consider particularly the need for informed public participation in the NEPA process.

The Council recommends that, in order to deter violations of OCS orders rather than simply shortening the time that operators take to correct noncompliance, the Secretary of the Interior propose sanctions requiring fixed shutin periods and administrative fines as enforcement measures.

The Council recommends that the Department of Interior determine the frequency and type of inspections necessary to verify compliance during all phases of OCS operations. It should establish inspection teams and procedures in light of those determinations and the scale of OCS development in various regions. State agencies should be invited to participate in these inspection efforts. In addition, the Department should establish a formal training program for the inspection staff.

Citizen suit provisions, which allow interested persons to sue to remedy violations of Federal regulations or permit conditions, can provide a useful compliance mechanism. The Council recommends that the Secretary of the Interior seek the establishment of such a right under the OCS Lands Act.

The Federal Government should carefully consider the full economic and environmental implications of various types of liability—fault or nofault—and various means of ensuring adequate compensation such as liability insurance for operators or a revolving fund financed through charges on operators. The Council recommends that a comprehensive Federal liability system for OCS-related oil spill cleanup and damages be established through new legislation.

Research Needs

In the course of this study, the Council found many gaps in biological, physical, chemical, technological, economic, and social data. These gaps must be closed and the research results must be usefully incorporated in improving OCS management decisions. We have mentioned earlier in this chapter the need for well-designed biological baseline and monitoring studies. Questions of when, where, how, and what to measure also must be answered. Other biological research needs are outlined below and in Chapter 6:

Population life histories for many species, including identification of survivorship, fecundity, larval lifestyle, migrations, and behavior.

Community response at the species level following polluting incidents or in controlled experiments.

Adaptations of organisms to oil exposure, including genetic changes.

Impacts of oil during sensitive stages of species development.

Effects of oil on commercial fisheries.

OCS technology should continue to evolve in order to ensure lower levels of risks from operations in the Atlantic and Gulf of Alaska. Research can contribute to understanding the behavior of offshore structures under storm and seismic forces, to reducing chronic pollution from OCS operations, to improving the integrity of offshore pipelines, and to integrating knowledge of human factors engineering into design. Improved Federal performance standards for OCS operations should draw upon the results of such research.

The Council believes that further study of onshore impacts of OCS activities is needed. Studies focusing on the socioeconomic impacts of OCS development at specific sites will be needed by local decisionmakers. Availability of land for development, impacts on the quality of life, shifts in population and employment patterns—all must be evaluated on a local basis to be of use in state and local planning.

References

- (1) The President's Energy Message of April 18, 1973.
- (2) 67 Stat. 462, 43 U.S.C. § 1313.
- (3) 83 Stat. 852, 42 U.S.C. § 4321.
- (4) 86 Stat. 1280, 16 U.S.C. § 1451.
- (5) 86 Stat. 816, 33 U.S.C. § 1251.
- (6) 86 Stat. 1052, 16 U.S.C. § 1431.

G. SUMMARY OF UNIVERSITY OF OKLAHOMA REPORT

ENERGY UNDER THE OCEANS—A SUMMARY REPORT OF A TECHNOLOGY ASSESSMENT OF OCS OIL AND GAS OPERATIONS

THE TECHNOLOGY ASSESSMENT GROUP SCIENCE AND PUBLIC POLICY PROGRAM, UNIVERSITY OF OKLAHOMA

Preface

This is a summary report of a technology assessment of oil and gas operations on the United States outer continental shelf undertaken by an interdisciplinary research team under the aegis of the Science and Public Policy Program at the University of Oklahoma. The complete report, *Energy Under the Oceans: A Technology Assessment of Outer Continental Shelf Oil and Gas Operations*, was published by the University of Oklahoma Press in September, 1973.

The assessment, funded by the National Science Foundation, was conducted over a twenty-month period beginning in September, 1971. Co-principal investigators for the study were Don E. Kash and Irvin L. (Jack) White, both of the University of Oklahoma. Don E. Kash is the director of the Science and Public Policy Program and professor of political science; Irvin L. White is the assistant director of the Science and Public Policy Program and associate professor of political science. Other members of the research team, also of the University of Oklahoma, included: Karl H. Bergey, professor of aerospace, mechani-

cal and nuclear engineering; Michael A. Chartock, assistant professor of zoology; Michael D. Devine, assistant professor of industrial engineering; R. Leon Leonard, assistant professor of aerospace, mechanical and nuclear engineering; Stephen N. Salomon, visiting assistant professor of physics; and Harold W. Young, professor of law. Each of these members of the research team is also a Research Fellow in the Science and Public Policy Program.

Charles C. Patton, director, petroleum and geological engineering and Halliburton Professor of Petroleum Engineering at the University, served as a technical advisor during the first twelve months of the study.

Continuing advice on the study was provided by an oversight committee consisting of: Edward D. Goldberg, Scripps Institution of Oceanography, Geological Research Division, University of California at San Diego; Robert Kay, chief, Policy Development Division, National Oceanic and Atmospheric Administration; Philip E. Jenson, production manager of Southern Region, Shell Oil Company; Vincent E. McKelvey, director, U.S. Geological Survey, Department of the Interior; Leo A. McReynolds, Research and Development Department, Phillips Petroleum Company; John P. Milton, former director, International Programs, The Conservation Foundation, now at the Woodrow Wilson Center; and Edward Wenk, Jr., professor of engineering and public affairs, University of Washington. We wish to acknowledge their major contribution to this report.

In addition, a number of individuals, corporations, government agencies, and public interest groups contributed significantly to the study. H. O. "Bud" Harder, chairman of the board of trustees of the University of Oklahoma Foundation, provided invaluable assistance and support, particularly during the early stages of the project. Bud not only gave us the benefit of a lifetime of experience in the petroleum industry, but also provided useful contacts, sound advice, and continuing personal support. Other individuals who should be singled out include: Malcolm F. Baldwin, Woodrow Wilson Center; Rear Admiral William M. Benkert, U.S. Coast Guard; Charles L. Blackburn, Shell Oil Co.; S. J. Brady, Phillips Petroleum Co.; Vincent M. Brown, National Petroleum Council; E. E. Clark, Phillips Petroleum Co.; Donald D. Dunlop, consultant; Morris K. Dyer, Marshall Spacecraft Center; Robert F. Evans, U.S. Geological Survey; Stephen J. Gage, Council on Environmental Quality; Paul L. Gassett, Gulf Oil Co.; Robert L. Geyer, Seismograph Services Corp.; Captain Clarence R. Hallberg, U.S. Coast Guard; Charles O. Jones, Falk Professor of Politics, University of Pittsburgh; Arthur Lubinski, Amoco Production Co.; Phillip S. Massey, Phillips Petroleum Co.; Charles S. Matthews, Shell Oil Co.; Roger W. Mowell, Esso Production Research Co.; F. T. Pease, The Offshore Company; Harry Perry, energy consultant; Robin J. Robinson, Esso Production Research Co.; Calvin Saunders, Halliburton Services; O. J. Shirley, Shell Oil Co.; Schofner Smith, Phillips Petroleum Co.; Henry D. Van Cleave, Environmental Protection Agency; Thomas B. Stoel, Natural Resources Defense Council; Darrel G. Warner, Exxon; E. N. Washburn, Phillips Petroleum Co.; Russell G. Wayland, U.S. Geological Survey; Alvin C. Weingand, Get Oil Out!; and Joseph E. Wirsching, Exxon.

We also wish to express our appreciation to the following organizations: Exxon, Gulf, Halliburton, Phillips, Shell, and the U.S. Geological Survey. We received wholehearted support from industry, government agencies, and interest groups generally, and the study could not have been successfully completed without the assistance these organizations provided.

Conduct of the study was facilitated by Joseph F. Coates, program manager in the Exploratory Research and Problem Assessment Office of the National Science Foundation, and Raymond D. Daniels and Taylor C. Anthony, director and assistant director of the Oklahoma Research Administration. Joe, who monitored the project for NSF, contributed to the study in ways too numerous to mention here; Ray and Taylor administered the NSF grant supporting the project in a manner which considerably eased the task of managing the project.

Robert J. Bauer, associate professor of English at the University of Oklahoma, served as an editorial consultant. While he bears no responsibility for the final editorial decisions, he contributed to the clarity and readability of the report.

Ginna H. Davidson did the graphics and several of the illustrations in the report. Her skills contributed significantly to the clarity of presentation.

We also wish to express appreciation to the staff of the Science and Public Policy Program. Ann M. Niemeyer and Peggy L. Neff organized and typed a seemingly endless number of research papers and drafts of the report. Janice K. Whinery assisted in preparation of this final report. Martha T. Jordan and Phillip C. Morgan provided continuing research assistance. Their efforts materially contributed to the completion of the study.

Although this study was funded by the National Science Foundation's program of Research Applied to National Needs (RANN) under NSF Grant Number GI-29942, the analyses, conclusions, and recommendations presented in this report do not necessarily reflect the views of the National Science Foundation. Neither the University of Oklahoma, the Oklahoma Research Administration, nor any of the numerous organizations and individuals identified here as contributing to this project are responsible for this report of a technology assessment of outer continental shelf oil and gas operations. The report is the sole responsibility of the Technology Assessment Group, Science and Public Policy Program, the University of Oklahoma.

ACRONYMS

BLM Bureau of Land Management
 BOP blowout preventer
 BTU British thermal unit
 CEQ Council on Environmental Quality
 EPA Environmental Protection Agency
 FPC Federal Power Commission
 FWPCA Federal Water Pollution Control Act
 NEPA National Environmental Policy Act of 1969
 NOAA National Oceanic and Atmospheric Administration
 NSF National Science Foundation
 NTSB National Transportation Safety Board
 OCS outer continental shelf

OPS Office of Pipeline Safety
 OSHA Occupational Safety and Health Act of 1970
 R&D research and development
 TAPS trans-Alaska pipeline system
 UN United Nations
 USGS U.S. Geological Survey

ABSTRACT

The Technology Assessment Group of the Science and Public Policy Program at the University of Oklahoma recently completed a twenty-month study of oil and gas operations on the outer continental shelf (OCS) of the United States.

The complete study, *Energy Under the Oceans: A Technology Assessment of Outer Continental Shelf Oil and Gas Operations*, was published by the University of Oklahoma Press in September, 1973. In the conduct of the study, the Group assessed a broad range of social impacts and public policy issues associated with OCS technologies and how they are managed and regulated. The results of this assessment are the basis for the Group's recommendations for changes in government policy and administration, industry management, and technologies. These changes are intended to contribute to making the development of OCS resources safer and less environmentally threatening. Recommended changes include: (1) using, improving, and developing specific items of equipment; (2) improving industry's and government's management of the way in which OCS technologies are developed, maintained, and operated; and (3) an overall management plan for optimizing OCS oil and gas development.

On the basis of a comparison of the results of the Group's assessment of the OCS and the results of studies which others have made of the desirability of developing the Alaskan North Slope (and the trans-Alaska pipeline) and increasing imports, the Group concluded that the development of OCS resources is generally preferable to and overall less socially costly than either of these two alternatives.

ENERGY UNDER THE OCEANS: A SUMMARY REPORT

ENERGY CONSUMPTION in the United States has been increasing at an annual rate of about 4 percent over the past ten years. An annual rate of 3.4 to 4.4 percent has been estimated for the period up to 1985. Given these rates of increase, U.S. energy consumption in 1985 will be between 112.5 and 130.0 quadrillion BTU's (the equivalent of 19.4 to 22.4 billion barrels of oil).

Demand for oil and gas accounts for almost 70 percent of this total, and, although energy from coal, nuclear, hydroelectric, or geothermal sources will increase, these sources are not likely to contribute enough to reduce oil and gas needs by very much. This point is emphasized by the two domestic production cases illustrated in Figure 1. The important question for the next twelve years, therefore, is where to get this supply of oil and gas.

Four areas from which it might be possible to increase domestic oil and gas production within this time period are:

1. onshore in the lower 48 states,
2. Alaska,

3. state lands offshore, and
4. the outer continental shelf (OCS).

Of the four, only Alaska and the OCS offer a potential for significant increases. With maximum development, the OCS may be expected to produce up to 2.6 million barrels of oil each day and 9.1 trillion cubic feet of gas each year; if the trans-Alaska pipeline system (TAPS) is available, daily Alaskan production can be as much as 2.6 million barrels of oil per day and 44 trillion cubic feet of gas per year.

But given even the lowest anticipated level of energy consumption, some portion of U.S. energy demand will have to be satisfied by imports. Assuming the lowest demand and highest domestic production situation shown in Figure 1, imports in 1985 would represent only 3 to 4 percent of supply, a level considered unrealistic by most experts. On the other hand, if it is assumed that demand will be at its highest while domestic production is at its lowest rate, imports will supply about 40 percent of total U.S. energy demand in 1985. The central question concerning energy supply, then, is to what extent will the U.S. be dependent upon imports. To answer this question requires that the costs and benefits associated with imports and the alternative means for increasing domestic production be compared.

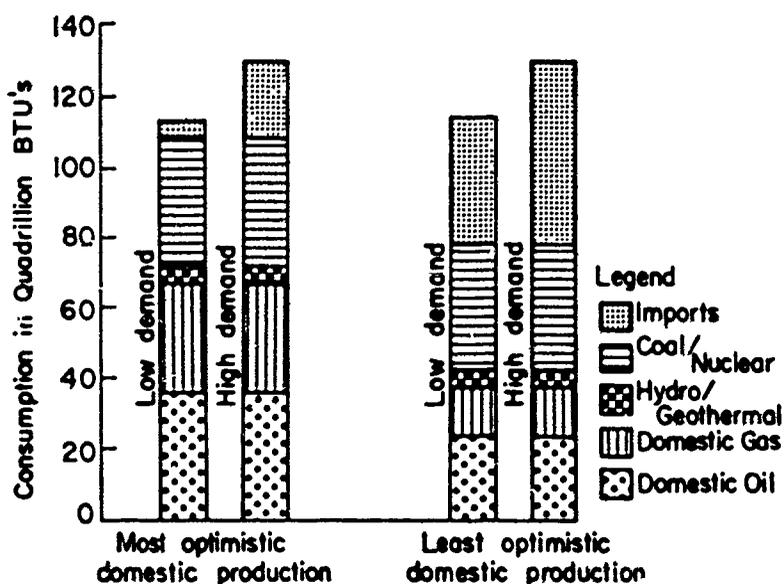


Fig. 1. U.S. Energy Supply and Consumption in 1985

There are objections to each of the domestic alternatives and to imports. The principal objections to Alaska and the OCS are environmental. Critics view developing either source as involving excessive, unwarranted environmental risks. Proponents of developing either Alaska or the OCS contend not only that imports are likely to be more of an environmental threat, but also that imports create national security, balance of trade, and economic problems.

Policy-makers who have to choose from among these three alternatives must seek to balance demands for protecting the environment against demands for more energy. Technology assessment, an attempt to identify, analyze, and evaluate potential environmental, legal/

political, and other social impacts, is one approach that can be used for informing policy-makers of what the consequences of the choice or choices are likely to be.

THIS STUDY

This NSF-funded technology assessment of the OCS alternative has been conducted over a twenty-month period by an eight-man interdisciplinary team at the University of Oklahoma. The purpose of the study has been to:

1. assess a broad range of social impacts associated with the development of OCS oil and gas resources;
2. contribute to rational policy-making for the OCS;
3. contribute to the formulation of a social-technological system for the development of OCS oil and gas resources responsive to broad social concerns; and
4. make specific recommendations for changes in government policy and administration, industry management, and technologies which will contribute to optimal resources development on the OCS.

For purposes of the study, it has been assumed that environmental and quality-of-life concerns will continue to be a factor in making OCS policy. It has also been assumed that there will be no major changes from the present state of society, such as a major war or depression, for example; and that as a result of the limitations of other energy alternatives and other pressures, the OCS will continue to be developed. In scope the study is limited to the:

1. OCS off the lower 48 states and Alaska;
2. next fifteen years;
3. OCS oil and gas—consideration of alternatives has been limited to examining their feasibility as a replacement for OCS oil and gas during the next fifteen years; and
4. use of pipelines as the means for transporting oil and gas ashore—bulk carriers are considered only as a temporary storage and transport option.

CONDUCT OF THE STUDY

At the outset the assessment was designed to focus on existing and anticipated physical technologies and technological alternatives for finding, developing, producing, and transporting oil and gas. As the study progressed, it became clear that this accepted conception of technology assessment was inappropriate for this particular problem area. Technologies used on the OCS proved to be relatively stable and technological alternatives limited. This is not an area in which technological breakthroughs occur; technological change has been and will continue to be gradual unless there are major new initiatives by industry and/or government. How technologies are managed and regulated, what we came to call the social technologies, proved to be the critical element in this problem area. This is due primarily to changes in the social context within which OCS policies are made and administered: changes requiring that attention be paid to new concerns, especially for environmental quality and safety, and that participation be expanded to include others in addition to industry and government, particularly environmental and consumer interest groups.

Once it became clear that most of the changes required to provide for optimal development involve changes in the behavior and relationships of responsible persons in industry and government rather than changes in hardware, the focus of the assessment was shifted. Although physical technologies were still to be assessed, the major effort was redirected to become an assessment of social technologies associated with the present and future development of OCS oil and gas resources.

Specific policy issues related to particular negative or undesirable impacts were identified, alternative responses were defined and analyzed, and recommendations to achieve desirable changes were formulated. While limited quantitative data are available for defining certain undesirable impacts, such as blowouts during drilling, for example, the effect of most changes in rules, standards, and procedures cannot be measured in quantitative terms. As a consequence, the standards employed in the study are for the most part procedural; that is, the assessment is in terms of whether present or proposed rules, standards, management practices, and changes in decision-making and administrative procedures, reduce or eliminate undesirable impacts.

The study is summarized beginning with our assessment of specific physical technologies and moving to our recommendations for an overall management plan for the OCS. This is followed by a brief summary comparison of the impacts of the OCS, TAPS, and imports.

THE ISSUES AND OUR RECOMMENDATIONS

Although most physical technologies used on the OCS are generally adequate to permit oil and gas resources to be found, developed, produced, and transported safely with minimal adverse social impacts, our assessment identified a number of technological weaknesses.

Physical Technologies

Only three technologies were found to be inadequate—velocity actuated downhole safety devices,* well control technologies, and oil containment and clean-up devices.

1. *Downhole Safety Devices.* Although reliability data for velocity actuated downhole safety devices are limited, there are numerous indications of their inadequacy. For example, in recent major accidents in the Gulf of Mexico, 25 and 40 percent of them failed. The U.S. Geological Survey (USGS) now requires new wells to be equipped with a surface, rather than a velocity actuated, downhole safety device. However, this new requirement does not apply to wells presently producing until tubing has to be pulled for some other purpose, such as a workover, for example. This may not occur for several years, if ever. Until there is a reliable replacement for "storm chokes" that can be installed in most producing wells without pulling tubing, the "storm choke" will continue to be a problem. *Therefore, the "storm choke" must be made more reliable.*

2. *Well Control Technologies.* The two principal approaches to re-establishing control over wells which are blowing out and/or burning are capping and drilling relief wells. (See the brief Glossary on page 32.) Capping is particularly difficult offshore because explosions and fires tend to destroy the platform requiring the cappers to provide their

*This device is commonly called the "storm choke."

own work platform. Drilling relief wells consumes too much time. *Alternatives for re-establishing well control must be developed.* Possibilities include subsurface and/or above-the-mudline valves.

3. *Containment and Clean-up.* There was no effective capability for containing and cleaning up oil on the OCS before Union's blowout at Santa Barbara, California. Subsequent crash efforts by industry and government have produced only a limited capability even now. In fact, wave heights, wind velocities, and currents on much of the U.S. OCS exceed designed capabilities at least a third of the time

Containment and clean-up on the OCS itself may be an illusory goal since, as a practical matter, there is an upper limit on sea conditions beyond which neither is possible. Although the primary effort should be to prevent accidents, it will never be possible to prevent all accidents and there must be some adequate means for responding when an accident does occur. *Consequently, efforts should continue to be made to improve the performance of containment and clean-up devices. However, the primary development effort should be to achieve a capability to deal effectively with oil spills which threaten to come ashore.*

Several other technologies being used on the OCS also require improvement:

1. *Drilling Bits.* Efforts to give drilling bits longer life have been a continuing research effort. These efforts should be continued and accelerated. Longer-lasting bits would reduce the number of trips made in drilling a well and would, thereby, reduce the risk of losing control of the well which is associated with this operation.

2. *Flaw Detectors.* Improved devices for detecting flaws in pipelines would make it possible to reduce chronic pollution from this source. Although usually dismissed as a minor source of polluting oil, in 1971 pipeline leaks and ruptures offshore accounted for 6 percent of all oil reported spilled into U.S. waters and 84 percent of all oil reported spilled from offshore facilities.

A number of technologies presently available for improving the quality of OCS operations are not being used by all operators.

1. *Sand Probes.* If sand probes, devices warning of excessive sand erosion, were used in all wells equipped with "storm chokes," these devices could be made more reliable.

2. *Mud Monitors.* Drilling safety could be enhanced if available devices for monitoring small changes in the volume of drilling mud were used on all drilling rigs.

3. *Mass Flow Monitors.* Pipeline spills could be held to a minimum if available mass flow monitoring equipment were used on all pipelines.

4. *Additional Controls for BOP's.* Control might be regained more quickly on some blowouts if sufficiently remote and protected controls were provided for the blowout preventors (BOP's).

Operations on the OCS could be made safer and undesirable environmental impacts less likely if certain kinds of new technologies were developed and utilized. Among those are:

1. *Downhole Safety Devices.* Surface actuated downhole safety devices that could be installed in a producing well without having to pull tubing and without cutting production below an economic rate.

2. *Downhole Instrumentation.* A capability to measure pressure at the face of the bit to give faster and more reliable warning of potential blowouts.

3. *Event Recorders.* Event recorders designed to survive accidents and provide records of equipment malfunctions.

4. *Identification Devices.* Devices for identifying which wells on a burning multi-well platform are out of control.

5. *Multi-Phase Fluid Movement.* Pumps and pipeline coatings capable of efficiently moving oil and gas in the same pipeline to help reduce flaring, the number of pipelines required, and to simplify a move to subsea production systems.

6. *Automated Drilling.* More automated drilling in order to reduce accidents due to human error.

Why Do These Technological Weaknesses Exist?

Most of these weaknesses in physical technologies exist because, until very recently, standards used for determining the adequacy of OCS technologies have been based largely on industry's judgment of what was economically feasible. Before events such as Union's Santa Barbara blowout attracted widespread public attention, continuous participation in policy-making and administration for OCS development had been pretty much limited to government and industry. The rules and regulations established by responsible government agencies had usually stated objectives rather than detailed specifications and standards. The most detailed rules, OCS orders issued for each USGS Area, had been and are the product of an institutionalized process of government-industry cooperation. Perhaps as a consequence, government regulation had tended to be heavily dependent upon industry's engineering and operational expertise when establishing OCS regulations.

In short, the system for managing and controlling OCS operations had been effectively closed to outside influences on a continuing basis. When it was subjected to close public scrutiny following Santa Barbara, some of the disadvantages of this closed decision-making system were identified. Many persons in responsible government agencies and in the petroleum industry recognize that the changed social context within which OCS development is now taking place necessitates changes in this system. Their goal is to respond to demands to improve the overall quality of OCS operations, and their efforts include taking steps to overcome some of the specific weaknesses identified here. For some of these weaknesses to be corrected, both industry and government agencies will have to change their past patterns of behavior. These should include changes in the way technologies are developed, maintained, and operated. Specifically:

1. Industry should modify its past pattern of incrementally adapting and linking components by making more extensive use of a systems design approach.*

2. Industry should expand its design criteria to focus explicit attention on human factors as a means for minimizing human error accidents.

3. USGS should establish equipment standards for all pieces of equipment affecting safety and the environment. Standards should be based on the objectives to be achieved and should not deter technological development.

*Recent joint efforts by aerospace and petroleum companies to develop subsea production systems illustrate how this approach can be advantageously employed by the petroleum industry.

4. USGS should appoint an independent and representative board of experts which would periodically review state-of-the-art OCS technologies and make recommendations concerning desirable changes, particularly changes in equipment and performance requirements and standards.

5. An improved system for recording and reporting equipment defects, malfunctions, and failures should be established. USGS should be responsible for insuring that these data are systematically analyzed and for issuing appropriate notices and directives for corrective action.

6. Investigative procedures to determine causes of major accidents and to provide data for improving safety should be strengthened and assigned to an independent investigative board within the Department of the Interior. This board should function within Interior as the National Transportation Safety Board does within the Department of Transportation. The Board should make appropriate recommendations for changes and additions to equipment, such recommendations to be available to the public.

7. USGS should undertake an expanded research, development, and testing program. This program should be aimed at identifying technological gaps and be designed to stimulate R&D. USGS initiatives should include involving organizations from outside the petroleum industry in order to promote the communication of perspectives from other technological communities. The program should also provide a means for USGS to develop and maintain a greater degree of technological independence from industry.

8. USGS should actively promote greater cooperation within industry in the development of safety, accident prevention, and environmental protection technologies. Industry should be assured that cooperation in these designated areas will not be subject to antitrust prosecution. This could be accomplished by having the Anti-Trust Division of the Department of Justice issue guidelines for cooperative efforts or by having the Division give an opinion on specific proposals.

9. USGS should establish uniform standards and certification requirements for personnel who perform inspection and test functions. As a first step, USGS should appoint a committee including representatives of the OCS operators and technical training specialists to recommend certification criteria and standards.

10. USGS should establish a program to develop improved and standardized procedures for operating personnel. This program should be developed in conjunction with technical experts and behavioral scientists who specialize in developing technical training programs.

11. USGS should appoint an advisory committee to assist its Area Supervisors in drafting and revising OCS orders. This committee should include representatives of parties of interest in addition to industry in order to broaden participation beyond the present pattern of government-industry cooperation.

12. USGS should review its sanctions for inadequate performance system seems generally to be adequate and the principal need will be to extend it on the basis of the philosophy recommended here. This philosophy calls for more stringent enforcement of stricter regulations, or nonperformance to insure that they are adequate to insure compliance with OCS orders and other regulations. The present sanctions

Each of these recommendations is aimed at bringing about desirable changes in the behavior of industry and its government regulators. The major thrust is to expand participation in policy-making and administration and to insure that both government and industry take advantage of developments within other technological communities.

SOCIAL TECHNOLOGIES

The public policy issues which arise in connection with government's management and control of the development of OCS oil and gas resources can be divided into four major categories: information and data, environmental quality, government management practices, and jurisdiction.

Information and Data

Background Data: Some opponents of the OCS alternative have cited the paucity of background data against which to assess environmental consequences as a reason for either slowing or stopping altogether the development of OCS oil and gas resources. There is little, if any, disagreement concerning the lack of these data. *The important issue for this study is what data are required adequately to inform policy-making for the OCS over the next fifteen years.*

Current and programmed research will improve on present knowledge of the environmental effects of OCS development. However, acquiring a functional understanding of coastal environments as ecological systems is an extremely long-term and expensive goal. Consequently, at best, policy makers are likely to have only selective and incomplete background data upon which to base OCS policy during the next fifteen years. *It is, therefore, particularly important that the allocation of research resources for this area be made so as to provide for the most essential data needs of policy makers. These include a special emphasis on acquiring a more complete knowledge of background levels of hydrocarbons in physical and biological components of the marine environment and the physiological effects of acute and chronic exposure to oil on marine plants and animals. Knowing those two kinds of data would make it possible to establish informed discharge and pollution regulations. Since this is the case, environmental research to acquire these data should be given a high priority by both government and industry. A single federal agency, either the Environmental Protection Agency (EPA) or the National Oceanic and Atmospheric Administration (NOAA), should coordinate and be a depository for the results for both kinds of studies. Background studies should be initiated by NOAA no later than when an OCS area is included on the Bureau of Land Management's (BLM) five-year lease schedule. In addition, when development activity actually begins on a tract, NOAA should be responsible for the continuous monitoring of physiological effects on marine plants and animals.*

Exploratory Information: In addition to lacking background data, the Department of the Interior has limited geological and geophysical data to use in its management and control of OCS oil and gas development. This limits the Department's capability for long-range planning and has led to the pattern of OCS development being largely in response to industry's interest in specific OCS areas rather than according to an Interior plan for systematic, orderly development. Li-

mitted information also affects the ability of BLM and USGS to make economic, engineering, and geologic evaluations of each OCS tract considered for sale. Much of the data available to them is proprietary and cannot be publicly disclosed. Therefore, these data cannot be published in the environmental impact statements written for every OCS lease sale. Having USGS either gather all its own geological and geophysical data or purchase it without the proprietary restriction is too expensive to be either reasonable or feasible. However, *USGS should be adequately funded to permit it to contract for exclusive seismic surveys in order to acquire adequate exploratory data for regional OCS development, including overall land use planning. And, before each lease sale, USGS should contract for both exclusive seismic and subsoil surveys to the extent necessary to acquire data for determining whether development can be carried out safely. Purchasing these data on an exclusive basis would permit their public disclosure, including their use in environmental impact statements.*

Environmental Quality

Clearly, preservation and improvement of environmental quality are major concerns which must be accommodated if the public is to be persuaded that OCS oil and gas resources can be developed at an acceptable level of risk. Three major aspects of this issue have been addressed legislatively: environmental impacts (the National Environmental Policy Act [NEPA] of 1969); water quality (the Federal Water Pollution Control Act [FWPCA] Amendments of 1972); and development of a contingency plan for responding to oil spills (initially required by executive order, now contained in the FWPCA Amendments of 1972).

NEPA: A major impact of NEPA has been to open up OCS policy-making to much greater public scrutiny and much broader public participation. This is a consequence primarily of the section of NEPA which requires an environmental impact statement to be written whenever a contemplated major federal action may have significant impact on the human environment. Responsible agencies and other interested parties are still working out, largely in the courts, an acceptable interpretation of this provision of NEPA. One effect has been to delay the pace of OCS development.

The statement requirement has revealed or highlighted several problems, including: fragmented responsibilities for energy and land use programs; the inadequacy of existing partial and incomplete energy and land use policies; and an enormous amount of duplication in statements prepared for the same policy area. *To resolve these problems, a regional programmatic statement should be written. Such a statement would help to eliminate unnecessary duplication, facilitate better planning for coordinated OCS development, and give a better basis for assessing overall impacts. These long-range statements would then be supplemented by statements for individual OCS lease sales.*

To guard against an agency acting as an advocate in the statement process, the Council on Environmental Quality should constitute an ad hoc committee to review all OCS draft lease impact statements. This committee, which should represent a broad range of interests and expertise, should determine whether the draft statement is adequate and consistent with the regional plan.

FWPCA Amendments of 1972: A major approach to water quality during the past several years has been an attempt to develop enforceable discharge requirements. The FWPCA Amendments of 1972 is the latest effort to establish requirements and procedures. However, the applicability of some provisions of the Amendments to the OCS is ambiguous; and a lack of sufficient data on the effects of discharges may lead to OCS facilities being exempt from the permit requirements. *The provisions of the Amendments should clearly be extended to cover OCS facilities.*

National Contingency Plan: The National Oil and Hazardous Substances Pollution Contingency Plan was established to provide for efficient, coordinated, and effective action to minimize damage from oil and hazardous substances. This include advance preparation for, as well as actually responding to, a spill.

One aspect of advance preparation has been the need to develop technologies for responding to spills on the OCS since no such technologies really existed prior to the Santa Barbara blowout. Coordinating government accident response R&D is the responsibility of the National Response Team established by the contingency plan. This is supposed to be achieved by a multi-agency R&D committee. This has not been very effective and as a consequence there appear to be gaps in government R&D efforts. *EPA should be given responsibility for monitoring, coordinating, and filling gaps in R&D in this area.*

The Coast Guard, with the advice of EPA and USGS, should establish equipment and performance standards to be met by the clean-up cooperatives which industry has established in its efforts to comply with lease requirements. This would assure coordination of government and industry operational response capabilities and help to eliminate overlaps and gaps.

Government Management Practices

Our assessment of the social technologies employed by government agencies overseeing OCS development identified three major management problem areas in addition to the management aspects of the problems already discussed. These three interrelated problems raise issues concerning leasing, planning, and cooperation and coordination.

Issues associated with all three arise in large part because of a fragmentation of responsibilities for energy and land use program. Management of the lease system, for example, is affected by the lack of a policy specifying what portion of energy demand should be satisfied by OCS oil and gas. Planning to determine this is constrained in part by the lack of exploratory information, a problem which was mentioned earlier. And planning is inherently difficult within fragmented authority structures because of the extensive inter- and intra-agency cooperation and coordination which is required. Experience shows that responsible agencies tend to promote their own particular programs and respond to the interests and demands of their own constituency. This makes cooperation and coordination difficult.

The most straightforward approach for dealing with all three of these problems would be to establish a Department of Energy and Natural Resources. Alternatively, an administration official, either a departmental secretary or an officer in the White House, should be

designated energy coordinator for the federal government. Either approach could facilitate the coordination of energy, environmental, and land use policies and planning. The objective, in any case, is to develop an administrative structure capable of formulating a ten-year energy, environmental, and land use plan. This plan would provide a basis for establishing the leasing pace required to produce OCS oil and gas at a specified rate.

Whatever the approach for dealing with the fragmentation problem, the functions of promoting and regulating OCS development should continue to be separated.

As we indicated in our discussion of environmental quality issues, environmental impact statements, have, in effect, become a means for forcing development of more coordinated, longer-range energy and land use policies and plans. The series of programmatic or regional statements proposed here is intended to force changes which will bring greater stability and certainty to government management and control of OCS oil and gas development.

At the operational level, the management system could be made more effective by greater centralization of responsibility. Pipelines are a case in point. BLM, USGS, the Office of Pipeline Safety, and the Federal Power Commission either grant rights-of-way, approve easements, issue certificates of convenience, set design criteria, or measure production, for example. In general, operational oversight responsibilities of this sort should be assigned to USGS since it already has the bulk of these kinds of responsibilities and possesses the greatest expertise for being an effective overseer. In addition, when new requirements for OCS facilities are established, such as those required by the Occupational Safety and Health Act and the FWPCA Amendments of 1972, USGS should be responsible for enforcing standards established for OCS facilities.

Jurisdiction

At least three kinds of jurisdictional questions arise concerning the OCS: gaps in federal jurisdiction, disputes between the states and federal government, and the definition of the shelf area under national jurisdiction.

Gaps in Federal Jurisdiction: There are two jurisdictional problems in addition to gaps in the FWPCA Amendments discussed earlier. These include: the ambiguity of federal jurisdiction under the Submerged Lands Act and the OCS Land Act as they apply to the six-mile area between three and nine miles off the Gulf coasts of Texas and Florida; and the lack of certification requirements for some types of drilling rigs.

The Courts have given both Texas and Florida jurisdiction over their adjacent submerged lands in the Gulf out to nine miles from their coasts. Ambiguity arises because the Submerged Lands Act applies only to the three-mile zone between the coast and the outer edge of the U.S. territorial sea; and the OCS Lands Act applies only to the portion of the shelf extending seaward from the outer edge of state jurisdiction. Those two Acts should be amended to provide unambiguously for clear federal authority in this six-mile zone.

As for certification of drilling rigs, Coast Guard authority for inspecting and certifying rigs is based on their being treated as vessels.

Mobile bottom-standing rigs should also be classified as vessels and inspection and certification requirements clearly extended to cover them.

Federal-State: The principal problems between states and the federal governments involve jurisdictional and land use issues, and the environmental impact of OCS development on state lands. In the past, jurisdictional issues have been resolved in the courts, a slow and not altogether satisfactory approach. These disputes should be anticipated when areas are included in the long-term leasing plan, and a non-judicial agreement on jurisdiction negotiated. Even if this is only an interim agreement, it will permit development to proceed while jurisdictional problems are being resolved.

Environmental concerns, including those related specifically to land use, arise because OCS activities necessarily impact on the adjacent state. Oil and gas produced on the OCS have to be brought ashore, and facilities for processing or transshipping it are located ashore. A comprehensive federal land-use law should be enacted to provide for federal, state, and local coordination in land use planning, including the OCS and coastal zones, and the law should require that these plans include provisions for siting necessary onshore facilities essential to OCS operations.

National-International: At the present time, there is no clear international rule fixing an outer limit of national jurisdiction over adjacent submerged lands. Neither the 158 Convention on the Continental Shelf nor the decision of the International Court of Justice in the *North Sea Cases* provides an adequate rule. The resulting uncertainty has become a significant international issue and attempts are being made to resolve it, primarily through negotiations within the United Nations. Two specific issues are being raised: who is to manage and control the development of seabed resources beyond 200 meters, and who is to benefit from their development?

A UN sponsored international conference to deal with this and other ocean space issues is to be convened in 1974. Proposals being considered range from extending national jurisdiction over the ocean and seabed some fixed distance (up to 200 miles) to retaining the present rule contained in the 1958 Convention and interpreting it to extend national jurisdiction to the outer edge of the continental margin. Most proposals now being discussed also provide for some sort of international authority to manage and control development of seabed resources outside national jurisdiction.

Participants engaged in working out new rules in this area represent a variety of values, perspectives, and ocean space interests.

Whatever the final solution to the seabed jurisdictional issue, if it is to accommodate the breadth of interests, values, and perspectives found within the international political system, it should fix an outer limit at some specified water depth or set number of miles from the coastline, establish an international authority to oversee development of resources beyond this limit, and accommodate other ocean space interests such as a right of transit and the special dependence of some countries on living resources in an extended adjacent ocean zone. The important point for development of oil and gas seabed resources adjacent to the U.S. is to provide for their orderly, safe development at an acceptable level of environmental risk.

A MANAGEMENT PLAN FOR THE OCS

Based on the assumption that OCS oil and gas resources will continue to be developed, this technology assessment was undertaken to determine how development of these resources could be optimized. In this booklet, we have summarized our major recommendations. While we have made recommendations for improving specific weaknesses in the physical technologies used on the OCS, our major effort has been to develop a management plan which will promote optimal development. An overall view of this plan and what it accomplishes is presented in Table 1. It should be kept in mind that the principal objectives intended to be achieved by the plan include:

1. effective, coordinated long-range planning and policy-making;
2. broadened participation in OCS policy-making and administration;
3. greater expertise within government to enhance the regulatory capabilities of responsible agencies;
4. more extensive, publicly disclosable information and data for making government management decisions;
5. greater centralization of responsibility and authority;
6. clarification of jurisdictional gaps and ambiguities; and
7. specifying the portion of the nation's energy demands to be satisfied by OCS oil and gas.

TABLE 1.—A PLAN FOR OCS DEVELOPMENT
JURISDICTIONAL MATTERS AFFECTING OCS MANAGEMENT

Present	Recommended	Changes required to implement recommendations
Outer boundary of national jurisdiction uncertain. Jurisdictional disputes between the Federal Government and State Government Ambiguous Federal authority over 6-mile zone between territorial sea and OCS.	1. Fix outer boundary of national jurisdiction 2. Establish an international seabed authority. Definitive agreement on State-Federal boundary If not possible negotiate interim agreement. Congress should clarify jurisdiction in this area	International agreement. Legislative and/or executive action. Amend Submerged Lands Act and/or OCS Lands Act.
Uncertain.....	Top official designated Federal energy coordinator on basis of organizational position.	Presidential directive.

OCS DEVELOPMENT PLANNING RESPONSIBILITIES

BLM prepares a 5-yr tentative OCS leasing schedule in consultation with USGS.	BLM formulate a 10-yr OCS development schedule in consultation with USGS.	Department action.
BLM, as lead agency, is preparing a programmatic statement on the 5-yr OCS leasing schedule.	USGS, as lead agency, but with cooperation of Commerce, prepare a programmatic impact statement which will serve as general development plan for each region included in the 10-yr schedule which integrates energy, environmental, and land use components.	Bureau action.
USGS participation in group seismic shoots to collect data for tract evaluation; data is proprietary.	BLM, in consultation with USGS, define by fixed coordinates areas (not tracts) included on 5-yr lease schedule.	Increase appropriations for data collection.
USGS grants exploration permits.....	USGS collect data to extent required to make tract evaluations. Data to be publicly available in lease sale impact statements. NOAA initiate continuous hydrocarbon background studies of areas on 5-yr lease schedule.	Agency action.
BLM receives and review lease nominations; BLM-USGS selects tracts BLM publishes list.	Continue present responsibility making all management decisions consistent with general development plan.	

TABLE 1.—A PLAN FOR OCS DEVELOPMENT—Continued
 JURISDICTIONAL MATTERS AFFECTING OCS MANAGEMENT—Continued

Present	Recommended	Changes required to implement recommendations
BLM prepares draft lease sale impact statement with inputs from other Federal agencies.	Based on the programmatic statements and nominations from industry BLM, with USGS, prepare draft lease sale impact statement to be available 15 mo prior to sale and 3 mo prior to public hearing; statement to supplement or amend programmatic statement as necessary.	Department action.
Interior publishes hearing notice.....	CEQ constitute committees to review draft impact statements, review and report to be made public. Continue present responsibility, making all management decisions consistent with the general development plan.	Presidential directive.
BLM prepares final lease sale impact statement; BLM publishes notice of lease sale 30 days after it is filed with CEQ.	Continue present responsibility, making all management decisions consistent with general development plan.	
BLM administers lease sale using the bonus bid-based royalty system.	Continue present practice; consider selected experimentation with the staggered bonus-based royalty.	Staggering bonus bidding requires legislative action.

POST-LEASE SALE MANAGEMENT: USGS GENERAL POLICY AND MANAGEMENT

General.....	USGS prepare any post-lease sale impact statements judged necessary for especially sensitive areas.	Department action.
	USGS enforce all environmental quality standards... USGS enforce OSHA on OCS.....	Interagency agreement. Do.
Drilling and development.....	Continue present responsibility, making all management decisions consistent with the general development plan.	
USGS requires lessee to submit exploratory drilling plan.		
USGS requires field development plan....	See recommended changes under management of technologies.	
USGS requires Application for Permit to Drill.	Continue present responsibility, consistent with general development plan.	
USGS enforces regulations covering safety and equipment concerns not included in Labor, Coast Guard, or state and local government regulations.	Continue present responsibility, consistent with general development plan.	
Production.....	Continue present responsibility, consistent with general development plan.	
USGS requires monthly production report.		
USGS requires monthly report of oil runs, gas sales, and royalties.	Continue present responsibility, consistent with general development plan.	
USGS requires reports and logs of well completions and recompletions.	Continue present responsibility, consistent with general development plan.	
USGS enforcement of safety and equipment regulations same as drilling and development phase.	Continue present responsibility, consistent with general development plan.	
Transportation.....	Continue present responsibility, consistent with general development plan.	
USGS authorizes right-of-use for gathering lines.		
Companies apply to FPC for approval of common carrier gas lines.	USGS provide FPC estimates of recoverable gas reserves; USGS assess lines consistent with general development plan.	Interagency agreement.
BLM authorizes transmission lines rights-of-way.	BLM grants rights-of-way only on recommendation of USGS.	Departmental action.
GPS responsible for common carrier design and performance standards.	USGS enforce design and performance standards for offshore pipelines.	Interagency agreement.

TABLE 1.—A PLAN FOR OCS DEVELOPMENT—Continued
 JURISDICTIONAL MATTERS AFFECTING OCS MANAGEMENT—Continued

Present	Recommended	Changes required to implement recommendations
MANAGEMENT OF TECHNOLOGIES		
USGS establishes and enforces general standards; trend toward more detailed standards.	USGS establish equipment requirements in terms of objectives to be achieved; enforce by appropriate inspections and sanctions.	USGS action.
USGS requires limited reporting of failures and malfunctions.	USGS improve reporting and analysis procedures for failures, malfunctions, and equipment defects; issue appropriate notices and warnings.	Do.
USGS investigates OCS accidents.....	Interior establish board similar to National Transportation Safety Board to investigate OCS accidents.	Department action.
	USGS appoint independent representative committee of experts to review state-of-the-art technologies periodically and recommend desirable changes.	USGS action.
	USGS undertake expanded R. & D. program.....	Increased appropriation.
	USGS develop uniform standards and certification requirements for personnel who perform inspection and test functions.	USGS action.
	Industry develop program of improved and standardized training procedures for operating personnel.	Industry action.
	Industry expand its R. & D. programs.....	Do.
	USGS promote greater cooperation within industry in development of safety, accident prevention, and environmental protection technologies.	Interior and Justice action.
	Industry increase use of systems design approach.	Industry action.
	Industry increase use of human factors design criteria.	Do.
	USGS encourage development and use of subsea production systems.	USGS and industry action.
	USGS immediately compile a list of weak technological components; publish annual summary of progress in correcting weaknesses.	USGS action.
	USGS detail all specifications and regulations in CCS orders for each area.	Do.
USGS and industry groups review CCS orders.	USGS appoint broadly representative committee for each USGS area to participate in review of CCS orders.	Do.
OTHER AGENCIES' GENERAL POLICY AND MANAGEMENT		
Corps of Engineers authorizes placement of any permanent or floating structure in navigable waters.	Continue present responsibility, making authorizations consistent with general development plan.	
Coast Guard enforces regulations covering safety, equipment, vessel transportation, and accidents on the OCS; jack-up rigs are not certified since they are not defined as vessels.	In addition to present responsibilities, Coast Guard establish formal certification and inspection requirements for jack-up drilling rigs.	Coast Guard action.
USGS establishes and enforces discharge standards; FWPCA not clearly applicable.	EPA establish discharge standards for OCS; USGS enforce standards.	Amend FWPCA.
	With start of exploratory drilling, NOAA assure continuous monitoring of commercially useful and sensitive marine species.	Agency action.
	EPA or NOAA assume responsibility for monitoring, coordinating, and filling gaps in environmental research.	Interagency agreement.
National Response Team R. & D. committee coordinates cleanup, containment R. & D.	EPA assume responsibility for monitoring, coordinating, and filling gaps in R. & D. aimed at improving cleanup and containment technology. Coast Guard establish equipment and performance standards for cleanup cooperatives.	National response team agreement. Legislative action.

While recognizing that an ideal management system might look quite different if the existing system could be disregarded, our plan has been formulated on the assumption that constraints within our political system dictate modification rather than wholesale revision of the present system for managing OCS development. With this limita-

tion in mind, we have used a hierarchy of environmental impact statements as a means for integrating land use and energy policies and planning, including provisions for long lead times and a formalized process for working out critical political accommodations. These are essential changes if OCS resources are to be optimally developed.

A COMPARISON WITH OTHER ALTERNATIVES

Although this study was limited to a technology assessment of the OCS as a domestic source of oil and gas, we did compare the broad social impacts of developing the OCS, the North Slope of Alaska, and the increased levels of imports that will be required if either or both of these domestic alternatives are not developed. For purposes of illustration, comparisons of impacts are based on production and imports at a level of 2 million barrels per day. These overall comparisons, based in part on secondary sources, are summarized in Table 2.

OCS vs. imports

As can be seen in the table, the OCS offers advantages over increased imports in each of the categories in which the two alternatives are compared except multiple use. Land uses for both are about the same: both require refineries; the OCS needs additional onshore facilities; and imports require increased port facilities. But OCS development has a greater overall potential for interfering with other uses, particularly fishing and marine transportation. If subsea production systems are widely used, this potential conflict with other users will be reduced.

TABLE 2.—A SUMMARY COMPARISON OF IMPACTS

Categories of impacts	OCS v. imports	OCS v. TAPS
Economic:		
Consumer costs.....	(1)	(2)
Balance of trade.....	(3)	(2)
Government revenue.....	(3)	(2)
Regional.....	(2)	(2)
Overall.....	(2)	(2)
Environmental:		
Spill source (worldwide).....	(3)	(2)
Spill rate (worldwide).....	(2)	(1)
Location.....	(2)	(2)
Biological consequences.....	(2)	(2)
Overall.....	(2)	(2)
National security (overall).....	(2)	(2)
Multiple use:		
Land use.....	(2)	(2)
Coastal use.....	(1)	(1)
Overall.....	(1)	(1)
Overall.....	(2)	(2)

1 Indicates a disadvantage for the OCS.

2 Indicates no discernible difference.

3 Indicates an advantage for the OCS.

4 Indicates that no conclusion could be drawn.

Note: Obviously many of the judgments made in this table are speculative; however, all entries are based on the quantitative and qualitative analyses made in this study.

Source: U.S. Department of the Interior, Final Environmental Impact Statement: Proposed Trans-Alaska Pipeline, vol. 1: Introduction and Summary (Washington: Government Printing Office, 1972).

There are a number of economic advantages for the OCS; however, it appears now that imports offer some advantage in terms of consumer costs. This advantage is at best slight and subject to considerable uncertainty in the future.

Considering environmental impacts worldwide, the OCS is less of a threat to the environment than increased imports will be. In part, this is due to the harmful effects of refined products which have to be considered with imports. If only U.S. waters are considered, imports appear to have an advantage, but this fails to take into account differences in the kind of petroleum spilled and the fact that spills outside can produce effects within U.S. waters.

OCS VS. TAPS

Developing OCS resources offers some advantages over TAPS. In large part this is due to the greater complexity and exposure to a wider variety of potential risks associated with developing the North Slope, transporting the oil by pipeline to Valdez, and then by tanker to West Coast U.S. ports. There is no experience upon which to base an estimate of the risk involved with TAPS, but if anything, the risk is probably greater than in the lower 48 states. However, different impacts could be expected if an inland pipeline were to be developed. For example, this alternative to TAPS would eliminate marine impacts.

A beginning assumption of this study was that OCS development would continue. The overall objective set for the study was to find ways to insure that development was optimal in a broad social sense. On the basis of our comparison of alternatives, we have concluded that continued OCS development is socially preferable to increased imports or TAPS. This is on the basis of current policies, practices, and technologies. If changes result in more optimal OCS development, the advantages of developing the OCS should become even greater.

GLOSSARY

- Blowout*—An uncontrolled flow of gas, oil, and other well fluids from a well to the atmosphere. A well blows out when formation pressure exceeds the pressure being applied to it by the column of drilling fluid.
- Blowout preventer (BOP)*—Equipment installed at the wellhead for the purpose of controlling pressures in the annular space between the casing and drill pipe, or in an open hole during drilling and completion operations.
- Capping*—Closing off a well to re-establish control after a blowout. If there is a fire, it must be extinguished before the well can be capped.
- Continental margin*—The submerged prolongation of adjacent land extending to an average water depth of 200 meters (approximately 660 feet).
- Downhole safety equipment*—Valves or other devices installed below the Christmas tree in production wells to prevent blowouts.
- Flaring*—The disposal of unwanted gas by burning in the atmosphere.
- Mass flow monitor*—Device for metering flow through pipelines for the purpose of early identification of leaks.

Mobile bottom-standing rigs—Includes jack-ups, which have legs that extend to the ocean bottom and raise the hull to the water's surface, and barges which are used only in shallow water and are sunk after being towed to location.

Mud monitor—Device for measuring sudden gain or loss of drilling mud in the well bore. Equipment which is capable of identifying the loss or gain of as little as one barrel is now available.

Multi-phase pumping—A procedure for moving simultaneously through pipeline systems various combinations of oil, gas, and water.

Outer continental shelf (OCS)—The submerged lands extending from the outer limit of the territorial sea to some undefined outer limit. In the U.S., this is the portion of the shelf under federal jurisdiction.

Relief well—A well drilled to intersect another well at some point below the surface, used to regain control of wells that are out of control.

Sand probe—A device used to warn of excessive sand erosion in wells containing velocity-actuated downhole safety valves.

Seismic survey—A geophysical exploration technique in which generated sound waves are reflected or refracted from underlying geologic strata recorded for later analysis.

Storm choke—Common terminology for a velocity-actuated downhole safety device.

Subsea production system (SPS)—The complex of piping valves and related equipment used to produce oil and gas from individual or connected subsea completions.

Subsoil survey—Investigation of shallow focus ocean bottom conditions, usually for the purpose of setting platforms or rigs.

Technology assessment—An attempt systematically to identify, analyze, and evaluate the potential environmental, legal/political, and other social impacts of a technology.

Territorial sea—The sea area immediately adjacent to a coastal nation within which it claims comprehensive jurisdiction.

Tubing—Conduit for routing oil or gas to the surface.

The Technology Assessment Group of the Science and Public Policy Program at the University of Oklahoma recently completed a twenty-month study of oil and gas operations on the outer continental shelf (OCS) of the United States.

The complete study, *Energy Under the Oceans: A Technology Assessment of Outer Continental Shelf Oil and Gas Operations*, was published by the University of Oklahoma Press in September, 1973. In the conduct of the study, the Group assessed a broad range of social impacts and public policy issues associated with OCS technologies and how they are managed and regulated. The results of this assessment are the basis for the Group's recommendations for changes in government policy and administration, industry management, and technologies. These changes are intended to contribute to the optimal development of OCS resources and include recommendations for: (1) using, improving, and developing specific items of equipment; (2) improving industry's and government's management of the way in which OCS technologies are developed, maintained, and operated; and (3) an overall management plan for optimizing OCS oil and gas development.

On the basis of a comparison of the results of the Group's assessment of the OCS and the results of studies which others have made of the desirability of developing the Alaskan North Slope (and the trans-Alaska pipeline) and increasing imports, the Group concluded that the development of OCS resources is generally preferable to and overall less socially costly than either of these two alternatives.

H. NAS CRITIQUE OF CEQ REPORT

ISSUES IN THE ASSESSMENT OF ENVIRONMENTAL IMPACTS OF OIL AND GAS PRODUCTION ON THE OUTER CONTINENTAL SHELF

A CRITIQUE OF "OCS OIL AND GAS—AN ENVIRONMENTAL ASSESSMENT"
A REPORT TO THE PRESIDENT PREPARED BY THE COUNCIL ON ENVIRONMENTAL QUALITY

The Review Committee on the Environmental Impact of Oil and Gas Production on the Outer Continental Shelf of the National Research Council Environmental Studies Board, National Academy of Sciences, National Academy of Engineering, Washington, D.C., 1974.

NOTICE

The project which is the subject of this report was approved by the Governing Board of the National Research Council, acting in behalf of the National Academy of Sciences. Such approval reflects the Board's judgment that the project is of national importance and appropriate with respect to both the purposes and resources of the National Research Council.

The members of the committee selected to undertake this project and prepare this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. Responsibility for the detailed aspects of this report rests with that committee.

Each report issuing from a study committee of the National Research Council is reviewed by an independent group of qualified individuals according to procedures established and monitored by the Report Review Committee of the National Academy of Science. Distribution of the report is approved, by the President of the Academy, upon satisfactory completion of the review process.

SUMMARY OF MAJOR CONCLUSIONS AND RECOMMENDATIONS

1. The CEQ Report

The CEQ Report is a commendable and useful first step toward the development of new federal policies for OCS oil and gas resources in the Atlantic and the Gulf of Alaska. The Report is aptly described by the CEQ as an "agenda for action" and it will provide information and analyses useful to evaluations of future OCS programs and projects. It does not purport to be an environmental impact statement on OCS leasing in the Atlantic or Gulf of Alaska; rather, it will serve as a helpful guide to the impact statement processes.

The Committee recognizes that under the National Environmental Policy Act any federal decision to develop OCS oil and gas resources in these two regions must follow the preparation and review of detailed impact statements to forecast the kinds of environmental changes that will occur and to assess the alternative policies available. Separate impact statements should be prepared for the leasing program as a whole, for the aggregate developments within each region, and for each specific lease sale.

While the CEQ Report is a responsive advisory statement on future environmental policies regarding OCS oil and gas, the Committee wishes to stress the study's limited mandate as well as its understandable avoidance of consideration of alternatives to our current national energy policy. At the outset, for example, the Report accepts without analysis the advisability and practicality of Project Independence, the federal program to achieve energy self-sufficiency by 1980. Most energy experts believe that such a program will entail immense economic disruptions and environmental costs and may not even be technically possible. Further, the Report accepts OCS development as an exclusive activity of the private sector without examining various legislative proposals for a federal oil development corporation or for other public development entities such as exist in other countries that produce oil and gas. Finally, the Report relies on the precept that continued annual growth in energy availability to the year 2000 and beyond is accepted public policy. The Committee believes that these assumptions should be challenged by all concerned with the development of a viable, long-term national energy policy.

2. Resource information

The Committee recommends that the federal government obtain and make public all information about natural resources necessary for informed decision-making on national energy policy. In particular, the federal government should publish the best detailed estimate of our OCS reserves of oil and gas, as has traditionally been done for other energy resources such as coal and oil shale. Existing sources of information can be used and additional field programs initiated applying advanced technologies such as the "bright spot" technique as discussed in Section III. The data can be obtained either by government agencies directly or by purchase from commercial sources. We recognize that implementation of this recommendation will transfer to the public the burden of exploration now borne directly by industry, but we suggest that appropriate adjustments in bidding and leasing policies can be devised to recover this cost equitably.

3. Rankings by relative degree of environmental risk

The Committee concludes that the criteria used by the Council in ranking potential OCS development areas by the degree of relative net environmental risk are inadequate and incomplete. We agree that developing the Gulf of Alaska areas entails high risk, but question the bases for the relative ratings of Atlantic OCS areas. The ranking criteria used were limited to the predicted probability and simulated trajectories of oil spills, the incidence of unusual natural phenomena in each area, the distance of the resource development sites from shore, regional economic benefits of related onshore developments as measured by employment and value of production, and projections of re-

gional energy needs. The bases on which predictions of the movement of oil spills have been made are uncertain and therefore these results should be viewed as having only limited utility. Moreover, a more adequate consideration would have included additional criteria for which data already exist: the effects of spills and discharges on offshore marine environments, evaluation of national economic benefits and costs, and alternative uses of OCS resources. There are also intangibles that should be assessed, such as the social costs and benefits to the quality of life that result from resource development. The Council's relative ranking of areas might have been different if they had included such criteria. For example, if a measure of the importance of present and potential alternative uses of the OCS for both domestic and foreign commercial fishing had been considered, the Georges Bank might not have been ranked as the area subject to the lowest relative risk.

4. Environmental protection

Stringent environmental control measures are mandatory in any OCS development. We concur with the recommendations of the CEQ Report for improving technology and for ensuring its effective use through appropriate regulation and enforcement. Policies for regulation and enforcement should rely as extensively as possible on incentives to the operators to maintain high levels of environmental protection and high standards of safety in their own interest. The full cost of implementing the measures recommended should be included in the costs of the crude oil and gas produced. Some additional related recommendations of the Committee are presented in Section V of this critique.

5. Coastal zone management

The Committee suggests that decisions concerning the development of OCS oil and gas resources involve the broadest possible base of participation by individual citizens and local, state, and federal agencies. In particular, we concur with the recommendations of the CEQ Report that state coastal zone management agencies be given full opportunities to cooperate with federal agencies in designing, preparing, and reviewing environmental impact statements and that these agencies should jointly participate in developing state coastal zone plans.

The Coastal Zone Management Act of 1972 encourages but does not require states to develop such plans. Development of OCS oil and gas is clearly a national concern, but its implementation must be carried out in ways that conform with state regulations and coastal zone plans. The impacts of OCS development on coastal zones, including the impacts of ports and related industry, can be minimized by careful planning. Unfortunately, few states or local jurisdictions, if any, have adequate capacity to undertake and sustain comprehensive planning of the scope and quality required to realize the onshore development opportunities and minimize the risks inherent in OCS resource use. Therefore, it is imperative that an open, effective institutional planning structure be created and adequately funded that will utilize the capabilities of federal, state, and local governments. Decisions within that process on land use planning and regulation should reflect national as well as regional environmental, economic, and energy interests.

II. PURPOSES

In his message to Congress of April 18, 1973, President Richard M. Nixon requested that the Council on Environmental Quality (CEQ) undertake, in consultation with the National Academy of Sciences (NAS) and Federal agencies, a study of the environmental impacts attendant to oil and gas production on the outer continental shelves (OCS) along the Atlantic coast and in the Gulf of Alaska.

As a result of this request, the NAS, through the Environmental Studies Board (ESB) of the National Research Council of the National Academies of Sciences and Engineering, convened an *ad hoc* panel in May 1973, to review the outline of the study proposed by the CEQ. Subsequently, the CEQ contracted with the NAS to provide for a formal consultative and review committee under the auspices of the ESB and its parent body, the Commission on Natural Resources. The members of this committee are listed in Appendix 1.

One purpose of the consultative and review committee of the NAS was to provide for the CEQ a continuing review for the duration of the study of the procedures, work plans, contractors' reports and other documents obtained by the CEQ for the purposes of the study. In addition, a critique of the final report of the CEQ was to be prepared and submitted to the President with the CEQ report. The appointment of the NAS committee, its deliberations, and the formulation and review of its reports were all conducted according to standard procedures of the Academy.

In the course of discharging its duties, the NAS committee met jointly with the staff of the CEQ on three occasions, once to review the CEQ study plan, once to review the work of contractors and a proposed outline of the CEQ report, and once to critique their draft report. The Chairman of the committee and members of the Council met twice to discuss the study and the role of the NAS in it. Several members of the committee and the staff participated in a site visit to oil and gas facilities in the Santa Barbara Channel. The NAS Project Officer also participated, at the invitation of the CEQ, in a field trip to offshore and onshore facilities in the Gulf of Mexico arranged for the Council members and staff by the United States Geological Survey. The respective staffs of the NAS and the CEQ maintained close contact throughout the period of the study.

This critique is the result of the committees' activities under the terms of the contract between the CEQ and the NAS. Its purpose is to provide a guide for assessing the environmental problems attendant to development of OCS oil and gas resources and the effectiveness with which they were treated in the CEQ Report. Most of the direct environmental impacts have been addressed in the CEQ Report. However, some broader issues of national policy on the development and management of OCS oil and gas resources were not covered. Recognizing the limits of the study as mandated to the CEQ, the NAS Committee independently chose to address in its critique those associated problems that it believes to be important and in the public interest.

The critique is organized to address the following major issues. Section II describes a perspective of OCS oil and gas in the context of national energy policy. Section III assesses present knowledge of available resources and environmental conditions. Section IV describes

the nature of the ecological and regional economic impacts attendant to OCS development. Section V assesses the evaluation of risk and the adequacy of technology. Section VI discusses institutions and public policy.

The committee acknowledges the assistance and cooperation of the staff of the CEQ in the conduct of its work, in particular the Study Director, Dr. Stephen J. Gage, and the Study Coordinator, Mr. Bruce A. Pasternack.

II. OCS OIL AND GAS IN THE CONTEXT OF NATIONAL ENERGY POLICY

Future Energy Supply and Demand

Any projection of the growth in demand for energy in the United States contains substantial amounts of guesswork. The CEQ Report has done a service by emphasizing the wide range of values that can emerge from plausible assumptions. The Report presents three estimates of total energy consumption in the United States in the years 1985 and 2000.¹ These estimates project consumption for the year 2000 to be 192 (high), 166 (medium), or 121 (low) quadrillion British thermal units (Btu). By comparison, consumption in 1973 was 75 quadrillion Btu. In our view, the medium and low estimates probably bracket what will happen, since the high estimate accounts for neither potential energy conservation nor the effects of increasing energy costs. The medium estimate is consistent with an annual growth rate in per capita consumption of about 1.8 percent, which is slightly greater than the average annual growth rate during the last 25 years. It is also consistent with an annual improvement in the efficiency of energy use—measured by the real Gross National Product produced per Btu consumed—of approximately one-half of a percent, about what has been achieved on the average in the past two decades. The low estimate would require a lower growth rate in per capita consumption and greater emphasis on efficient energy use. There are no technical obstacles to achieving more economy in energy use, but the implied restrictions on energy intensive forms of consumption may be painful.

Substantial additional supplies will be required to attain any of these levels of consumption of energy. Indeed, because oil and gas reserves are subject to continual depletion, the amount of new reserve that must be found each year exceeds the rate at which demand for oil and gas grows. There are in the ground ample alternative sources such as coal and oil shale for meeting the expected demand for energy for the next 100 years, even without imports. The problems are getting them out of the ground and using them in environmentally acceptable ways. Large reserves of coal, oil shale, petroleum, and natural gas can be supplemented by nuclear power and such novel sources as solar and geothermal energy.

The pattern of increasing energy prices will probably continue and may lead to so large an expansion of production of oil and natural gas from current production sites that much of the anticipated growth in demand for these fuels can be met from these sources alone. Such an expansion in production, however, yields net economic benefits largely at the margin. New reservoirs of oil or gas have the potential

¹ Council on Environmental Quality, 1974. *OCS Oil and Gas—An Environmental Assessment*, Chapter 3. Washington, D.C. (Hereafter cited as CEQ Report.)

for producing very much larger net economic benefits per unit of output; exploration in new areas frequently results in the discovery of reserves of oil or gas that can be produced and transported to a market at a cost considerably below the marked price. This potential for large net economic benefit is one of the most attractive features of OCS exploration, and determining the extent to which such reserves of OCS oil and gas in fact exist appears to be a priority goal for the nation.

OCS oil and gas

The significance of the oil and gas deposits under the OCS is inevitably conjectural. It depends both upon the trend of consumption, which can be foreseen only roughly, and upon the size of the resource *in situ*, which cannot be estimated accurately without a great deal of seismic exploration and exploratory drilling. The range of possibilities described in the CEQ Report is indicated in Table I. On the basis of the medium projection for consumption and the high estimate of OCS yield, the OCS could supply about one-fifth of domestic consumption of crude oil and natural gas in the year 2000. Given the more pessimistic yield estimate and the same consumption rate, the OSC would supply less than one-tenth of consumption in 2000. Although these ratios indicate the plausible orders of magnitude, actual events may not conform to the suggested range. In appraising the significance of OSC contributions, it should be kept in mind that the oil and gas resources under the OCS will be nearing exhaustion by the end of the century.

TABLE I.—CEQ PROJECTIONS OF CONSUMPTION AND OCS PRODUCTION OF PETROLEUM AND NATURAL GAS
OIL (MILLIONS OF BARRELS PER DAY)

	1985	2000
Consumption growth estimate: ¹		
Medium.....	24	30
Low.....	14	12
OCS production estimate: ²		
High.....	3.0	6.5
Low.....	1.0	2.5

NATURAL GAS (BILLIONS OF CUBIC FEET PER DAY)

	1985	2000
Consumption growth estimate: ¹		
Medium.....	75	85
Low.....	75	60
OCS production estimate: ²		
High.....	3.6	18.0
Low.....	1.2	8.0

¹ Adapted from the CEQ report, ch. 3. The energy content of a barrel of oil is about 5,800,000 Btu, and that of a cubic foot of natural gas is about 1020 Btu.

² CEQ report, ch. 7, total for all 4 regions.

The possible importance of OCS oil and gas can also be assessed by an economic analysis to determine whether a potential economic gain, exclusive of undetermined environmental and social costs, appears large enough to be capable of more than balancing these costs. Such an analysis also provides a basis for comparing the potential

economic benefits of developing alternative energy sources instead of the oil and gas of the OCS.

The CEQ did not consider an economic analysis as part of its charge, so we have made one based on their data and on assumptions and methods described in Appendix II. We have assumed that during their 20 year lifetimes, the OCS fields will produce amounts of oil and gas that are intermediate between the high and low production cases used in the CEQ analysis. Using \$8 per barrel for oil and \$.75 per thousand cubic feet for gas, the gross lifetime revenues from the OCS fields amount to about \$240 billion. From this amount the costs of exploration, development, and operation of the fields must be subtracted. A discount factor must also be applied because the recovery of the resource is spread over time and a postponement of its availability reduces its value. Taking into account the assumptions of Appendix II, we find that the contemplated development of this resource probably would have a net economic value of roughly \$80 billion.

This would be a large return which would have the potential for offsetting the economic costs to other industries, such as fishing, recreation, and tourism, that might suffer as a result of the development. Although we have no means for judging the economic reductions that will be suffered due to OCS oil and gas operations, we believe that if precautions are taken, they may not be an appreciable portion of the estimated national economic benefits of producing the petroleum resources.

The enhancement of our national wealth from OCS development can also be significantly offset by non-monetary considerations. However, these social and environmental costs can not necessarily be equated with purely economic values. Thus, even if large quantities of oil and gas can be developed with large economic benefit, it is not clear that this would be in the interests of the nation or of any particular region. This is especially true when it is not known whether a similar investment in some other potential source of energy would not yield the same, or a larger, net economic value at smaller social and environmental costs.

Analysis of the costs and benefits of employing petroleum as an energy resource as opposed to other uses is also necessary. Approximately 10 percent of the products of refined crude oil presently become such commodities as lubricants, greases, and asphalts, and feedstocks for petrochemical industries such as plastics, synthetic fibers, medicinal, pesticides, and fertilizers. In the event that substitutes for petroleum in the manufacture of such products are unavailable, the consumption of oil and gas for energy needs could conceivably deprive future generations.

It is essential that the net economic and social value of the full range of alternatives be considered before major policy decisions are made about the OCS. Such an analysis of alternatives was not performed in the CEQ report. For each alternative the economic, social, and environmental drawbacks should be weighed against the anticipated national economic benefits of development. Furthermore, such analyses should be conducted for both national and regional resources. For example, an appraisal of the development of the Georges Bank for petroleum resources should consider its value as an international fishing grounds and the value of areas adjacent to it for recreational uses.

The Distribution of Costs and Benefits

In evaluating the commercial exploitation of any national resource, the Committee suggests that it is important to consider the distribution of costs and benefits as well as their total values. The principle of such an appraisal should be that no one bears more of the cost than accrues to him as a benefit. A subsidiary consideration should be that benefits be widely and equitably distributed.

In the case of OCS oil and gas development, the environmental costs will be borne by all who derive pleasure or profit from the affected portions of the environment in its present state. Compensation should be given to those who can demonstrate the most severe prospective losses. Some degree of justice can be obtained for the rest of those affected by assuring that adequate payments are made into the national treasury in the form of lease bonuses and royalties.

National Reserves

Optimal timing of the exploitation of a reserve, once it is identified, has received inadequate consideration both by the CEQ and by the NAS committee. A reserve *in situ* is a stockpile, available for use in an emergency or as a hedge against future demand for feedstocks. An understanding of the costs of maintaining a reserve in the ground in varying stages of readiness, is needed. In many instances, such a strategy may be preferable to above-ground storage of large reserves, a topic being discussed as a strategy to decrease the nation's vulnerability to foreign boycotts. We do not know which of the various underground reserves are best suited for stand-by roles of various kinds. It is possible that such a problem can only receive adequate scrutiny when exploration is divorced from production, a situation far from today's patterns of leasing.

Public Policy

The Committee assumes as a principle that public policy should be established with maximum participation of the public and based on the availability of the most complete and accurate information obtainable. A corollary to this principle is that the most complete and accurate information should be available to the public. The facts on which policy is based should be disseminated as widely as possible and their implications carefully and clearly detailed. The recommendation of the CEQ that the public be encouraged to participate in the preparation and review of OCS impact statements, especially through state and local planning agencies, is most welcome.²

III. RESOURCE AND ENVIRONMENTAL ASSESSMENT

A rational policy for the development of a natural resource requires knowledge of the amount and availability of the resource, the social and economic changes required by or attendant to the development, the environmental constraints that will influence the technological operation, and the environmental changes that will result. This section is concerned with the inadequacies of current assessments, of both oil and gas resources and of the environment likely to be affected by their development.

² CEQ Report, Chapter 9.

Oil and Gas Resources

The amount and location of mineral resources in the United States are only partially known, because the required exploration has been conducted mostly by private interests. For economic reasons, private industry seeks the least expensive resources that are available worldwide and has little incentive to prove reserves to meet demand for more than a decade in the future. In particular, the federal government has not viewed the systematic determination of the availability of oil and gas resources as sufficiently critical to national goals to warrant the allocation of more than minimal resources for that purpose. As a consequence, assessments of the national treasure of oil and gas, including those reviewed in the CEQ Report, are little more than sophisticated guesses as to how much resource is available, even, to some extent, in explored areas. The Committee wishes to stress the uncertainty that currently prevails in these estimates of oil and gas resource availability.

However, the application of modern technology to oil and gas exploration can change this situation. One such technology is computer enhancement of "bright spots" that positively identify the presence of fluids with low sound velocities such as oil and gas.^{3,4} Just as signal processing by computer can reduce a jumble of light and dark into a detailed picture of the surface of Mars, so too can the "bright spot" technology of seismic exploration mentioned in the CEQ Report now reveal in many places whether potential geological traps contain oil and/or gas. Drilling is not required in the application of this technology. While the information that can be acquired does not necessarily tell all that would be useful to know about undrilled fields, the knowledge to be gained from seismic exploration is now significantly greater than in the recent past. Furthermore, we believe that it is reasonable to expect that future improvements in this and other technologies will not only provide even more detailed information but also do so at reduced cost. Thus, we suggest that it is now possible and increasingly practical to survey our national treasurer of oil and gas.

To accomplish this goal we therefore recommend that the federal government acquire and make public, together with supporting data and analysis, the best possible estimate of our OCS resources of oil and gas based on the new techniques, just as has traditionally been done for other energy sources such as coal and oil shale. This estimate can probably be obtained rapidly, and while the data processing is expensive, the cost is relatively low compared with the potential benefits. More accurate information regarding the resource potential will facilitate not only the formulation of national energy policy, but also the assessment of environmental impacts. Since the amount of resource in situ determines at least the maximum possible rate of production, it indicates the maximum expectable environmental impact as well. Furthermore, the resource is limited, and if we are to avoid the economic crises associated with the exhaustion of resources, we must plan their use with their ultimate depletion in mind. Such planning can only be undertaken if a reliable estimate of the total resource exists.

³ Craft, C. 1973. Detecting hydrocarbons: For years the goal of exploratory geophysics. *Oil Gas J.* 71 (8) : 122-25.

⁴ Savit, C. H. 1974. Bright spot in the energy picture. *Ocean Ind.* 9 (2) : 60-65.

For example, at the CEQ's high production estimate, the resources presently estimated to lie beneath the Atlantic and Gulf of Alaska OCS would be nearly exhausted by the year 2000.

Yet another uncertainty that should be clarified in order to understand the relative economic importance of developing new OCS resources is the degree to which the rate of production of oil and gas responds to market prices. During the course of the CEQ study, world prices for oil changed markedly. Few observers expect these prices ever to return to the level existing early in 1973. Higher prices stimulate increased activity from several sources: increased production from existing wells in established fields, drilling of new wells in established fields, and development of synthetic oil and gas from other mineral resources, all with accompanying environmental effects. Increasing prices may delay the need to develop completely new resources such as the Alaskan and Atlantic OCS.

The Environment

The availability of more accurate information regarding resource potential has implications for the assessment of impacts as indicated above. The amount of impact will become greater as the magnitude of the development increases. Obviously, it is also necessary to assess the state of the environment likely to be affected, including the land, the air, and the water. Such an environmental assessment should be designed to allow for both qualitative and quantitative evaluations of impacts. Qualitative information often reflects social values but not the biological impact of an event on an ecosystem. Quantitative estimates should be made so that risks can be calculated and decisions based on these calculations as well as on social values when indicated.

From the CEQ study, which was based on existing data, and on the basis of its own understanding, the Committee agrees with the CEQ that present knowledge is inadequate for assessing thoroughly the likely physical and biological consequences of OCS development activities on the environments in question. Information is available in varying degrees of completeness. For example, the topography of coastal areas is well-known. However, weather conditions, sea state, and ocean currents are only partially known and do not provide an adequate base for assessment, design, or operation in every area. The functional dynamics of the ecological systems of estuaries, marshlands, and open waters and their interrelationships are complicated and differ in various geographical areas. In some areas the systems have not been adequately described. We, therefore, recommend that a vigorous effort be initiated to expand knowledge of the physical and biological environments and the ecological systems likely to be affected. In particular, we agree with the CEQ Report recommendation that potential impacts on commercial fisheries should be evaluated before development begins.⁵

A catalog of environmental parameters such as local air and water quality indices, meteorological conditions, acres of land in selected uses, and species of plants and animals is necessary, but not sufficient for an environmental assessment. Further understanding of the productivity and value of discrete ecosystems should be developed. Such

⁵ CEQ Report, Chapter 6.

an evaluation requires an understanding of the complex interrelationships between living plants and animals and the physical environment in an area large enough to be distinguishable as an ecological system. While it is frequently useful to classify ecosystems geographically into marshes, estuaries, offshore areas, and so forth, it is also important to recognize that within each classification there are both similarities and differences. For example, although intertidal areas consisting of marshlands and shallow estuaries generally are highly productive of renewable resources and serve as important nursery grounds for fisheries, not all of these areas consist of the same types of plants and animals or the same types of interrelationships. Thus, some may be more sensitive to environmental changes than others. It is important, therefore, that each ecosystem be assessed with respect to its uniqueness of character and its productivity, as well as its economic and social value.

Yet another parameter of each ecosystem should be assessed: its spatial extent. It is conceivable that some areas, although they represent only a small percentage of the area of the ocean or of the coastal zone, are sufficiently important biologically to preclude any serious development in their immediate vicinity. No such areas have been defined in the CEQ study, but they may yet be identified as understanding improves. Conversely, less productive and sensitive areas, where experience indicates that recovery from oil damage may be rapid, could be considered less vulnerable to intrusion and therefore more acceptable for development.

Economic evaluation of a particular discrete ecosystem should be directed toward analyzing its renewable resources (its fisheries in particular) and its relationship to other areas, e.g., as a nursery ground. For example, the Louisiana delta and marshlands are considered the controlling factors for fisheries production in the northern Gulf of Mexico. The Chesapeake Bay area has a similar relationship with the mid-Atlantic region and, without doubt, there are other such areas along every coastline that can be similarly identified as critically important to production of renewable resources.

Any stress that seriously alters the dynamics of an ecosystem should be avoided, since critical changes in its productivity may result. On the other hand, specific systems may be subject to varying degrees of natural stress, such as a decrease in the salinity of an estuarian system due to unusually heavy freshwater runoff. A system operating normally can overcome and repair temporary losses of its renewable resources in variable but reasonable periods of time. Therefore, the danger of environmental intrusion by man is not necessarily the temporary loss of populations but rather the loss of or permanent change in the dynamics of the system that supports its productivity. For this reason studies of the recovery of ecosystems from catastrophic damage resulting from natural stress are particularly critical. The Committee therefore recommends that, in order to improve the base of knowledge necessary for understanding and assessing the impacts of man's activities, data be developed to establish the natural ecosystem dynamics associated with production of renewable resources, with particular attention given to the effects of seasonal and occasional episodic changes in environmental parameters.

Ecological studies of an area that might be affected by OCS development should be conducted while plans are developing for exploration and engineering, so that the possible effects can be evaluated before significant impacts occur. The ecological data can thus help to evolve the system, rather than to impede ultimate development activities. In particular, the coastline and land-based services can be planned well in advance of construction to assure minimum adverse effects.

An essential element in a decision on OCS development is the definition of the physical environment: the combinations of weather, sea states, and ocean currents. These data, in greater detail, are also vital for design of structures and operating procedures, for risk evaluation, and for safe and economical operation.

The available physical data are more extensive for the Atlantic than for the Gulf of Alaska OCS. However, since these data are for the most part collected by shore stations or merchant ships, they are not optimal for design of OCS installations or for providing the warnings or modifications necessary for operations. In order to define the environment properly, carefully located buoys are needed to make observations extending over time. For example, information on ocean current profiles and their response to changing weather conditions may be needed to design towers or bottom-mounted storage or to develop operational strategies.

The MIT study of oil spill trajectories conducted for the CEQ calls attention to the fact that data relating to the transport of oil slicks by winds, waves, and ocean currents are inadequate.⁶ Further, it emphasizes that model calculations based on present understanding of transport mechanisms are highly uncertain. Nevertheless, these calculations are used as the primary criteria for rank ordering of the OCS Atlantic coast development regions in the CEQ Report. We conclude that this reliance is not justified, and that more comprehensive studies are needed before adequate predictive models can be made. The major limiting weather and sea conditions should be described thoroughly through analysis of selected case studies. Experimental model calculations should be checked systematically against the results of field experiments.

It is clear that the available data do not recommend the development of OCS resources at the present time in the Gulf of Alaska. First, data on weather conditions, sea states, ocean currents, ecological system dynamics, fisheries resources, and the sensitivity of indigenous species to oil pollution are not well known. Second, operating conditions due to weather and sea states will be difficult, because storms are frequent, and their forecasts are less reliable. Third, the economic and social impacts of development on Alaskan coastal communities will be extreme. Finally, the frequency and severity of earthquakes and tsunamis in the area pose costly problems in engineering.

IV. ECOLOGICAL AND ECONOMIC IMPACTS

OCS oil and gas development, including the associated industrialization on land, will have ecological and economic impacts both at

⁶ Stewart, R. J., J. W. Devaney, III, and W. Briggs, 1974. Oil spill trajectory studies for Atlantic Coast and Gulf of Alaska. Final draft report to the Executive Office of the President, Council on Environmental Quality, by Massachusetts Institute of Technology, March 1, 1974.

sea and ashore. These impacts may or may not be desirable or acceptable. Chronic and accidental discharges of oil and other pollutants and changes in the uses of land and water will cause both temporary and permanent changes in the environment. Local employment opportunities will be created and displaced with varying effects on the economic and social life of the affected communities. Although such impacts are interrelated, they are divided somewhat artificially in this section into ecological and economic categories.

Ecological Impacts

Both permanent and temporary stresses can cause ecological impacts. Permanent stresses result from development of harbors and construction facilities, placement of platforms and pipelines, dredging and filling operations, alteration of drainage patterns, and construction of refining and petrochemical complexes. Chronic pollution by the operational discharge of brines from active fields may also be considered to be permanent, since these discharges—which also contain some oil—continue and actually increase with the age of the field. Permanent effects may be further subdivided into direct, indirect, and associated problems. Direct effects involve the permanent loss of land or water bottoms to structures, dredging operations, and spoil placement. Indirect effects, which cause the greatest damage to ecosystem dynamics, are broader in scope, involving changes in water circulation, salinity, turbidity, and chronic pollution. Associated effects involve a multitude of changes in land use, air and water pollution, and other problems resulting from such secondary developments as construction of industrial complexes and housing, and shifts of populations to or within the coastal zone.

Temporary ecological impacts are generally associated with accidents such as well blowouts, loss of drilling muds, and oil spills. These occurrences can be costly and destructive and reduce productivity of the impacted area. After a variable amount of time has elapsed, the affected ecosystem generally will recover to a point where the normal biota and ecosystem activity are restored.

The significance of such impacts may be measured by their spatial extent and the length of time required for recovery. The recovery time depends not only on the species present in the area and their interdependencies, but also on the persistence of the pollutant in the environment. As indicated in the CEQ Report, the persistence of oil in the marine environment is still poorly understood.⁷ Conflicting observations on the persistence of oil and its long-term effects on the local ecosystem abound in the published literature. Evidence exists for rapid degradation and dispersal of oil by natural processes. On the other hand, there is also evidence of continuing impacts due, for example, to periodic releases of hydrocarbons that have been incorporated into sediments, where they can persist unchanged for long periods of time. We suggest that the questions surrounding the persistence of oil in the marine environment should be resolved through careful and intensive investigation before irreversible damage is inflicted on biologically and economically sensitive areas.

Having determined the nature of the temporary impacts, it is important to predict the frequency with which they occur. The CEQ

⁷ CEQ Report, Chapter 6.

study has revealed interesting and useful statistics on the probabilities of accidents.⁸ These statistics should lead to a further analysis of the causes of failures, both physical and operational, so that technology can be developed and implemented to reduce their recurrence.

Accidental spills should also be analyzed for the probability of reaching an ecologically sensitive area. This probability depends upon the location of the source, the type and amount of pollution, the location of the ecosystem affected, and the season of occurrence. The size of the spill and the extent of the area affected would be important in evaluating the impact on the function or productivity of the area. The CEQ study has addressed these problems for accidental spills at possible production sites offshore and for selected local areas based on the work performed by MIT.⁹

The probability of localized impacts based upon computed drifts or trajectories of oil slicks using historical wind and weather data could be helpful in evaluating the relative hazards of different drilling sites or locations for shore-based pipeline terminals, transfer facilities, or refineries. However, as noted in Section III, the data on which the study is based are inadequate and the model uncertain. The probabilities in the CEQ Report are based on a large number of simulated trajectories using hypothesized mean currents and stochastic winds. The mathematical simulations were checked against drift bottle data that may or may not have meaning for the tracking of oil spills. Because the mathematical and physical models of the transport mechanisms are themselves uncertain, we do not have confidence in present capability to predict the probability of localized impact due to the movement of oil spills.

We wish to emphasize that for a particular spill at a given time predictions of the probability of that spill reaching a particular location may be misleading. Since spills are not expected to occur frequently, the degree of risk will be determined by the actual weather and sea conditions at the time of the accident and for a period of time following it.

The toxicity of crude oil and its fractions is also little known and poorly understood.¹⁰ Most of the literature on toxicity has evolved from laboratory experiments or from heavy spills into small areas. An evaluation of the toxicity problem should account for the amount of oil spilled, the proportion of the toxic fraction, the total volume of water polluted and its rate of replacement, and the surface area involved. This type of analysis over many variations of the environmental parameters does not exist, as the CEQ study implies.

A thorough evaluation of an oil spill impact on an ecosystem, its productivity, and economic structure, requires estimation of the size of the spill, the probability of oil reaching the area, the physical and biological effects of the oil, its persistence in the environment, and the resilience of the ecosystem to the intrusion. The resilience of an ecosystem is determined by its internal dynamics. As we indicated in Section III, some systems, for example estuaries and deltas, have inherent dynamic characteristics that permit them to withstand highly variable and seasonal changes in their natural environmental parameters. In

⁸ CEQ Report, Chapter 4.

⁹ Stewart, R. J., et al. *Op. cit.*

¹⁰ CEQ Report, Chapter 6.

specific cases these natural fluctuations can be so great that they overshadow any effect from either chronic or accidental spills thus far observed. Many communities and species are transient: their appearance and disappearance by season or by some other short interval of time may obscure the impact of a localized and temporary stress from oil. Even assuming that most of the living organisms were killed within a local area, the total productivity of the ecosystem might still fall within the measurable limits of annual variations in production. Thus, only cumulative losses in acreage or changes in the composition of the biota would give evidence for measurable permanent damage.

It should not be inferred, however, that recovery from unnatural or man-made stresses, whether chronic or temporary, can always proceed without measurable long-term effects. The response of a particular system to an unnatural stress may differ from that due to natural variations, especially since the existing ecosystem has developed as a result of tolerance to the usual range of natural phenomena. Clearly, the response of a specific ecosystem to man-made change will depend critically upon the system, its dynamics, and the nature of the alteration.

The impacts of oil pollution on ecosystems in different habitats will differ. Oil spilled near stable shores with narrow intertidal zones is likely to be washed away by wave action more rapidly than oil spilled in estuaries and marshlands with wide, shallow intertidal zones. In these latter areas, pollution is more likely to be trapped and incorporated into sediments where it can persist for long periods. The finer sediments, such as silts and clays, will retain oil for longer periods than will clean sandy sediments. As the CEQ Report concludes, the economic impact of oil pollution in estuaries and marshlands is also likely to be more significant because these areas generally serve as feeding and nursery grounds for many important commercial species of fish and shellfish.¹¹

The CEQ study has concentrated primarily on the fates and effects of temporary oil spills from offshore locations and secondarily on the impacts of chronic discharges. The Committee concludes that insufficient attention has been given to permanent direct and indirect effects and to the effects associated with onshore development. In particular, the environmental effects in the coastal zone due to economic activities accompanying OCS development, such as changing land use patterns and population centers, ought to be examined in detail.

One type of permanent impact treated in the CEQ Report results from the landfall of pipelines.¹² Dredging, filling, and damming in unstable estuarine and deltaic regions can alter drainage patterns, leading to loss of land and to changes in the physical and chemical environment with resultant ecosystem changes. Much less damage may occur, however, if pipelines come ashore at stable shores.

While all of the necessary information regarding the impact of oil on the marine environment is not available, definitive conclusions can be reached for some effects. For example, the evidence on the effects of oil on birds is clear. Toxic results are known where refined oils have been spilled in confined areas. The distribution of tar balls in the open sea is well known, as is their presence on beaches. In contrast,

¹¹ CEQ Report, Chapter 7.

¹² CEQ Report, Chapter 6.

clear damage by sublethal chronic contamination in the Gulf of Mexico has not been demonstrated. Ambiguities arise because most studies have been incomplete, inadequate, and transitory, and the effects of spills in the open seas have rarely been studied.

Regional Economic Impacts

Oil and gas development on the OCS will alter local and regional economics as well as the ecosystems in which they take place. In recognition of this fact, the CEQ has correctly focused on the necessity of managing development in order to avoid permanent degradation on the environment and unnecessary disruption of traditional local values and life styles. Further the Report attempts to provide a methodology for gathering the information needed by state and local officials, who must make plans in the face of difficult and complex decisions on growth and land use. To assess both the favorable and unfavorable economic impacts and the associated environmental impacts, the Report has addressed, identified, and quantified impacts on employment, value of production, and total population in the local and regional economies. The study further translates these data into estimates of land requirements, air and water pollution loadings, and a selected list of impacts on the social infrastructure.¹³

The Committee agrees with the concerns of the CEQ and is encouraged by its attempt to quantify the likely onshore impacts in order to provide information that we consider to be vital both to decision-making and to planning. Because the methodology for this type of study is of critical importance to its usefulness, we wish to call attention to what we consider to be deficiencies and omissions in the present study as prepared for the CEQ.¹⁴

The obvious first step in this type of analysis is the definition of the appropriate geographic dimensions of the impacts of OSC development. The study has separated potential impacts simply into offshore and onshore categories. Offshore impacts are concerned primarily with the fates and effects of oil pollution originating at or near potential development sites. Onshore impacts include the effects of employment and production in specific oil and gas receiving and processing locales and regions and the attendant air and water pollution loads. Although the selection of the specific study sites could be questioned, we recognize that for the present purposes the analysis is intended only to illustrate a technique.

We are concerned that the manner in which the impact dimensions have been geographically segregated, with selected effects considered under each division, does not facilitate a complete understanding of the total development process. By omitting from treatment such important activities as those that take place somewhere other than at offshore production and onshore industrial sites, the CEQ study has neglected an important dimension. This difficulty applies to the analysis of environmental as well as economic impacts. The discussion of the Puget Sound area, for example, omits analysis of the consequences of increased tanker traffic in the inside waters of the Sound—waters

¹³ CEQ Report, Chapter 7.

¹⁴ Resources Planning Associates and David M. Dornbusch and Co., 1973. Potential onshore effects of oil and gas production on the Atlantic and Gulf of Alaska outer continental shelf, Vol. 1, Chapter 1, Report to the Executive Office of the President, Council on Environmental Quality, December 1973.

that are subject to treacherous tidal currents, dense fogs, and high winds. Collisions or groundings within the narrow passages of the Sound could cause extensive ecological and economic damage throughout the entire region.

Commercial fishing, to cite a further example, is an economic activity that takes place both offshore and onshore. The geographic classification used not only eliminates from consideration the offshore activities of fishing, but as a consequence does not register the onshore impacts on fish processing and support activities due to possible reductions of offshore fisheries production.

A suitable methodology, therefore, must begin with a regional definition that embraces the entire development process in an area large enough to be distinguishable as a complete system. Within this region a hierarchy of inter-related areas should be defined in accordance with their economic characteristics. For example, we suggest that in the case of the Gulf of Alaska the large region within which OCS development would operate is south-central Alaska, including the offshore continental shelf areas (this is the district used for administrative and planning purposes by state agencies). Analytical units within this region would be the Anchorage area headquarters and support area for all Alaska petroleum development), the Cook Inlet basin (presently developed petroleum, gas, and petrochemical industries), and the Gulf coastal and outer continental shelf area (the area under consideration in this study for future development).

A second step in analyzing impacts is to devise simple but appropriate models of each regional and local economy. These models should reveal the specific nature of each economy in order to identify and measure impacts properly. The present study uses the same five sector models for all areas and the same multipliers in calculating induced employment, production, and total population from the oil and gas development impacts.¹⁵ The sectors are too limited in number and scope to describe a complete economy. Furthermore, the data sources appear to be civilian, non-agricultural wage and salary employment and payroll series which exclude or understate defense, commercial fisheries and agricultural activities. The application of this uniform and incomplete model to every economy and the use of limited economic data obscure the variations in local economic structures and the unique functioning of which, and distort the projection of development impacts.

Projections of each base case economic development must be tailored to specific regional structure, growth behavior, and anticipated future conditions; thus such forecasts in general will be more complicated than simple linear projections. A study of actual case histories of regions that have experienced offshore developments would provide useful guides. Examples of these are the Gulf of Mexico development and its impacts on the coasts of Louisiana and Texas, the more recent development of offshore oil and gas in the upper Cook Inlet and its economic and social impact upon the Kenai Peninsula Borough and the City of Kenai, and the North Seas development and its impacts on the east coast of Scotland.

¹⁵ Resource Planning Associates and David M. Dornbusch and Co., 1973. Potential onshore effects of oil and gas production on the Atlantic and Gulf of Alaska outer continental shelf. Draft Appendix VI. Report to the Executive Office of the President, Council on Environmental Quality, December 19, 1973.

In addition to what we view as deficiencies in the design and methodology of this study of economic impacts, we find several specific aspects that are either omitted or inadequately treated in the Report. For example, impacts are a function not only of the nature and magnitude of the development, but also of the rate of development. When such programs are undertaken on a crash basis, the local and regional economies may be subject to the economic and social ills of boom and bust. Slower, controlled development rates over longer periods would minimize these distortions. Ultimately, an economic activity based on a nonrenewable resource must confront the predictable end of its existence. The social and economic costs of adjustment to this outcome must also be considered in assessing regional economic impacts.

Alteration of land use patterns can have both environmental and economic impacts. The CEQ study has classified present and future land uses in selected locations to identify the amount and general location of land that will be available to development.¹⁶ All land has a use, either for man, for nature, or for both. The development of land changes its use from one purpose to another, and such changes have social, economic, and environmental consequences. For instance, the disturbance of a marshland ecosystem by dredging and filling operations may have indirect economic costs if marine resource nurseries are lost. Loss of agricultural lands represents a direct economic cost, especially if those lands are particularly suited to specialty crops because of unique conditions associated with their proximity to the ocean. Examples of such crops are the cranberries of the bogs of Massachusetts and New Jersey and the artichoke fields of the central coast of California. Social costs of changes in land use can result from the loss of open space, beach-land, and recreational facilities, all of which have associated economic costs.

An additional consideration in assessing economic-ecological impacts of OCS gas and oil development is the transportability of crude oil and natural gas. Because oil and gas can be transported at low cost by pipeline, tanker, or barge alternatives for refinery locations exist at different economic and environmental costs. In the Gulf of Mexico, transportation costs have amounted to about six percent of the cost of production per barrel.¹⁷ Thus, as the CEQ Report suggests, both the social benefits that may be derived from siting and the costs of various refinery locations should be taken into account in planning for development.¹⁸

There are potential conflicts and confluences of interest between several other ocean-based technologies all in comparable early stages of planning at the present time. For the most part, the studies of these technologies are proceeding in isolation from one another. Particularly, these are offshore power plants, deep-water ports, and offshore drilling. Potential mutual enhancement clearly exists between deep-water ports and offshore drilling. The interactions of nuclear power plants with the other two are less clear, but a major design consideration for offshore nuclear power plants is the need to protect them from damage in collisions with ocean vessels; as the largest vessels afloat are oil tankers, there is evidently a potential desirability

¹⁶ CEQ Report, Chapter 7.

¹⁷ Kash, D. E., et al. 1973. *Energy under the Ocean*, p. 81. University of Oklahoma Press, Norman, 378 pp.

¹⁸ CEQ Report, Chapter 6.

for zoning the coastal regions to prevent large tankers from coming near offshore power plants. There are doubtless other positive and negative interactions that deserve careful attention, again as much to uncover otherwise missed opportunities as to discover unforeseen obstacles to development.

V. TECHNOLOGY AND RISK EVALUATION

The Committee concludes that improvements in OCS technology can and should be developed and implemented to minimize damage to the environment resulting from offshore operations, the transportation of oil and gas, onshore siting and construction, and petrochemical operations. The CEQ Report¹⁹ has reviewed the state of the technology and OCS lease management and operating procedures, relying primarily on previously published studies.^{20 21 22 23 24} The Committee concurs with the CEQ in recommending further developments of OCS technology and better systems design, operating procedures, regulation, and management.²⁵ Some additional comments and discussion are given in this section.

To ensure the existence of adequate technology for environmental protection and safety, appropriate governmental agencies should be given responsibility for conducting and/or sponsoring research and development in the areas of engineering relevant to these aspects of OCS operations. In the absence of incentives, industry should not be expected to provide sufficient effort in this area.

We recommend the adoption of two principles applicable to the assessment of technology and risks as described in this section. First, the costs of all operations for safety and environmental control for OCS operations should be included in the costs of the crude oil and gas produced. Second, the public rather than the operators should determine the balance between the levels of risk assumed and benefits obtained in areas of public interest.

Environmental Protection

An effective program of environmental control of both accidental spills and chronic discharges should be a prerequisite for new OCS oil and gas development along the Atlantic coast and in the Gulf of Alaska. Much of the technology exists, but improvements can and should be developed as necessary. Equally important are better systems designs (taking human factors into account), improved regulation and enforcement, better trained operating personnel, and a firm commitment to environmental protection by OCS operators.

¹⁹ CEQ Report, Chapter 4.

²⁰ Kash, D. E., et al. *supra* note 17, Part Three.

²¹ National Academy of Engineering, Marine Board, Panel on Operational Safety in Offshore Resource Development, 1972. Outer continental shelf resource development safety: A review of technology and regulation for the systematic minimization of environmental intrusion. U.S. Geological Survey, U.S. Department of the Interior, Washington, D.C. 197 pp.

²² Dyer, M. K., et al. 1971. Applicability of NASA contract quality management and failure mode effect analysis procedures to the USGS outer continental shelf oil and gas lease management program. Unpublished report to the U.S. Geological Survey, November 1971.

²³ Acuff, A. D., et al. 1973. Report of the work group on OCS safety and pollution control. U.S. Geological Survey, May 1973, 33 pp.

²⁴ Comptroller General of the United States, 1973. Improved inspection and regulation could reduce the possibility of oil spills on the outer continental shelf: A report to the Conservation and Natural Resources Subcommittee, Committee on Government, House of Representatives, Paper B-14633, June 29, 1973, 44 pp.

²⁵ CEQ Report, Chapter 8.

Costs

The CEQ Report does not describe incremental costs of various applications of current technology to environmental protection. We conclude that such data would be useful and hope that such a study will be initiated. We recognize that in some instances the costs of safe operation and environmental controls may increase the cost of extraction beyond the level at which operations are economically attractive. In such a case, resources should be developed elsewhere under circumstances where total costs—with environmental costs properly taken into account—are less. Importantly, the fact that environmental controls in such a case are costly should not be used as grounds for reducing the level of control, but rather should indicate that the development of that resource should be deferred to a time when the costs of environmental control are reduced through technological advances or the value of the resource increases.

Risks

Accidental spills result either from the failure of equipment or from human errors and deficiencies in operating procedures. Almost by definition some risk of an accident always exists, but we believe that improved technology and adequate managerial and operating procedures can reduce these risks. Because the costs of such protection will be borne by the public should evaluate the levels of tolerable risk for which it wishes to assume the burden. The perception of risk by the operators ordinarily does not account for environmental and social costs and will not do so in the absence of economic incentives or regulations designed for that purpose. We recommend that appropriate incentives be provided to the operators as inducements to maintain firm commitments to the levels of environmental protection and safety deemed acceptable by the public.

As recommended by the CEQ, specific design and performance criteria for structures, tankers, pipelines, and other equipment should be established by appropriate government agencies.²⁴ These criteria should specify for each leasing site the intensities of extreme natural hazards (winds, waves, currents, ice, earthquakes, and tsunamis) that OCS structures and equipment must withstand without failure. An intensive effort at collecting oceanographic and meteorological data for specific leasing sites will be necessary before these design standards can be rationally established.

The coastal and offshore structures, including harbors and waterways, that a developer proposes to build and operate should be closely reviewed by a regulatory agency to ensure compliance with established design criteria. Furthermore, the developer should make available to the agency complete information on structural and foundation analyses and the results of all special structural and hydraulic model tests. The regulatory staff should include engineers with appropriate specialized qualifications for complete review of such structures.

For tankers and ships, particular attention should be given to measures for reducing chances of collisions and groundings, such as improving navigational aids and shipping lanes—especially in harbor approaches—and installing adequate collision warning devices on both ships and platforms.

²⁴ CEQ Report, Chapter 8.

Chronic Discharges

Chronic discharges of oil may far exceed the amounts from accidental spills during the life of an offshore oil field, and may be more significant environmentally. Systematic evaluation of the sources of chronic discharges to the environment is necessary to devise the best corrective measures.

A major source of such pollution is the ocean dumping of well brines, which under current controls may contain as much as 100 parts per million (ppm) of oil with an average of less than 50 ppm. Separators would adequate carrying capacity should be required to satisfy specific performance criteria for removing the oil from these brines. It may be desirable to limit the gross emission rates of oil that can be tolerated from any given structure or over any given area, rather than specifying the percentage of oil in the discharged brine. The brine should also be studied for its impacts on the environment, because of its high content of dissolved solids, including heavy metals.

As indicated by the CEQ, tanker and barge operations are also sources of chronic pollution near shore and at sea, and should be controlled.²⁷

VI. INSTITUTIONAL AND PUBLIC POLICY ISSUES

Development of oil and gas resources from the OCS will require important changes in local, state, and federal institutional policies and relationships. In fulfillment of its mandate, the CEQ has addressed some of these needs in its Report, particularly those most directly related to environmental protection.²⁸ In this section, we address not only these, but other issues that are important to public and federal agency formulation of OCS resource policy.

Leasing Federal Lands

As noted in Section III, knowledge of the OCS resource potential and its attendant environmental values is an essential prerequisite to sound policies for the exploitation of OCS oil and gas resources. Several options exist for improving federal resource information policy and for permitting full public disclosure: federal agencies might obtain basic resource information (a) by their own exploration and interpretation prior to the sale of leases, (b) by requiring a quasi-governmental or public corporation to do so, or (c) by permitting competitive bidding for data-gathering contracts. Knowledge obtained in any of these ways would allow the federal government to maintain maximum planning capabilities for OCS energy resource development. A federal agency could, for example, compare the economic worth of a potential leasing area with the environmental degradation and risks that a sale would cause. Because the concept of private proprietary resource information would be eliminated, public availability of such data would be both possible and desirable. Another option, with more far-reaching policy implications, is establishment of a non-profit, federally-chartered corporation to engage in all aspects of oil and gas exploration, development, production, refinement and distribution in

²⁷ CEQ Report, Chapter 8.

²⁸ CEQ Report, Chapter 9.

cooperation with and in competition with private industry.²⁹ Whatever the instrument, disclosure of resource data might encourage widespread and aggressive bidding among prospective lessees.

We believe that a significant opportunity now exists for forming an institutional structure based on public knowledge of oil and gas resources. In order to achieve this goal, careful study should be given to these and other policy options prior to the sale of leases in new OCS areas.

Leases to exploit public resources should also be altered to account for the public availability of resource information. It may be advisable, for example, to substitute royalty or some other form of lease bidding for the present bonus-bid system. Royalty rate bidding might be appropriate at rates consistent with ever-increasing oil and gas prices.

Before any lease is awarded, other factors must also be assessed by federal agencies, such as the past record of the operator in achieving and surpassing minimum standards for production and environmental protection. The federal government should seek vigorously to establish the principle that OCS lessees have a license to develop public resources for the public benefit and so must be held accountable to strict standards in the public interest.

The Committee suggests that royalties and/or bonuses, whichever are applicable, should be distributed as benefits to those by whom the costs are borne. Because many of the costs of environmental protection and degradation are incurred locally, some portion of the dollar royalty benefits of OCS development should be returned by the federal government to these locales to offset coastal planning, regulatory, and other associated costs.

Coastal Zone Management

Development of OCS oil and gas is clearly a national concern, but its implementation must be carried out in ways that conform with state regulations and coastal zone plans. Because the impacts of OCS development on the coastal zone can be minimized by careful planning, we conclude that it is imperative that an open, effective institutional planning structure be created and adequately funded that will utilize the capabilities of federal, state, and local governments. Decisions within that process on land use planning and regulation should reflect national as well as regional environmental, economic, and energy interests. For each development, the affected state should retain the right to impose its own special conditions for protecting waters within its jurisdiction and for controlling the impacts of land-based developments of ancillary services ashore. Federal leases should require that OCS operators comply with these standards.

As described in the CEQ Report, major environmental and social problems and dislocations will be caused by OCS operations once leasing has occurred.³⁰ The Scottish experience with North Sea development reveals that the fabrication of platforms and the establishment of onshore service and terminal facilities demand the most careful and sophisticated planning and controls long before any oil

²⁹ For a description of institutional mechanisms used by countries with oil and gas operations in the North Sea, see White, I. L., et al. 1973. *North sea oil and gas*, pp. 152 and 145. University of Oklahoma Press, Norman, 178 pp.

³⁰ CEQ Report, Chapter 7.

and gas is produced. Without such planning, local and state governments will be subject to highly unpredictable private economic determinations of the locations for onshore facilities. We conclude that the Coastal Zone Management Act—the only existing mechanism for comprehensive national coastal protection—should be strengthened and fully funded to encourage the development of coastal zone management plans and regulations.

Whatever management policy is adopted to provide equitable treatment of national and local needs, we believe that no OCS leasing should occur until after the development of adequate coastal zone plans.

Regulation and Surveillance of OCS Operations

Staffing and funding for resource assessment and enforcement should be commensurate with the increased magnitude of the OCS program. The extension of OCS oil and gas activities to new areas will strain the existing capacity of federal agencies to assess new tracts for resource potential and environmental problems and to regulate OCS operations once begun.³¹ Substantial increases in funding for the Bureau of Land Management, the U.S. Geological Survey, and the U.S. Coast Guard may be required to match projected plans to lease 10 million acres in the OCS in 1975—a tenfold increase over leasing in 1973.

We endorse the recommendations of the CEQ for a regular, frequent, and rigorous OCS enforcement system, for a new system of punitive shut-ins and administrative fines, for formal inspection training programs, and for citizen suit provisions that will permit interested persons to seek judicial remedies for OCS regulations and permits.³² In addition, we recommend that the federal government adopt strict standards regarding liability of OCS lessees for pollution damage on and offshore to both private and public parties. Such highly certain liability can be assumed by OCS operators as the cost of doing business and has already been recognized as legal and appropriate for coastal protection by state and federal courts and agencies.

A basic policy question related to OCS development and enforcement administration is whether these functions should reside in separate federal agencies. We agree with the analysis of the University of Oklahoma, which suggests separating resource development and regulation within the federal government, rather than integrating them under the responsibility of a single agency.³³ Such separation could promote the public availability of information that otherwise might be hidden behind bureaucratic barriers.

Environmental Impact Statements

The most thorough and rigorous federal environmental assessment of new OCS programs is based on the environmental impact statement process required by the National Environmental Policy (NEPA) of 1969. This tool for management planning and decisionmaking has not been used to its full potential by federal agencies. It can prove particularly useful for OCS programs at various stages: when a new leasing program and schedule is proposed, when a particular region

³¹ Comptroller General of the United States. *Op. cit.*

³² CEO Report, Chapter 9.

³³ Kush, D. E., et al, *supra* note 17, at p. 195.

is subsequently proposed, and finally when a particular lease sale is contemplated. A new impact statement process should begin as each stage is being planned.

To assess environment impacts in both the programmatic and regional statements, baseline data on the environment itself must be gathered. Our critique and the CEQ Report have outlined some kinds of data and analytical methods required for adequate assessment. To make effective use of the impact statement process, it will be necessary to obtain extensive new data and to make more rigorous environmental analyses for future impact statements.

As the CEQ Report suggests, the use of impact statements as guides to decisionmaking should be promoted through improved substantive contributions from other expert federal, state, and local agencies and by the interested public.²⁴ New data, new analyses on cumulative efforts, and new public attitudes require constant evolution of impact statements. To facilitate that useful evolution we suggest that federal agencies develop specific guidelines for these statements and take positive steps to encourage meaningful public and governmental participation in their writing and review.

I. ABSTRACT OF NAS REPORT

International Issues

Under the 1958 Geneva Convention on the Continental Shelf, governments of coastal states are permitted to explore and exploit the natural resources of their continental shelves, arbitrarily defined as the water bottoms under less than 200 meters of water, and beyond to depths limited by technology. Until recently, the lack of technological and economic feasibility did not encourage exploitation beyond a depth of 200 meters, but this situation has changed with recent leasing at greater depths in the Gulf of Mexico. Thus, development of the OCS beyond the 200 meter depth in the Atlantic and Gulf of Alaska may also be contemplated. Unilateral extension of development below 200 meters in these waters could jeopardize international treaties, conferences and negotiations regarding pollution, fisheries, and the law of the sea. A moratorium on further leasing on deep extensions of the OCS would be advisable until the international issues are resolved.

APPENDIX 1—MEMBERS OF THE NAS COMMITTEE

- DR. H. W. MENARD,¹ Scripps Institute of Oceanography, University of California, La Jolla, California (Chairman)
 DR. D. JAMES BAKER, Jr., Department of Oceanography, University of Washington, Seattle, Washington
 MR. MALCOLM F. BALDWIN, Environmental Impact Assessment Project, Washington, D.C.
 DR. NORMAN H. BROOKS,² Department of Environmental Engineering Science, California Institute of Technology, Pasadena, California
 DR. ROBERT DORFMAN, Department of Economics, Harvard University, Cambridge, Massachusetts

²⁴ CEQ Report, Chapter 9.

¹ Indicates member of the National Academy of Sciences.

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- DR. ROBERT G. FLEAGLE, Department of Atmospheric Sciences,
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ernment Research, University of Alaska, Juneau, Alaska
- DR. ROBERT H. SOCOLOW, Center for Environmental Studies,
Princeton University, Princeton, New Jersey
- DR. LYLE ST. AMANT, Louisiana Wildlife and Fisheries Com-
mission, New Orleans, Louisiana
- DR. CLYDE A. WAHRHAFTIG, Department of Geology and Geo-
physics, University of California, Berkeley, California
- DR. FREDERICK ZACHARIASEN, Department of Physics, Cali-
fornia Institute of Technology, Pasadena, California

FOR THE NATIONAL ACADEMY OF SCIENCES

Project Officer, Dr. Myron F. Uman,² NAS Resident Fellow
Project Secretary, Mrs. Ruth M. Kelly

APPENDIX 2—AN ANALYSIS OF THE ECONOMIC VALUE OF OCS OIL AND GAS

The calculations below are made for the purpose of illustrating the kind of analysis from which estimates of the economic value of OCS oil and gas can be derived. The results of the analysis presented might be widely different if other parameters are used or if other amounts of recoverable oil and gas are assumed.

To estimate the gross economic value of the OCS oil and gas development under study by the CEQ, we have assumed that, during their 20 year lifetimes, the OCS fields will produce some 24 billion barrels of oil and 73 trillion cubic feet of natural gas. These figures are intermediate values within the range of possibilities forecast in the CEQ Report. Assuming reasonable values of \$8 per barrel of crude and \$.75 per thousand cubic feet of gas, the gross lifetime revenue of this development is about \$240 billion.

The most pertinent data available for making an estimate of the costs of development and operation of OCS fields, and resulting flows of oil and gas, are those prepared by MIT for the CEQ study.¹ The field of medium size analyzed has a lifetime yield of 388 million barrels of crude. The entire OCS development can be considered as a sequence of about 60 these fields. The life history of this typical field is two years of construction and development, followed by about seven years of operation during which additional wells are produced. Oil and gas from a given well appear at an exponentially declining rate. Given the prices noted above and a 6 percent real rate of discount, the present value of the oil and gas revenues as of the time that construction begins is about \$2,600 million. The corresponding present cost of

² On leave of absence from the Department of Electrical Engineering, University of California, Davis, California.

¹ Massachusetts Institute of Technology, 1974. Offshore economic model. Draft report to the Executive Office of the President, Council on Environmental Quality. 35 pp.

construction and operation is \$240 million; the net present value of the resource is thus about \$2.4 billion.

The value of the entire contemplated OCS development can be appraised roughly by extrapolating from the data given above. Information supplied to the CEQ indicates that the fields will be brought in gradually, with construction of the first beginning in 1978, twelve fields in operation in 1985, and full development of twenty-five fields in 2000.² Assuming that the number of fields grows linearly during the twenty-year operating lifetime, the present value of revenues as of 1978 is about \$87 billion, and that of development and operating costs \$8 billion, making the net economic value of the resource \$80 billion. From this might be subtracted the costs of exploration, which, although large in absolute magnitude, are small in comparison to the estimated net economic value.

APPENDIX I.—OUTER CONTINENTAL SHELF RESOURCE DEVELOPMENT SAFETY: A REVIEW OF TECHNOLOGY AND REGULATION FOR THE SYSTEMATIC MINIMIZATION OF ENVIRONMENTAL INTRUSION FROM PETROLEUM PRODUCTS

PANEL ON OPERATIONAL SAFETY IN OFFSHORE RESOURCE DEVELOPMENT, NATIONAL ACADEMY OF ENGINEERING, MARINE BOARD, DECEMBER 1972

Abstract

The subject of offshore oil resource development safety is considered from the standpoint of minimizing the potential for sudden massive and small continued releases of oil to the environment. The numerous aspects of technology ranging from geophysical exploration to well workover and abandonment are described briefly in Chapter One and evaluated for possible hazards. Conclusions and recommendations are presented on pages 47-50. The effectiveness of present regulations and inspections is evaluated in Chapter Two and conclusions presented on page 64. Precedents for improved practices in other areas of government regulatory responsibility are examined and recommendations are made in Chapter Three on page 79 concerning improvements to regulations and standards for use offshore. The need for additional safety-related information is examined in Chapter Four and means for improvement are recommended on page 88. Training and personnel qualification are considered in Chapter Five and recommendations are presented on page 96.

² Resource Planning Associates and David M. Dornbusch and Co., 1973. Potential on-shore effects of oil and gas production on the Atlantic and Gulf of Alaska outer continental shelf. Vol. 1, Chapter 1. Report to the Executive Office of the President, Council on Environmental Quality, December 1973.