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BEFORE THE

SPECIAL SUBCOMMITTEE ON OUTER CONTINENTAL SHELF

OF THE

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS UNITED STATES SENATE

NINETY-FIRST CONGRESS

SECOND SESSION

ON

ISSUES RELATED TO ESTABLISHMENT OF SEAWARD BOUNDARY
OF UNITED STATES OUTER CONTINENTAL SHELF

APRIL 1, MAY 20, AND 27, 1970

PART 2



Printed for the use of the
Committee on Interior and Insular Affairs

U.S. GOVERNMENT PRINTING OFFICE

WASHINGTON : 1970

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OUTER CONTINENTAL SHELF

WEDNESDAY, APRIL 1, 1970

U.S. SENATE,
SPECIAL SUBCOMMITTEE OF OUTER CONTINENTAL SHELF
OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The special subcommittee met at 10:10 a.m., pursuant to call, in room 3110, New Senate Office Building, Senator Lee Metcalf (chairman of the subcommittee) presiding.

Present: Senators Metcalf and Hansen.

Staff members present: Jerry T. Verkler, staff director; Stewart French, chief counsel; and Charles F. Cook, Jr., minority counsel.

Senator METCALF. The committee will be in order.

During previous hearings the special Subcommittee on Outer Continental Shelf has heard testimony from various witnesses focusing mainly on the legal and policy aspects of mineral resource jurisdiction over Continental Shelf and deep seabed areas.

Today we turn to economic considerations relating to the impact of alternative boundary locations on the present and future exploitation of living and nonliving resources from the marine environment.

It is a pleasure this morning to welcome three distinguished mineral resource economists. With us we have Dr. Miller B. Spangler of the National Planning Association, Washington, D.C.; Mr. Leonard L. Fischman, consulting economist, also of Washington, D.C.; and Professor Walter Mead of the Department of Economics, University of California at Santa Barbara.

Gentlemen, you have the subcommittee's letter of invitation under date of February 28. Without objection, I shall place it in the record at this point.

(The letter follows:)

U.S. SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C., February 28, 1970.

Prof. WALTER MEAD,
Department of Economics, University of California, Santa Barbara, Calif.

DEAR PROFESSOR MEAD: This will confirm the invitation, extended and accepted by telephone, to testify before the Special Subcommittee on the Outer Continental Shelf, Senate Committee on Interior and Insular Affairs, in room 3110, New Senate Office Building, on 11 March 1970 at 10 a.m.

At that time, those testifying will be seated together at the witness table forming a panel of individuals knowledgeable in mineral resource economics. Each will briefly summarize their prepared statements which will be placed in the record in their entirety. During the following discussion, members of the Subcommittee and the panel may pose appropriate questions for consideration.

It is anticipated that approximately 100 copies of your prepared statement will be required at the hearing for distribution to interested individuals. If you do not have duplicating facilities at your disposal, please provide one copy of your statement to the Committee, ATTN: Mr. Jerry T. Verkler, Staff Director, not later than March 9, for reproduction. In any event, advance copies for members of the subcommittee by that date would be appreciated.

In previous hearings, we have heard testimony from various witnesses focusing mainly on the legal and policy aspects of mineral resource jurisdiction over continental shelf and deep seabed areas. We would now like to turn to economic considerations relating to the impact of alternative boundary locations on the present and future exploitation of living and nonliving resources from the marine environment. In this regard, we would appreciate your comments on the following issues.

It is particularly important to know how and to what extent the U.S. economy will be affected by different limits of jurisdiction and by different rules and regulations. More accurate appraisal of potential development of seabed minerals will also be very useful in determining the degree of urgency with which solutions must be reached. There appear to be wide differences in the evaluation of the potential wealth of the minerals on and under the seabed. Given the present state of knowledge, how would you characterize the seabed minerals in terms of their contribution to the growth of the U.S. economy? It would be helpful to have your comments broken down into different time periods and for the different areas. That is, how would you characterize the contribution at present, in the near future, say over the next decade, and by the turn of the century? What contributions to the economy can we reasonably expect from the exploitation of the minerals of the continental shelf, the continental slope and rise, and from the deep sea area beyond the rise?

It is possible that the value of seabed minerals can be enhanced by new Federal programs and regulations. It is difficult to determine, however, what the appropriate Federal role should be. To what extent do you think the government should provide incentives for marine mining? What kinds of incentives would be best, and what time frame would you recommend for their implementation? If Federal research programs are desirable, should these be restricted to basic research, or should they include general surveys, the delineation and evaluation of resource sites, or the development of mining technology? If financial incentives are desirable, should these be in the form of tax easements, market controls, or other more direct forms of support? It is recognized that specific answers to these questions may be quite difficult. It would be appreciated, therefore, if you could suggest some criteria that would be helpful in making choices among alternative programs, such as those indicated above.

In addition to programs, rules and regulations may have a significant effect on marine mining activity. You may wish to comment on the present rules and regulations governing the exploitation of seabed minerals within the area of national jurisdiction, but it would be particularly helpful to have your suggestions on appropriate rules and regulations that should govern exploitation in the area beyond the national limits, wherever limits are drawn. What kinds of rules would permit U.S. entrepreneurs to operate with the greatest economic efficiency? Is it desirable that some means be found for assuring or guaranteeing security of investment? How should rights to exploit deep seabed resources be allocated, on a "first-come, first-served" basis, through competitive bidding, or some other means? Would the payment of royalties or bonuses by exploiters to some International Fund impede development?

Also, as exploitation of seabed minerals increases, it is likely to be accompanied by increasing interferences with other uses of the marine environment. Such interferences might include those between shipping and fixed rigs, mineral exploitation and fishing, dredging and submarine cables and pipelines, and between commercial activities and military preserves. Pollution from seabed mineral extraction may also become more significant. Many of these conflicts are likely to occur in areas of mixed jurisdiction, such as for example, where the U.S. would have control over oil rigs but beyond the 12-mile exclusive fishing zone. Do you think it is realistic to expect conflicts that cannot be readily accommodated by the different parties? What kinds of controls can, or should, the U.S. exert over conflicting uses that take place beyond 12 miles from our shores? What effect would this have on the extension of jurisdiction upwards through the super-jacent waters? Can you suggest criteria that would be helpful in resolving conflicts between competing uses of the sea?

Finally, what other factors do you consider relevant in making a decision on the breadth of the continental shelf and the type of international regime which would relate to deep seabed exploration and exploitation?

Very truly yours,

LEE METCALF, *Chairman,*
Special Subcommittee on the Outer Continental Shelf.

Senator METCALF. If you have prepared statements, they will be inserted in the record as if read. I will appreciate it if each of you limit your remarks to 20 minutes—to allow time for questions from other members of the panel and from the subcommittee.

Dr. Spangler, we will ask that you speak first, then Mr. Fischman, who will be followed by Professor Mead.

Dr. Spangler?

STATEMENT OF DR. MILLER B. SPANGLER, DIRECTOR, CENTER FOR TECHNO-ECONOMIC STUDIES, NATIONAL PLANNING ASSOCIATION, WASHINGTON, D.C.

Dr. SPANGLER. Thank you.

The invitation by Senator Metcalf to present my views to the Senate Subcommittee on the Outer Continental Shelf on U.S. economic interests in marine resource developments and related issues is greatly appreciated. For the past several years I have worked on various planning and forecasting aspects of marine resource developments. Under the joint sponsorship of the National Science Foundation and the National Council on Marine Resources and Engineering Development, our Center prepared a study on "Alternative Federal measures for encouraging private investment enterprise in marine resource development."

Subsequently, we have prepared for the NSF studies on accelerating the development of a wide variety of marine resources, including offshore oil, minerals, fisheries and coastal zone developments. For the National Council on Marine Resources and Engineering Development, our Center has produced a report on "The Role of Marine Sciences in the Multiple Uses of the Coastal Zone of Lake Erie and Lake Superior." Currently we are preparing forecasts for the U.S. Coast Guard on various kinds of activities in the marine environment requiring search and rescue services.

Although much of my testimony will deal with findings developed in these studies, the views I express are my own and not necessarily those of the sponsoring agencies nor of the National Planning Association.

I. THE POTENTIAL DEVELOPMENT OF SEABED MINERALS AND THEIR CONTRIBUTION TO GROWTH AND PERFORMANCE OF THE U.S. ECONOMY

There are recitations on the potential wealth of ocean resources which can excite the imagination. For many of these, it would take blind faith in the miracles of science to believe they can be translated into actual wealth. I would like to confine my remarks to those potential marine resources which have attracted the attention of U.S. business firms. By far the largest of these is oil.

Offshore oil development from the U.S. Continental Shelf already exceeds \$1 billion per year and by 1980 is expected to reach about one-fourth of U.S. production. The world value of sand, gravel, oyster shells, and sulfur mined from or beneath the ocean floor is estimated at \$150 million annually plus \$50 million from marine mining of tin and iron sands, heavy minerals, and diamonds.

The potential for expanded mining of minerals from marine areas is believed to be quite large, though still little explored. Vast quantities of phosphorite nodules and so-called manganese nodules are known to exist at the edges of the U.S. continental shelves or the deep sea beyond. Provided low-cost mining technologies can be developed to make these nodules competitive with land minerals, it is believed that these nodules could supply the total world requirements for manganese, copper, nickel, and cobalt for hundreds of years to come.

Whether private enterprise will soon invest the large sums to achieve these technological advances will depend on the kind and extent of assistance afforded by the Federal Government. Also of importance is the outlook for change in such risk factors as national or international jurisdiction over marine resources and future terms governing the economics of their exploitation.

It is fair to ask what contribution might be made to the U.S. economy from the exploitation of seabed minerals during the coming decade and the remainder of this century. Although present knowledge does not permit a precise answer, some inferences can be drawn to develop crude estimates.

The largest U.S. marine mining activity in 1980 is likely to be from offshore oil, which may reach \$3 to \$5 billion annually. However, an increase of \$2 billion in oil production does not imply a net increase in GNP of the same amount. The financial and manpower resources thus employed could have achieved substantial production if these had been used in other economic pursuits. Indeed, some would argue that greater economic gains could be achieved if the United States were to produce less oil, either from land or the seabed, and to supplant this with lower priced imports.

The hooker, of course, is whether we should increase our dependency on overseas supplies from politically unstable countries at increased risk to our national security as well as the likelihood of increased nationalization of U.S. oil activities abroad. Also, savings to our economy may vanish in due course as higher taxes or less favorable leasing terms for overseas oil operations are imposed as these countries realize our vulnerability in the light of our increased dependency on imports.

The mineral with a chance of achieving the second highest level of U.S. marine production by 1980 is manganese nodules which have been found in vast abundance on the floor of the Pacific, Atlantic, and Indian Oceans. Because of relatively high mining and processing costs, the major interest in these nodules is primarily for their recoverable values of copper, nickel, and cobalt which are all much higher priced than manganese.

Certain high-quality nodules found in a triangle southeast of Hawaii have an average copper content about two-thirds greater than the average copper content of U.S. land mines. The same samples have an average nickel content only one-sixth less than the average of ores mined in Oregon and some samples exceeded this average.

Present knowledge of available technology neither proves nor disproves whether these nodules can be recovered and processed at costs competitive with alternative land minerals. If present technologies do prove to be cost competitive, or if R. & D. produced cost-effective technologies making the cupro-nickel nodules fully competitive by 1975, then the U.S. production of nodule metals might reach \$500 million to \$2 billion annually by 1980.

Should the higher level be attained, substantial reductions in the prices of manganese, cobalt, and nickel would most probably result from heavy surpluses in their supply as well as heading off further increases in the price of copper. Savings to the U.S. economy could, under favorable circumstances, reach \$150 million to \$1 billion annually by 1980.

As for the third ranking mineral which may be mined by U.S. firms from the seabed in 1980, no candidate appears to have a particularly large potential. Marine phosphates mined offshore California serving markets in the Pacific Basin might reach \$80 million annually by 1980 under favorable conditions. Some expansion in marine mining of sulfur, sand, seashells, and conglomerate materials can be expected, as well as new marine mining ventures of placer gold and certain heavy minerals. However, U.S. production of all seabed minerals other than oil or manganese nodules will probably total under \$500 million per year by 1980.

Obviously, the prospects are much better for the U.S. production of all the above minerals from the seabed at substantially higher levels of activity in the period 1980-2000. There will likely be significant advances in technology in the next 10 to 20 years which will improve the cost competitiveness of marine minerals with land minerals whose prices may rise significantly in the meanwhile. Moreover, the stream of news about growing investments in marine technological developments by foreign countries increases the possibility of an oceanic Sputnik which may goad our national program. Accordingly, the total production of oil, deep sea nodules and other marine minerals could reach a level of \$10 to \$20 billion annually before the year 2000.

As for the depth of water or distance from shore such seabed minerals might be produced, present knowledge would seem to support the following outlook. With regard to oil and gas production, industry has demonstrated the ability to drill for these resources in water depths of several thousand feet and experimental technology is being readied for underwater well completion and production facilities.

However, it is anticipated that the U.S. offshore oil and gas production from the continental slope and rise will attain importance between 1980 and 1990 unless strong incentives are provided to private industry to accelerate these developments.

The deep submergence drilling project sponsored by the National Science Foundation discovered an oil and gas accumulation in a submerged salt dome structure in 9,200 feet of water in the Gulf of Mexico midway between Louisiana and the Yucatan Peninsula. There is increasing expectation that the continental rise, which is at water depths of 2,000 to 12,000 feet, will prove to have sizable oil deposits. Because of high costs of drilling and producing oil in deep waters, such operations may be unprofitable.

Fortunately, the sedimentary thicknesses suitable for the entrapment of oil are known to be unusually great in many regions of the continental rise. This could lead to very large oil fields, reducing discovery and production costs per barrel of recoverable oil.

As for manganese nodules, the deep waters of the Pacific Ocean near Hawaii seem likeliest for early mining because of their higher copper and nickel content. There are slab deposits of manganese on the shallower Blake Plateau off the Southeast Atlantic States, but known deposits have unattractive contents of high-valued metals such

as copper, nickel, and cobalt. However, Dr. Emery, of Woods Hole Oceanographic Institution, suggests higher quality nodules may be found on the seaward side of the Blake Plateau because of its greater distance from diluting sediments. If so, mining these nodules would be in several thousand feet of water, hundreds of miles from shore.

One of the most favorable locations for the mining of marine phosphates is at the edge of the Continental Shelf and slope where upwelling currents provide conditions suitable for the deposition of phosphate nodules. Phosphate deposits are found 30 to 40 miles west of San Diego in water depths ranging from 190 to 600 feet, and other regions offshore of southern California and Baja, California.

It is also believed that favorable areas may exist off the Atlantic seaboard stretching from Florida to New Jersey. It is thought that the highest quality marine phosphates in this region may be found in outcroppings of a phosphate formation on the continental slope between the Continental Shelf and the Blake Plateau offshore of Florida and Georgia. Much more work needs to be done in exploring and delineating marine phosphates.

As for gold and other heavy minerals, evidence suggests that the near shore areas of the Continental Shelf are the most likely places to find sizable deposits and, of course mining costs would be more favorable in waters less than 200-feet deep. Gold placers are to be found on the Continental Shelf of Alaska, Oregon, and California.

Exploration and resource delineation for heavy minerals has been limited to only a few locations and it would be unwise to predict that none will be mined at water depths below the 200-meter isobath in the next decade or so.

Submerged salt domes which may bear sulfur have been identified in the Gulf of Mexico on the Continental Shelf, slope, rise and the deeper waters of the gulf itself. At the moment the price of sulfur and the cost of the extraction technology do not favor sulfur mining except in waters of 100 to 200 feet.

This could change in a decade or so. Lode mining of ores does not appear as an exciting prospect, for the near term, mostly because of the dearth of knowledge as to where such lodes might exist and the unreadiness of technology.

Another kind of mineral deposit capturing the attention of private enterprise is that associated with the hot brine pools found at the bottom of the Red Sea. One of these is estimated to contain about \$1.5 billion worth of gold, copper, zinc, and silver in the top 100 feet of sediments covering an area of 8 miles by 4 miles in 7,000 feet of water. In addition, the associated brines in these pools contain dissolved metals such as zinc, lead, copper, silver, and gold whose concentrations are from 1,000 to 50,000 times their average concentrations in ordinary seawater. It is possible that phenomena of this kind might be discovered in less politically complicated regions of the world.

It has been conjectured that regions such as the mid-Atlantic Ridge may have deposits of heavy minerals and the water depths would tend to increase interest in exploring these in due course. The same might be true of the Continental Shelf of Antarctica where the geology is quite favorable to the deposition of oil and gas.

The greater distances from shore bases to service mining operations in mid-Atlantic areas and Antarctica, plus jurisdictional uncertainties, may restrain a rush to these areas until more knowledge accumulates and marine technologies are more advanced. The 1980's would appear to be the more likely period for high-risk ventures such as these, although competitive international interests may stimulate earlier activity.

In addition to direct economic benefits from marine mining activities of possible importance are the potential contributions to the performance of the U.S. economy by easing balance-of-payments problems which have led to a large drain on gold reserves. The United States has increasingly turned to importing minerals or metals that could be obtained from marine sources.

During the period 1950-67 the cumulative value of U.S. imports of petroleum, manganese, copper, and nickel—all of which are or could be obtained from the seabed—totaled \$37 billion, or almost identical with the cumulative U.S. balance-of-payments deficits over the same period. Unless new land sources of copper, nickel, and manganese are found in the United States or a deep sea nodule industry is established. U.S. imports of copper, nickel, cobalt, and manganese for the period 1970-2000 are projected at about \$50 billion.

II. INCENTIVES AND CRITERIA FOR ENCOURAGING MARINE MINING DEVELOPMENTS

The Marine Resources and Engineering Development Act of 1966 stated as national objectives that—

1. The development of resources of the marine environment should be accelerated; and
2. Private investment enterprise should be encouraged in the exploration, technical development, marine commerce, and economic utilization of these resources.

Quite obviously, it was not the intent of the Congress that the development of all marine resources should be accelerated. The key questions, then, become which resources and why.

In selecting potential marine resources deserving analysis as candidates for Federal encouragement, we were guided by the following criteria: (1) present knowledge of the occurrence of different marine resources, their extent, and quality; (2) the size of their potential market; (3) the known interest of private business firms in these resources; (4) the prospect that further research and development would bring substantial reductions in mining or processing costs; and (5) the chances that commercial developments of certain of these resources, even if limited in market size, would yield advances in technology which could be transferred to accelerate the development of other marine resources of more substantial market potential.

We placed much less emphasis in selection criteria on knowledge of significant developmental difficulties or the presence of institutional barriers, since the very purpose of R. & D. and measures of Government-business cooperation are to solve technical problems and to remove institutional barriers.

In selecting measures of encouraging private enterprise investments in marine resource development, it is important to note that national interests and normal business interests do not always coincide. Moreover, the pattern of motivations and risks of the oil industry, for example, and the character of its human and capital resources are vastly different from those of firms oriented to mining hard minerals on land, or to the small oceanography-oriented firm.

In developing an optimal set of measures for each kind of resource, three successive criteria need be considered:

1. Will the national interest be sufficiently served by the given marine resource development to warrant its acceleration?

2. If so, will normal business incentives be operative to promote such developments on a scale and timeliness commensurate with the national interest without special measures of encouragement by the Federal Government?

3. If not, what are the measures and level of support necessary to stimulate an adequate response by private enterprise?

As mentioned in the act of 1966, the specific kinds of national interests related to developing marine resources are those serving or promoting: (1) national economic well-being, (2) national security, (3) foreign aid objectives and benefits derived from international oceanic cooperation, (4) technological leadership, (5) uncovering the mysteries of nature through basic research, (6) promoting the health and safety of our citizens, and (7) other social values including domestic tranquility, freedom, justice, or a basic concern for mankind.

After appraising various potential marine resource developments in serving these national interests, I have come to the conclusion that those which are likely to be of greatest strategic importance to the United States and whose accelerated development should be encouraged are: (1) those offshore oil developments in difficult environments or presently high-cost regions such as the deeper waters of the continental slope and rise, or the Arctic Continental Shelf; (2) deep sea nodules of a quality which would yield substantial quantities of strategic metals such as copper, nickel, cobalt, and manganese; (3) new technologies which would secure U.S. leadership in harvesting wild fish species as well as aquaculture developments, the latter concentrating initially on high-valued species under controlled conditions permitting their genetic improvement.

The major criteria in selecting these resources is that their development could make substantial contributions to the United States and world economies; their potential for easing the long-range outlook for U.S. balance-of-payments difficulties is also quite large in substituting for growing imports of these commodities; in the case of offshore oil and deep sea nodules, their development would reduce our growing dependency on politically unstable regions of the world for strategic materials affecting our national security; and in the case of fishery developments, it would provide for U.S. leadership in a field of technology which is likely to become important to the destiny of the human race as a source of meeting protein requirements of a rapidly exploding population.

Moreover, the supporting science and the technology building blocks that would serve these developments may also have beneficial application to smaller scale marine resource developments which collectively may be important.

In deciding on incentives, it is essential if we wish to insure a meaningful competitive role of the United States that (1) the incentives be initiated early and (2) that they be adequate to secure an ample margin of technological leadership to compensate for the higher salaries or wages of the U.S. labor force.

Whatever the proven abilities of the United States may be to catch up in certain military or space technologies, in those fields where free and competitive international trade is involved, it is crucial that the United States have an adequate margin of technological leadership just to maintain a piece of the action. Obviously, a margin of technological leadership is easier to attain—and probably less costly in the long run—if action programs are established early rather than later.

In our analysis we examined the relative merits of some 50 or so measures of encouraging private investment enterprise. Without taking time to summarize our conclusions, it would be helpful to present a quick rundown on what I believe to be desirable measures of encouraging the development of the marine mineral resources which I have singled out for priority attention; namely, offshore oil in deep water or difficult environments and the cupro-nickel nodules.

In the first of these cases, offshore oil developments have made substantial progress in shallow waters under the stimulus of a system of prorationing production plus regulation of import quotas which together promoted a favorable price structure. Research and development is proceeding in cooperation with the aerospace industry and others in an attempt to develop underwater technology for well completion and production systems which may enable oil recovery in the deeper waters of the continental slope and rise to be produced at costs competitive with alternative sources of oil.

Rather than to provide new incentives for the whole of the U.S. oil industry either on land or offshore, I would recommend that a "principle of variable incentives" be applied to those offshore oil leases where it is deemed desirable in the national interest to encourage advances in new technology. This is at the point where technology is experiencing its cutting edge; namely, in deeper waters or other high-cost areas. Once the technologies have been proven cost effective, the incentives need not be maintained for future lease sales in similar areas.

For these special cases of offshore oil developments, suitable incentives would include: (1) higher allowable rates of oil production at maximum efficient rates of recovery consistent with sound conservation practice; (2) larger lease sales which would increase the amount of financial rewards of oil discovery commensurate with the higher risks involved in these special areas; and (3) reduced royalty payments for oil produced from these fields.

Other measures such as broad geophysical surveys, bathymetric mapping, and exploratory coring as performed in the deep submer-

gence drilling project to provide geological information could all prove to be of valuable assistance. Other forms of financial assistance, basic research, or direct R. & D. support to develop the underwater technologies are probably not necessary in the case of stimulating offshore oil developments of this kind.

However, in promoting development of a cupro-nickel nodule industry in a deep sea environment, a different situation prevails requiring a different combination of stimulative measures.

While it is felt by some engineers that a modification of conventional hydraulic dredging methods can mine these nodules at competitive costs, it is estimated that the construction of a dredging system for full-fledged commercial operations would cost around \$100 million. This is no small sum to gamble on such an untested system in water depths of 15,000 feet where high quality nodules have been found.

Moreover, the recovery of the high-valued metals from such a complex ore, while subject to known methods of differential leaching, is also untested on a full-fledged commercial scale. Add to these risks the substantial uncertainties over future legal or jurisdictional regimes which may be imposed to regulate mining operations as well as market uncertainties—and one begins to appreciate why such a large investment has not yet been made.

Nevertheless, there are a number of companies with diverse industrial orientations which have been an interest in mining these nodules and several have spent substantial sums in exploratory R. & D. Yet, no single firm possesses the full range of capabilities in ocean engineering, metallurgical processing and marketing needed to ensure a successful, integrated operation.

Accordingly, it is far from certain that U.S. private enterprise will develop the requisite technologies to bring these into full-scale commercial developments on a timetable in keeping with national interests for early development to ensure an adequate margin of technological leadership.

There are several kinds of measures which might secure this objective. One approach would be for the Federal Government to fund a major fraction of the R. & D. and equipment fabrication costs to mount a full-scale commercial mining operation, the contract to be awarded in competitive bidding. A percentage of profits from the venture would be repaid to the U.S. Treasury up to the amount of the Federal investment plus interest.

Another approach would seek to remove uncertainty over processing costs by financing R. & D. on a pilot scale metallurgical plant to extract the key metals and sharing the results on a royalty basis. The pilot recovery plant could provide an ongoing facility to continue research on reducing recovery costs and strengthening the industry to compete favorably with alternative sources of supply.

Still a third approach would be to establish a quasi-public corporation with joint Federal Government and private enterprise participation to develop and operate nodule mining operations. Metallurgical processing of the nodules could either be included or excluded from the consortium as seems appropriate. Initially it may prove desirable to include nodule processing plants and later divesting these by sale to private ownership once commercial feasibility has been demonstrated.

One reason for considering a corporation patterned after Comsat is the considerable uncertainty over future international jurisdiction or leasing arrangements plus the necessity to limit the rate of growth of the industry to reduce unfavorable social and economic impacts on land mining activities in the United States or friendly foreign nations from whom, for example, we now import large amounts of copper. For various reasons, a reduction of imports of nickel, cobalt, and manganese would pose lesser levels of concern.

On the subject of national versus international regimes for controlling seabed mining, my feeling is that for the time being and possibly in the long run as well, the United States in serving its own best interests should not attempt to alter the Geneva Convention on the Continental Shelf. The latter permits the coastal nation to exercise exclusive jurisdiction over the seabed resources of its Continental Shelf beyond the depth of 200 meters since technology has been developed, or can be developed to exploit the resources of the Continental Shelf, slope and rise.

Experience has demonstrated that this convention provides a suitable economic climate to encourage seabed resource development in water deeper than the 200 meter isobath, whereas the establishment of an international regime to control the development of such resource would make this economic climate less favorable.

The most important consideration in any contemplated change should not be economic, but rather its impact on our national security. I am not one of those who would claim that a change in the Geneva Continental Shelf Convention to formalize the jurisdiction of the coastal nation over seabed resources of the shelf, slope or rise at some specific water depth in excess of 200 meters or at some specified distance from shore would necessarily impair the rights of innocent passage of military vessels in the overhead water column.

But I can understand the increased concern that such a change on this matter might bring to our Government officials responsible for national security, and I can appreciate the persuasive efforts that may be required of our State Department to prevent such impairment of rights from happening.

On the other hand, I doubt that in the interests of national security the United States should desire a new Continental Shelf regime to be established which would lead to seabed mining activity of foreign firms or nations on the continental rise and slope off U.S. coasts which was not wholly subject to U.S. control and inspection.

As for mineral resources of the deep seabed, until a better knowledge is attained of the technologies that will prove to be cost competitive as well as associated environmental and market problems, it is probably not desirable to develop an inflexible or definite regime for either U.S. or international regulatory practices. This suggests that the preferred initial approach might include the establishment of an international registry office with any restrictions which may be placed on size of claims and governing procedures to be established on a temporary basis by the nation whose firms apply for claims.

In this event, there would be a need for the U.S. Government to guarantee the security of the initial investments of U.S. firms against any future losses that might be incurred by virtue of any changes

in the management regime necessitated by international agreements to solve growing problems of supply or demand associated with these resources.

Senator METCALF. That is very interesting. I think the committee, when it reads your testimony, will be interested in especially the latter part of your statement where we are concerned with how we are going to protect investments which are, as you indicated, in rather sizable amounts, in these international waters.

I hope later on we can address ourselves to that in more detail.

Dr. SPANGLER. Mr. Chairman, I also have a more complete statement.

Senator METCALF. Without objection, it will be placed in the record at this point.

(Dr. Spangler's complete statement follows:)

STATEMENT OF DR. MILLER B. SPANGLER, DIRECTOR, CENTER FOR TECHNO-ECONOMIC STUDIES, NATIONAL PLANNING ASSOCIATION, WASHINGTON, D.C.

The invitation by Senator Metcalf to present my views to the Senate Subcommittee on the Outer Continental Shelf on U.S. economic interests in marine resource developments and related issues is greatly appreciated.

For the past three and one-half years I have worked almost continuously on various planning and forecasting aspects of marine resource developments. Under the joint sponsorship of the National Science Foundation and the National Council on Marine Resources and Engineering Development, our Center prepared an appended study on *A Preliminary Review of Alternative Federal Measure for Encouraging Private Investment Enterprise in Marine Resource Development*. This published report plus 15 working papers on related case studies of oceanic and non-oceanic developments of new technologies were made available to the National Commission on Marine Science, Engineering and Resources as well as the Council for use in the preparation of their reports.

Subsequently, our work for the NSF included studies on living marine resources and the analysis of various kinds of national interests in accelerating the development of a wide variety of marine resources including offshore oil, minerals, fisheries, and coastal zone developments. This work will be published* under the title, *New Technology and Marine Resource Development: A Study of Government-Business Cooperation*. Under contract with the National Council on Marine Resources and Engineering Development, the Center produced a report on *The Role of Marine Sciences in the Multiple Uses of the Coastal Zone of Lake Erie and Lake Superior*. This study emphasized pollution control as well as other measures to deal with conflicting uses of the coastal zone resources of these lakes. At present, the NPA Center for Techno-Economic Studies is performing for the U.S. Coast Guard a study on *Long-Range Forecasts of Activities in the Marine Environment with Implications for Planning Coast Guard Search and Rescue Operations*.

Although much of my testimony will deal with findings and insights developed in these studies, the views I express are entirely my own and not necessarily those of the sponsoring agencies nor of the National Planning Association.

I. THE POTENTIAL DEVELOPMENT OF SEABED MINERALS AND THEIR CONTRIBUTION TO GROWTH AND PERFORMANCE OF THE U.S. ECONOMY

There are a number of recitations on the potential wealth of the oceans which can excite the imagination of any school child. If large figures are desired, one can begin with the amounts of different kinds of chemicals or metals dissolved in a cubic mile of seawater. For example, the latter is estimated to contain 120 million tons of sodium chloride, 8 million tons of magnesium sulfate, 60,000 tons of strontium, 50 to 350 tons of arsenic, up to 45 tons of silver, up to 25 tons of gold

*By Frederick A. Praeger Publishers, Inc. (September 1970).

and 7 tons of uranium. Multiply these figures by the 329 million cubic miles of seawater found in the world's oceans and the current market price of these chemicals or metals and one gets a staggering sum.

The potential sustainable yield of fishery resources in the world's oceans is estimated at 200 million tons per year or nearly four times the present catch level—enough to meet the protein requirements of a world population of seven billion persons, or twice the present population. The landed value of fishery products of U.S. fishermen was \$472 million in 1968. Yet, U.S. flag vessels harvest only about one-tenth the useful fishery species available in waters adjacent to our Continental Shelf, far less than are caught by foreign vessels operating in these waters. Moreover, the potential increase in yields from advances in aquaculture is also quite large.

Offshore oil development has already proceeded to the point where U.S. oil production from the Continental Shelf exceeds \$1 billion per year and offshore production accounts for 16 percent of total world production. The latter is expected to increase to one-third the annual world production by 1980. Substantial production of natural gas also comes from offshore wells. The value of sand, gravel, oyster shells, and sulfur mined from or beneath the ocean floor is estimated at \$150 million annually with an additional \$50 million of marine mining of tin and iron sands, heavy minerals, and diamonds. The potential for expanding the mining of such minerals from marine areas is believed to be quite large though still little explored. Vast quantities of phosphorite nodules and so-called manganese nodules are known to exist at the edges of the U.S. continental shelves or the deep sea beyond. Provided low cost technologies of mining and processing such nodules can be developed to make their utilization competitive with alternative land minerals, it is believed that these deep sea nodules could supply the total world requirements for manganese, copper, nickel, and cobalt for hundreds of years to come.

The key to developing the potential wealth of the oceans precisely lies in the future advances to be made in science and technology. Whether private enterprise will invest the not inconsiderable sums of money to achieve these technological advances will in no small measure depend upon the extent and kind of measures of assistance afforded by the Federal Government. Also importantly involved is the outlook for change in such risk factors as national or international jurisdiction over the different marine resources and the nature of administrative controls over exploitation or leasing terms.

It is fair to ask what contribution might be made to the U.S. economy from the exploitation of seabed minerals during the decade of the 1970's and for the last two decades of this century. The state of our present knowledge does not permit a very precise answer to this question. Yet, some inferences can be drawn from present knowledge to develop at least a crude estimate of such expectations. The largest U.S. economic activity associated with seabed minerals in 1980 is likely to be from the same leader as today, namely offshore oil. The value of U.S. offshore oil production could readily reach \$3 to \$5 billion annually depending on the nature of incentives and whether some truly giant fields are discovered which is a definite possibility, as witness the Prudhoe Bay Field recently discovered on the Arctic Coast of Alaska.

It should be noted, however, that an increase of, say, \$2 billion annually in the value of oil produced from U.S. offshore oil wells certainly does not imply a net increase in GNP of the same amount. The capital and manpower resources employed in such developments could have achieved substantial production if employed in other economic pursuits. Thus, it is the *difference* between alternative economic outputs of these resources that must be assessed to determine the *net* gains to the economy—an almost impossibly difficult task in view of the myriad number of hypothetical alternatives. Indeed, some would argue that greater economic gains could be achieved if the United States were to produce less oil and gas, either from land or the seabed, and to supplant this source of energy from greater oil imports. The hooker, of course, is whether the United States should substantially increase its dependency on overseas sources of supply from politically unstable parts of the world at increased risk to our national security and possibly an increased risk of nationalization of our oil activities abroad and higher taxes or less favorable leasing terms for overseas oil operations as these countries realize our vulnerability in the light of such increased dependency.

The seabed mineral which has a chance of achieving the second highest level of U.S. marine mineral production by 1980 is that of the so-called manganese nodules. These nodules are known to occur in vast abundance throughout the sea floor of the Pacific, Atlantic, and Indian Oceans. Because of the relatively high mining and processing costs believed associated with these nodules, the major interest in these nodules is primarily for their recoverable values of copper, nickel, and cobalt which are all much higher priced metals than manganese. Certain samples of high-quality manganese nodules found in a triangle to the South and East of Hawaii have an average copper content that is about two-thirds greater than the 0.63 percent average copper content of land ores mined in the United States in 1967. The same samples have an average nickel content only about one-sixth less than the ores mined in Oregon in 1965 averaging 1.42 percent nickel. Indeed, several samples exceeded the nickel content of the average nickel ore mined in Oregon.

Our present knowledge of currently available technology neither proves nor disproves whether these nodules can be recovered and processed at costs competitive with alternative land sources of supply of these metals. If present technologies did indeed prove to be cost competitive, or if further R&D prior to 1975 produced cost-effective technologies making the cupro-nickel nodules fully competitive, then it is possible that the U.S. production of metals from these nodules might reach \$500 million to \$2 billion annually by 1980. Should the latter level be attained, then substantial reductions in the prices of manganese, cobalt, and nickel would most probably result from heavy surpluses in the supply of these metals as well as the possibility of heading off further increases in the price of copper. The latter increased from \$.31 per pound in 1963 to a price in excess of \$.50 per pound today. Gross savings to the U.S. economy in the reduction in the prices of these metals or the preclusion of price increases could, under favorable circumstances, reach \$150 million to \$1 billion or more annually by 1980. To obtain net savings one would need to deduct the level of Federal investments including interest charges necessary to stimulate an early development of such an industry.

As for the third ranking mineral which may be mined by U.S. firms from the seabed in 1980, none appear to have a particularly large potential. A market for marine phosphates mined offshore of California serving the Pacific Basin might reach \$80 million annually by 1980 under favorable conditions. Larger markets in the U.S. east of the Rocky Mountains or in Europe might be satisfied by marine phosphates offshore of Georgia or the Carolinas, but these would need to have rather high phosphate contents to compete with low cost Florida phosphates for these same markets. Some expansion in the mining of sulfur, sand, seashells, and conglomerate materials can be expected, as well as new marine mining ventures of placer gold and certain heavy minerals. However, the sum total of U.S. production of all seabed minerals other than oil or manganese nodules may collectively remain under \$500 million per year by 1980.

Obviously, the prospects are much better for the U.S. production of all the above minerals from the seabed at substantially higher levels of activity in the period 1980-2000. There will likely be significant advances in technology in the next 10 to 20 years which will improve the cost competitiveness of marine minerals with land minerals whose prices may rise significantly in the meanwhile. Moreover, the steady stream of news about growing investments in marine technological developments by numerous foreign countries serves to remind that an oceanic "Sputnik" is certainly not out of the question. U.S. production of oil, deep sea nodules, and other marine minerals conceivably could reach collectively a level of \$10 to \$20 billion or more annually by the year 2000.

As for the depth of water or distance from shore such seabed minerals might be produced, present knowledge would seem to support the following outlook. With regard to oil and gas production, industry already has demonstrated the ability to drill for these resources in water depths of several thousand feet and experimental technology is being readied for underwater well completion and production facilities. The latter will replace stationary platforms which may reach an economic limit at water depths of 600 to 1000 feet. However, it is anticipated that by 1980 only a relatively limited fraction of U.S. offshore oil and gas production will come from the Continental Slope and Rise in water depths greater than 600 feet unless strong incentives are provided to private industry at a fairly early date.

The Deep Submergence Drilling Project sponsored by the National Science Foundation led to the discovery of oil and gas accumulation in a submerged salt dome structure in 9,200 feet of water in the Sigsbee Knolls area in the Gulf of Mexico midway between New Orleans and the Yucatan Peninsula. Knowledge of this kind is increasing the expectation that the Continental Rise which is seaward of the Continental Shelf and Slope may contain sizable oil deposits. At present, the costs of drilling for oil as well as production facilities are believed quite high at water depths of 2,000–10,000 feet that are typical for the Continental Rise. Thus, oil recovery may prove to be unprofitable unless the amount of oil recovered per well is unusually high. Fortunately, the sedimentary thickness suitable for the entrapment of oil are known to be unusually great in many regions of the Continental Rise. This could lead to very large oil fields which would reduce discovery and production costs per barrel of recoverable oil. The Continental Rise in many offshore regions of the United States is over 50 miles from land placing it beyond the 12 mile limit of fishery jurisdiction. Although major U.S. oil developments in the Continental Rise may take place before 1980, the more likely interval is between 1980 and 2000. It is not difficult to imagine the contributions which could be made to the U.S. economy by the discovery of oil fields only one-third to one-half the size of the Prudhoe Bay field of Arctic Alaska, if these were discovered in the Continental Rise offshore of Louisiana, Florida, or North Carolina.

As for manganese nodules, the deep waters of the Pacific Oceans southeast of Hawaii seem the best bet for early mining because of their higher copper and nickel content. There are slab deposits of manganese on the shallower Blake Plateau off the Carolinas but known deposits have unattractive contents of high-valued metals such as copper, nickel, and cobalt. However, Dr. K. O. Emery of Woods Hole Oceanographic Institution suggests that higher quality nodules may be found on the seaward side of the Blake Plateau because of its greater distance from diluting detrital sediments. If so, the mining of such nodules would be in several thousand feet of water and hundreds of miles from shore.

Should the mining of marine phosphates become a commercial activity, one of the most favorable locations according to presently available knowledge would be at the edge of the Continental Shelf and Slope where strong upwelling currents provide conditions suitable for the deposition of phosphate nodules. Such areas of deposition are known to exist in regions 30 to 40 miles west of San Diego in water depths ranging from 190 to 600 feet and other regions offshore of Southern California and Baja California. It is also believed that favorable areas may exist off the Atlantic Seaboard stretching from Florida to New Jersey. It is thought that the highest quality marine phosphates in this region may be found in outcroppings of a phosphate formation on the Continental Slope between the Continental Shelf and the Blake Plateau offshore of Florida and Georgia. Much more work needs to be done in exploring and delineating marine phosphates.

As for gold and other heavy minerals, evidence suggests that the near shore areas of the Continental Shelf are the most likely places to find sizable deposits and, of course, mining costs would generally be more favorable in shallower waters less than 200 feet deep. Gold and tin placers are known to exist on the Continental Shelf of Alaska. Except for a very few regions, exploration and resource delineation for heavy minerals has been so limited to date that it would be rash to state that none will be mined at water depths below the 200 meter isobath in the next decade or two.

Submerged salt domes which may bear sulfur have been identified in the Gulf of Mexico on the Continental Shelf, Slope, Rise, and the deeper waters of the Gulf itself. At the moment, the price of sulfur and the cost of the extraction technology do not favor sulfur mining except in waters of 100 to 200 feet. This could change in a decade or so. Lode mining of ores does not presently appear as a very exciting prospect, mostly because of the dearth of knowledge as to where such lodes might exist and the unreadiness of suitable technologies.

One interesting kind of mineral deposit that has stimulated the attention of private enterprise is that associated with the hot brine pools found at the bottom of the Red Sea. One of these, called the Atlantis Deep is estimated to contain about \$1.5 billion worth of gold, copper, zinc, and silver in the top 100 feet of sediment which covers an area of about eight miles by four miles in 7,020 feet of water. In addition, the associated brines in these pools contain dissolved

metals such as zinc, lead, copper, silver, and gold whose concentrations are from 1,000 to 50,000 times the average amounts of these metals found in ordinary seawater. Uncertainty over political jurisdiction of these resources has thus far frustrated the organization of mining or extraction activities. It is possible that phenomena of this kind might be discovered in other less politically complicated regions of the world. Since this phenomena is associated with the spreading of the seafloor, the most prospective areas closest to the United States would appear to be offshore of Alaska, the Pacific Coast states, and Hawaii, where fracture zones and volcanic seamounts are known to exist. If such areas of deposition were found, it seems likely that these would be in the deeper waters beyond the Continental Shelf and Slope.

It has been conjectured that regions such as the Mid-Atlantic Ridge may have deposits of oil or heavy minerals and the shallower water depths would tend to increase interest in exploring these in due course. The same might be true of the Continental Shelf of Antarctica where the geology is believed to be quite favorable to the deposition of oil and gas. The greater distances from shore bases to service marine mining operations in Mid-Atlantic areas and Antarctica, plus jurisdictional uncertainties may restrain a rush to these areas until more knowledge accumulates and marine technologies become more advanced. The 1980's would appear to be the more likely period for high-risk ventures such as these, although competitive international interests may stimulate earlier activity.

Thus far, the discussion has dwelt primarily on the gross revenues from U.S. marine mining activities and how this could enhance the national economy through reducing prices or forestalling price increases of oil products, metals, or minerals obtained from the sea. Possibly an even more important, though indirect, contribution might be made by such mining activities to the performance of the U.S. economy by easing the problems our country has been faced with in terms of equalizing our balance-of-payments without further export of our gold reserves. These have reached a rather precarious level resulting from cumulative balance-of-payments deficits which, though temporarily brought under reasonable control, may worsen again in future years.

It is not desirable at this time to explore the basis of concern over future balance-of-payments difficulties nor to establish the various ways the U.S. economy may be impaired by prolonged difficulties of this kind. Suffice it to say that the United States has increasingly turned to importing minerals or metals that could be obtained from marine sources in very large quantities. For example, during the period 1950-67 the cumulative value of U.S. imports of petroleum, manganese, copper, and nickel—all of which are, or could be obtained from the seabed—totaled \$37 billion. This was almost equal to the \$37.6 billion cumulative U.S. balance-of-payments deficits over the identical period. Indeed, for 1967 alone U.S. imports of petroleum were valued at \$2.1 billion and the sum of U.S. imports of manganese, copper, and nickel was approximately \$1 billion. Fishery imports cost the United States \$708 million in 1967. Unless new land sources of copper, nickel, and manganese are found in the United States or a deep sea nodule industry is established by U.S. firms for the extraction of these metals, the projected U.S. imports of copper, nickel, cobalt, and manganese for the period 1970 to 2000 is approximately \$50 billion.

II. INCENTIVES AND CRITERIA FOR ENCOURAGING MARINE MINING DEVELOPMENTS

The Marine Resources and Engineering Development Act of 1966 stated as national objectives that:

1. The development of resources of the marine environment should be accelerated; and
2. Private investment enterprise should be encouraged in the exploration, technological development, marine commerce, and economic utilization of these resources.

These are precisely the issues which the NPA Center for Techno-Economic Studies explored in the aforementioned studies sponsored jointly by the National Science Foundation and the National Council on Marine Resources and Engineering Development.

First of all, it does not seem reasonable, nor do we believe it to be the intent of the Congress, that these objectives mean that the development of *all* marine resources should be accelerated. The key questions then become *which* resources, *why*, *where*, and *when*. Despite the fundamental importance of these questions,

a careful scrutiny of all that has been published to date, including our own studies, will show that definitive and fully satisfactory answers have not yet appeared. One basic problem is the disturbing nature of information gaps whose solution would facilitate appraisal and decision on these matters. Not only is required the provision of better trend data on economic activities in the marine environment which are too often merged with related activities on land, but also required is the performance of *pivotal* kinds of research and development. The latter would include geophysical and geological surveying; exploration and delineation of marine resources; evaluation of the associated environmental forces affecting the design of mining systems and the cost of recovery; and efforts to improve the present state of technology in mining systems and possibly the processing of ores as well.

In selecting those specific kinds of potential marine resources deserving of analysis as candidates for Federal measures of encouragement, we were guided by such criteria as: the known interest of private business firms as demonstrated by their initial investments including exploratory planning efforts; present knowledge of the occurrence of marine resources, their extent and quality; the size of their potential market considering among other competitive factors their locational advantages or disadvantages; the prospect that further research and development would bring substantial reductions in mining or processing costs; and the chances that commercial developments of certain of these resources, even if limited in market size, would yield advances in technology which could be transferred to accelerate the development of other marine resources of more substantial market potential.

We placed much less emphasis in selection criteria on knowledge of significant developmental difficulties or the presence of institutional problems since the very purposes of R&D and measures of government-business cooperation are to solve technical problems and to remove institutional barriers. Just as former President Harry Truman advised politicians to "get out of the kitchen if you can't stand the heat," so is this the case in formulating a national plan for marine resource development that is worthy of the long-range potential of harvesting marine resources for the benefit of mankind, and worthy of the tradition of our country as leaders in important areas of new technology.

In formulating a national oceanography program, including measures of encouraging private enterprise investments in marine resource development, it is important to observe that national interests and normal business interests do not always coincide and, moreover, that business interests as between different firms and between different industries engaged in marine resource developments do not always coincide. The latter, of course, is a serious understatement. It goes without saying that the pattern of motivations and risks of the oil industry and the character of its human and capital resources are vastly different from those of firms oriented to mining hard minerals on land, or to the small oceanography-oriented firm. Under these circumstances, one should not expect representatives of these firms to be experts on the juncture—present or future—between private and public interests in marine resource development nor expect them to be unbiased advisors on an optimal set of measures for encouraging private enterprise. The major responsibility for these decisions must lie with the Federal Government which should seek, but not always follow, the counsel of representatives from private enterprise, State and local governments, and oceanographic and other non-profit research institutions.

Thus, an important challenge in formulating a national marine resource development plan is not only to identify the present juncture of public and private interests. It also must identify how this juncture might be enlarged through imaginative efforts in designing an optimal mix of stimulative measures which would lead to self-generating growth as technologies advance, as new high quality marine resources are discovered, and as new opportunities for their development unfold.

Indeed, it is my view that in selecting the optimal set of measures for each kind of resource three successive criteria need be taken into account:

1. Does the national interest require the given marine resource development in the first instance?
2. If so, will normal business incentives be operative to promote such developments on a scale and timeliness commensurate with the national interest *without* special measures of encouragement by the Federal Government?

3. If not, what then are the measures and level of support necessary to stimulate an adequate responsiveness of private enterprise investment without being wasteful of Federal funds or in violation of sound conservation practice?

Among the specific kinds of national interests related to developing national oceanic programs and policies are those serving or promoting: (1) national economic well-being, (2) national security, (3) foreign aid objectives, (4) benefits derived from international oceanic cooperation, (5) technological leadership and our national image, (6) uncovering the mysteries of nature through basic research or descriptive science, (7) health and safety of our citizens, and (8) other social values including domestic tranquility, freedom, justice, or an altruistic concern for mankind.

After appraising various kinds of potential marine resource developments in the light of the above kinds of national interests and present knowledge, I have come to the conclusion that those which are likely to be of greatest strategic importance to the United States and whose development should be encouraged are: (1) offshore oil developments in difficult environments or presently high-cost regions such as the deeper waters of the Continental Slope and Rise, or the Arctic Continental Shelf, Gulf of Alaska, etc.; (2) deep sea nodules of a quality which would yield substantial quantities of strategic metals such as copper, nickel, cobalt, and manganese; (3) new technologies which would secure U.S. leadership in harvesting wild fish species as well as aquaculture developments concentrating initially on high-valued species under controlled conditions permitting their genetic improvement.

The major criteria in selecting these resources is that their scale of development has a large potential to make substantial contributions to the United States and world economies; their potential for easing the long-range outlook for U.S. balance-of-payments difficulties is also quite large in substituting for growing imports of these commodities; in the case of oil and deep sea nodule developments, it would reduce our growing dependency on politically unstable regions of the world for strategic materials affecting our national security; and in the case of fishery developments, it would provide for U.S. leadership in a field of technology which is likely to become important to the destiny of the human race as a source of meeting protein requirements of a rapidly exploding population. Moreover, the supporting science and the technology building blocks that would serve these developments may also have beneficial application to smaller scale marine resource developments which collectively may be important.

In deciding on incentives for these and other kinds of marine resource developments, it is essential if we wish to ensure a meaningful competitive role of the United States that (1) the incentives be initiated *early* and (2) that they be adequate to secure an ample *margin* of technological leadership to compensate for the higher salaries or wages of the U.S. labor force. Whatever the proven abilities of the United States may be to catch up in military or space technologies, in those fields where free and competitive international trade is involved, it is crucial that the United States have an adequate margin of technological leadership just to maintain a piece of the action. Obviously, a margin of technological leadership is easier to attain—and probably less costly in the long run—if action programs are established early rather than later.

An analysis of the relative merits of some 50 or so measures is provided in our study on *A Preliminary Review of Alternative Federal Measures of Encouraging Private Investment Enterprise in Marine Resource Development*. A summary of our conclusions is provided in this report (pp. 130-137) which need not be repeated here. However, it would be helpful to present a quick run down on what I believe to be desirable measures of encouraging the development of marine mineral resources which were singled out above as deserving priority attention, namely, offshore oil in deep water or difficult environment and the cupronickel nodules—if I may give them the name they deserve.

In the first of these cases, offshore oil developments under the stimulus of a favorable depletion allowance and a stable price structure promoted by a system of prorationing production plus regulation of import quotas represent significant progress already, especially in waters less than 400 feet in depth. Research and development has proceeded in cooperation with the aerospace industry and others to develop underwater technology for well completion and production systems which may or may not enable oil recovery in the deeper waters of the Continental Slope and Rise to be produced at costs competitive with alternative

sources of oil. New disincentives have arisen or are threatened in the form of (1) a reduced depletion allowance; (2) higher costs and an adverse political climate associated with the unhappy accidents of oil spills; and (3) the possibility of larger oil imports which would undermine the present stable price structure for crude oil. The first of these the oil industry is presumably prepared to live with and the second it undoubtedly will attempt to combat (with government prodding and assistance) by introducing more stringent controls and developing better technologies to reduce the risk of accidents and to minimize damages and costs should accidents happen. If a substantial weakening of the price structure or profitability should occur, it could be expected that the industry momentum in developing offshore oil technologies for deeper waters or more difficult environments may largely dissipate or be appreciably slowed.

Rather than to provide new incentives for the whole of the U.S. oil industry either on land or offshore, I would recommend that a "principle of variable incentives" be applied only to those offshore oil leases where it is deemed desirable in the national interest to encourage advances in new technology. This is at the point where technology is experiencing its cutting edge: namely, in deeper waters or other high cost areas. Once the technologies have been proven cost-effective, the incentives need not be maintained for future lease sales in similar areas. By this kind of program, the Government will have promoted technological leadership to extend the utilization of an important kind of marine resource and at the same time will have provided information as to the future reserves (and associated cost outlook) that potentially are developable in such regions as the Continental Slope and Rise or the Continental Shelf of Arctic Alaska. This information is essential to developing plans for meeting long-range energy requirements. Moreover, it would be surprising indeed if some of the underwater technologies thus developed would not find important applications, possibly with modification, in other kinds of marine resource developments—in other words, the "stepping-stone" argument.

For these special cases of offshore oil developments, suitable incentives would include: (1) higher allowable rates of oil production at maximum efficient rates of recovery consistent with sound conservation practice; (2) larger lease sales which would increase the amount of financial rewards of oil discovery commensurate with the higher risks involved in these special areas; and (3) reduced royalty payments for oil produced from these fields. Other measures such as broad geophysical surveys, bathymetric mapping, and exploratory coring as performed in the Deep Submergence Drilling Project to provide geological information could all prove to be of valuable assistance. Other forms of financial assistance, basic research, or direct R&D support to develop the underwater technologies are probably not necessary in the case of stimulating offshore oil developments of this kind.

However, in the case of promoting the development of a cupro-nickel nodule industry in a deep sea environment, a very different situation prevails and the need for a different combination of stimulative measures is indicated. According to present public information, the highest quality nodules in terms of their percentage content of high priced metals such as copper, nickel, and cobalt are found in about 15,000 feet of water southeast of Hawaii. Other high quality nodules are known to exist in waters of comparable depth off the coast of Peru. Although the search is continuing for high quality nodules at substantially shallower depth, it appears that a technology for mining cupronickel nodules will need to perform at far greater depths than heretofore experienced in other kinds of marine mineral mining such as diamonds or tin placers.

While it is felt by some engineers that a modification of conventional hydraulic dredging methods can mine these nodules at competitive costs, it is estimated that the construction of a dredging system for full-fledged commercial operations would cost from \$30 to 300 million. The investment of \$100 million, which is regarded by David Brooks as an appropriate estimate, is no small sum of money to gamble on such an untested system. Moreover, the recovery of the high-valued metals from such a complex ore, while subject to known methods of differential leaching, is also untested on a full-fledged commercial scale. Add to these techno-economic risks, the substantial uncertainties over future legal or jurisdictional regimes which may be imposed to regulate mining operations—as well as market uncertainties—and one begins to appreciate why such a large investment has not yet been made.

Nevertheless, there are a sizable number of companies with diverse industrial orientations which have shown an interest in mining these nodules and several have spent substantial sums in exploratory R&D. However, no one firm of this group possesses the full range of requisite capabilities in ocean engineering, metallurgical processing and marketing capability needed to ensure a successful, integrated operation. This suggests the desirability of a consortia of firms with complementary skills; but their divergent interests and investment attitudes makes such arrangements difficult to consummate.

Accordingly, it is far from certain that U.S. private enterprise will develop the requisite technologies to bring these into full-scale commercial developments on a time table in keeping with national interests for early development to ensure an adequate margin of technological leadership. There are several kinds of measures which may be required to secure this objective. One approach would be for the Federal Government to fund a major fraction of the R&D and equipment fabrication costs to mount a full-scale commercial mining operation, the contract to be awarded in competitive sealed bidding. A percentage of profits from the venture would be repaid to the U.S. Treasury up to the amount of the Federal investment contribution plus interest.

Another approach would focus on removing uncertainty over processing costs by financing R&D on a pilot scale metallurgical plant to extract the key metals and sharing the results with U.S. firms on a royalty basis. The pilot recovery plant could provide an ongoing facility to continue research on reducing recovery costs and strengthening the industry to compete favorably with alternative sources of supply.

Still a third approach would be to establish a quasi-public corporation with joint Federal Government and private enterprise participation to develop and operate nodule operations. Metallurgical processing of the nodules could either be included or excluded from the consortium as seems most appropriate. Possibly it would initially prove desirable to include nodule processing plants which later may be divested by sale to private ownership once commercial feasibility has been demonstrated. One reason for considering a corporation patterned after COMSAT is the considerable uncertainty over future international jurisdiction or leasing arrangements plus the necessity to limit the rate of growth of the industry to reduce unfavorable social and economic impacts on land mining activities in the United States or in friendly foreign nations from whom, for example, we now import large amounts of copper. For various reasons, a reduction of imports of nickel, cobalt, and manganese would pose lesser levels of concern. The COMSAT type of corporation would also facilitate Federal participation in exploring and delineating favorable areas for nodule mining.

Indeed, whichever of the above alternatives might be followed, the imposition of market controls would probably attract the participation of firms mining land reserves of copper and nickel since the ubiquitous nodule reserves would presumably not be permitted under such controls to destroy the economic viability of existing land mining and related refinery investments. However, the expansion of land operations would likely be curbed if the deep sea nodules prove to have a decided cost advantage. Tax abatement measures for the first five or ten years of operation of nodule mining and processing systems may also prove to be a desirable and effective stimulant, but only if it was reasonably certain that some measure of profits would accrue to these investments rather than losses.

III. RULES AND REGULATIONS FOR MARINE MINING OPERATIONS BEYOND THE LIMITS OF NATIONAL JURISDICTION

The matter of establishing rules and regulations for marine mining operations beyond the limits of national jurisdiction, wherever these might be, can be a highly critical one in terms of encouraging U.S. enterprise to invest in such mining activities and in terms of promoting our national security objectives and sound international relations. The Geneva Continental Shelf Convention of 1958, which was ratified by the United States in 1964, contains provisions for many national and international rights, including national sovereignty over uses of the ocean floor beyond the territorial sea limits. The Continental Shelf is defined in the Convention as:

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 (655 feet) or, beyond that limit, to where the depths of the superjacent waters admit of the exploitation of the natural resources of the said area.

Thus, if the technological or engineering capability exists to exploit marine resources on the bottom of the ocean beyond a depth of 200 meters, a nation can lay claim to such resources off its coast. In some instances, notably offshore of Alaska and Siberia, the 200 meter contour of the Continental Shelf extends as much as 500 to 800 miles from the coast. It should be noted that the United States has already leased tracts of submerged lands to private business firms for the exploitation of oil and phosphorite resources at water depths in excess of 200 meters. However, the phosphorite lease money was refunded to the lone firm involved in this type of transaction after a naval shell was dredged which indicated that the area was not free and clear for normal recovery operations. A number of recent offshore oil lease sales in the Santa Barbara Channel were at depths in excess of 1200 feet.

Accordingly, it would appear that the "rubber boundary" character of the present Geneva Convention need not impede government-business cooperation in the United States to develop marine mineral resources for essentially the full width of the Continental Shelf, Slope, and Rise. One might raise a concern over the implications of this "wide" Continental Margin interpretation of the Convention in terms of denying U.S. business firms an opportunity to extract oil and other mineral resources from the Continental Shelf, Slope, and Rise of other coastal nations. Thus far, such an arrangement has worked well on the Continental Shelf of numerous foreign countries where U.S. oil companies have invested in offshore operations and there is little reason to suppose the same sorts of arrangements would not work equally well for the Continental Slope and Rise and for other kinds of marine minerals. Indeed, the Continental Shelf underlying the North Sea involving over a half-million square kilometers has been divided by agreement among the coastal nations and this has served to stimulate large-scale exploratory and development activities of firms of many nations including the United States.

There are some who presume that the Geneva Convention phrase that states "to a depth of 200 meters, or beyond the limit to where the depths of the superjacent waters admit of the exploitation of the said area" implies national jurisdiction to the median point between adjacent coastal nations so long as a practical technology exists. There is considerable uncertainty in the vast distances of the Pacific Ocean, for example, as to where such median lines would fall, how precisely they could be determined and observed, and whether the concerned coastal nations will agree to their location.

Nevertheless, it may prove unwise to assume that the Geneva Convention might not be modified, reinterpreted, or revised to deny the median-line presumption. The recent Malta proposal that the United Nations should exercise jurisdiction over the sea bed resources in the deep sea beyond the Continental Shelf serves notice that forces are at work, including some proponents in the United States, to bring changes that would limit any presumed U.S. jurisdiction over vast areas having deep sea nodules, which are nonetheless closer to U.S. shores than those of other nations—not to mention other areas.

One can find proponents of a variety of positions concerning alternative regimes for governing exploitation of deep sea mineral resources: First is the "flag nation" approach in which commercial mining operations of firms would proceed on the basis of claims guaranteed by their nation. Second is the idea of establishing claims on a first-come, first-served basis with an international registry office. Third is the division of the sea beds among coastal nations much as was accomplished in the North Sea. Fourth is the surrender of national jurisdictional claims to an international agency with the authority to grant leases and to extract revenues.

While the latter holds a certain appeal from the standpoint of promoting world order and social justice, a closer examination is invited. The notion that all nations of the world, including land-locked nations, should share in the wealth of the oceans—or at least the deep sea portion—has a ring of fairness to it. Revenues derived from the leasing of deep sea areas for mineral mining could then be distributed by the international authority through some mechanism or other to benefit the developing nations of the world. While I have spent two years overseas in the service of the U.S. Agency for International Development and feel that U.S. funding for this program should be enlarged, there are at least several points of concern in the idea that such countries would necessarily benefit more from this kind of regime than one which fails to provide for such a developmental dividend.

One such problem is that the so-called "wealth" of the oceans is really not wealth at all until technologies are developed to extract these resources at costs competitive with alternative land resources. The cupro-nickel nodules are thus far the only known resource in the deep seas beyond the Continental Margins which business firms have demonstrated any serious interest in exploiting. There is hesitation to incur the high development costs to test the commercial feasibility of mining even these resources because of uncertainty over whether a level of profits commensurate with the risks can be achieved to make the venture a reasonable gamble. If a lease rental premium or royalty payment of any but negligible proportions were to be paid, for example, to either the United States Government or an international agency, this would make the venture that much less attractive.

Moreover, even assuming that profits of 15 to 30 percent might accrue which is not unreasonable for a venture of this degree of risk, any infant industry would need a continuation of a return to investment of at least 10 to 20 percent for a substantial number of years to provide capital formation for an expansion of activities. It is true that advances in technologies could be expected to reduce costs, but the competitive mining operations that would be stimulated once certain risks have been removed would produce surpluses first of manganese and cobalt and then of nickel. This would force prices down, possibly as much as 25 to 45 percent, for these metals. This could even produce a profit squeeze on these operations in due course. Thus, the margin of profits out of which rents could be extracted for national or international purposes might not be all that large to make any substantial per capita distribution of revenue derived from such operations for a world population approaching seven billion by the turn of the century.

A more rapid development of the deep sea resources would be encouraged by a more favorable regime for exploiting these resources which did not require substantial revenue payments to an international regime whose regulative measures and stability of practice would appear unpredictable. Indeed, if the development of deep sea resources led to a reduction in world prices or the thwarting of price rises for metals that are in increasingly short supply—at least from superior quality ores—then all the nations in the world which import these minerals or metals in raw, semi-processed, or in manufactured products would automatically receive an economic dividend without any controversial international machinery to administer it.

A very large fraction of the nations of the world have coastal regions and therefore an exclusive claim to Continental Shelf resources as set forth in the above terms of the Geneva Convention. If, as now seems likely, the major economically exploitable resources will prove to be located in the wide Continental Margin rather than in the deep sea beyond—and if some significant economic dividend will accrue to these coastal nations in the form of lower prices for copper, steel, and other metallurgical products than would prevail if a rental and royalty premium were tacked onto the mining of deep sea resources, it would seem that a majority of these coastal nations will find it to be in their interest to retain the Geneva Continental Shelf Convention in its present form.

Moreover, the investing of an international regime with important regulatory and revenue setting powers may result in its rejection by a number of nations which are the most technologically capable of harvesting the deep sea resources. Thus, a regime of this kind instead of promoting world order may actually sow the seeds of considerable discord, if not chaotic conditions, in harvesting marine resources for the benefit of mankind.

But what of the interests of nations having no significant coastal region and, hence, direct role in marine resources exploitation? A list of these appears as follows: North and Central America: None. South America: Bolivia, Paraguay. Europe: Austria, Czechoslovakia, Hungary, Luxembourg, Switzerland. Asia: Afghanistan, Iraq,* Jordan,* Laos, Mongolia, Nepal. Africa: Basutoland, Bechuanaland, Burundi, Central African Republic, Chad, Democratic Republic of the Congo,* Malawi, Mali, Niger, Rhodesia, Rwanda, Uganda, Upper Volta, Zambia, Swaziland.

In examining this list one is impressed that their number is small, indeed, and that their share in any distributed revenues from international jurisdiction of deep sea resources would also be relatively small if their collective fraction of world population were to have an important bearing on such a distribution. Moreover, it is difficult to conceive of a fair basis for distributing such dividends and the shares would scarcely be very large by whatever formula is established.

*Relatively limited coastal access.

Despite the questionability of having an international regime that would have the power to grant leases and receive revenue payments or rentals, in the interests of economic efficiency it would probably be desirable to have some sort of international institution to administer the sort of regime agreed upon by nations that wish to participate in the harvesting of deep sea resources. First of all, it would be desirable to establish some reasonable limit on the size of a lease or claim-holding and the total number of claims to prevent any one company or country from monopolizing the regions of the sea bottom having the highest quality reserves. In this case "quality" should refer not only to the metallurgical content of the nodules or other mineral resource but also such depositional and environmental characteristics which would influence the cost of mining: depth of water, unevenness of bottom topography, density of nodules per acre or hectare, and the strength of ocean currents or frequency and violence of surface state conditions that may interrupt operations or cause equipment failures.

Secondly, controls should be established—probably under some international cartel agreement among participating nations—to limit for each producing nation its annual rate of production of a ubiquitous marine resource so as not to cause an undue reduction in metal prices that would impair the economic viability and the nodule mining operation or promote serious injury to major producing nations of competing land resources.

Moreover, if pollution caused by these deep sea mining activities were to effect a demonstrably significant impairment of living marine resources or other oceanographic interests, some uniform international regulations would be desirable to curb such pollution or its effects. Likewise, there would likely be a need for establishing international rules promoting safety and cooperation in search and rescue or emergency health services for operations which may be hundreds, or even thousands, of miles from the nearest land base.

Until a better knowledge is attained of the technologies that will prove to be cost-competitive and associated environmental and market problems, it is probably not desirable to develop an inflexible or definitive regime for either U.S. or international regulatory practices. This suggests that the preferred initial approach might include the establishment of an international registry office with any restrictions on size of claims and governing procedures to be established on a temporary basis by the nation whose firms apply for claims. In this event, there would be a need for the U.S. Government to guarantee the security of the initial investments against any future losses that might be incurred by virtue of any changes in the management regime necessitated by international agreements to solve problems of the kinds mentioned above.

These problems would become more of a concern as the industry expands and as the number of international competitors with different economic organization and regulatory practices complicate or impair the overall climate for efficient economic operations. Thus, it probably would be initially desirable to encourage exploitation of the deep seabed resources on a "first-come, first-served" basis but with some limitation on claims size—probably at a level which would permit the initial equipment and a reasonable expansion of capacity to mine the claim for about 20 to 25 years before exhausting the specified resource to which the claim is limited. As the total mining operations of U.S. companies builds up to a level of output involving, say, 50 percent of the U.S. annual nickel consumption—which would promote a copper output of roughly 6 percent of U.S. annual consumption from the same nodules—then knowledge should be sufficient to establish more closely defined regulations and essential leasing arrangements to protect better the involved national and international interests.

In developing measures to restrict output, if this proves necessary or desirable, a choice would need to be made between: (1) cartelizing markets and total lease allocations among participating nations and permitting each nation to lease or allocate its leases to its member firms in a manner of its own choosing, and (2) turning over to some international agency the authority to administer the allocation of leases. These two crudely outlined regimes could, of course, have a myriad of variations in detail which it would be unwise to explore at this time. However, if the choice between these basic alternatives should primarily be guided by the desire to stimulate the development of mineral resources of the deep seabed (rather than some other national or international interests), then it seems likely that U.S. private enterprise would prefer the first alternative.

If the course of world events should favor the establishment of the second alternative, then it would be desirable to limit either the amount of lease rentals and royalty payments the international agency could retain, or the manner of

its use. For example, the revenues such an agency might receive could be used to meet the administrative expenses of the agency and any surplus might be used to support some ocean-related research such as an improved system for monitoring and forecasting world wide weather and ocean state conditions, or possibly general survey of deep seabed resources for which economic exploitation has not yet been achieved but which are attracting preliminary signs of interest on the part of business firms or governments. Another alternative would be to return revenues in surplus of administrative expenses to the participating nations or to be allocated for any useful humanitarian or development purposes the governing board might vote. In a national regime of leasing it would be desirable in the interest of fairness and promoting economic efficiency to award leases to the highest bidder much as is already done in the case of U.S. offshore leasing practice.

IV. PROBLEMS OF INTERFERENCES IN THE MULTIPLE USES OF SEALED RESOURCES IN AREAS OF MIXED JURISDICTION

The most serious interferences in the multiple uses of seabed resources of the U.S. Continental Shelf where the greatest experience has been accumulated is that of oil spills and other oil pollution of an accidental nature. There is a need to tighten controls and to impose meaningful penalties in those cases where accidents have resulted from carelessness or deliberate violation of regulations. Moreover, there is a need to improve the technologies of accident prevention and to minimize damages to recreation, fishing, and other interests when accidents do happen. I believe progress will be made in both technological advances and in regulatory procedures and adherence to them which will reduce but not entirely eliminate interference problems of this kind.

Another kind of pollution problem is that involved in hydraulic dredging operations. Sea shells, sand, and conglomerate materials are mined in this manner and have the effect of stirring up bottom sediments and colloidal materials which make recreation unattractive and possibly damage certain kinds of fisheries. For the most part, these activities are generally found in the shallower waters of the Shelf or protected embayments or lagoons of national rather than mixed jurisdictions. However, their pollution effects serve to remind us what might happen in areas of mixed jurisdiction where seabed mining takes place that would disturb bottom sediments or drop tailings or other dross overboard. How widespread the pollution effects might be will be determined by the strength of currents, the density and finess of the dross materials, or their colloidal nature. Instances of widespread damage of this kind may not prove to be particularly numerous though measures to control adverse effects would probably be difficult.

Other physical interference problems between shipping and fixed rigs, mineral exploitation, fishing, pipelines and submarine cables have been managed fairly well in Continental Shelf areas of U.S. jurisdiction and probably will prove manageable in areas of mixed jurisdiction. I have no special suggestions on new kinds of controls not already being implemented in areas of strictly U.S. jurisdiction, except to indicate a need for coordination of procedures through bi-national discussions with those foreign governments whose entrepreneurial units are operative in these areas of mixed jurisdiction. An appropriate international agency might also deal with establishing uniform procedural standards where this would eliminate confusion, promote cooperation of participants, and ensure safe and economically efficient practices.

V. OTHER IMPORTANT FACTORS RELEVANT TO ESTABLISHING THE BREADTH OF THE CONTINENTAL SHELF

My feeling is that for the time-being, and possibly in the long run as well, the United States in serving its own best interests should not attempt to alter the Geneva Convention on the Continental Shelf. The latter permits the coastal nation to exercise exclusive jurisdiction over the seabed resources of its Continental Shelf beyond the depth of 200 meters since technology has been developed, or can be developed, to exploit the resources of the Continental Shelf. Slope, and Rise. Experience has demonstrated that this Convention provides a suitable economic climate to encourage seabed resource development in waters deeper than the 200 meter isobath, whereas the establishment of an international regime to control the development of such resources would make this economic climate less favorable.

The most important factor in any contemplated change should not be economic but rather its impact on our national security. I am not one of those who would claim that a change in the Geneva Continental Shelf Convention to formalize the jurisdiction of the coastal nation over seabed resources of the Shelf, Slope, or Rise at some water depth in excess of 200 meters or at some specified distance from shore would *necessarily* impair the rights of innocent passage of military vessels in the overhead water column. But I can understand the increased concern that such a change on this matter might bring to our government officials responsible for national security, and I can appreciate the persuasive efforts that may be required of our State Department to prevent such impairment of rights from happening.

On the other hand, I doubt that in the interests of national security, the United States would desire a new Continental Shelf regime to be established which would lead to seabed mining activity of foreign firms or nations on the Continental Rise and Slope off U.S. coasts which was not wholly controlled by the United States and subject to U.S. inspection.

Senator METCALF. Our next witness is Mr. Fischman. If you will go ahead, and we will give you plenty of latitude.

**STATEMENT OF LEONARD L. FISCHMAN, CONSULTING
ECONOMIST, WASHINGTON, D.C.**

Mr. FISCHMAN. I will try to do this as well as I can.

I wanted to make clear that my expertise in this field is pretty much general. I am a general economist. My mineral economics expertise dates back to the time I was economist with the Bureau of Mines, about 18 years ago, and I have obviously since followed it, but what I think is quite important for the purposes of this panel was my experience with Resources for the Future where I was heavily involved in the comprehensive study made there on the long-range demands and supply of resources for the U.S. economy.

We, too, look forward to the year 2000 and the work resulted in a book published in 1963, called "Resources in America's Future," of which I am coauthor.

The third important encounter was in my capacity as director of economic associates, where I also directed a study made for the Marine Sciences Council, to use its popular name, on the economic potential of the mineral and botanical resources of the U.S. Continental Shelf and slope.

On the basis of that limitation, I could say that anything I say about the sea beyond the slope, I refuse to be held accountable for. I will soon make some remarks, because obviously my thinking has not stopped with the slope, even though my detailed research has.

Senator METCALF. The only experience that the chairman of the subcommittee has had is going down into the shaft of some of the mines that start at 5,200 feet, 1 mile above sea level, and go down a couple of hundred feet below sea level in the mountainous areas. So all of you have greater expertise than I, and I am going to benefit from your information.

Mr. FISCHMAN. I won't pursue the question of who has gotten in more deeply.

My statement, which I will try to pick the high spots from, is essentially patterned after the sets of questions which were posed in your letter of February 28. The first group of these questions relate to the importance of the seabed minerals to the U.S. economy, and the consequent urgency of the need for a definition of the limits of U.S. jurisdiction.

My brief answer to that set of questions is that the importance of expanded minerals production to the U.S. economy does not dictate any urgency. The current areas of exploitation all would appear to me to fall within limits which, under the 1958 Geneva Convention, are within exclusive U.S. jurisdiction for exploitation, and are probably going to remain within those limits in any redefinition of the boundaries.

Though I feel there is no urgency in defining the boundaries for general economic reasons, I think there is some urgency about it for another reason, and this relates somewhat to the things that Dr. Spangler was saying. We are on the verge of commercial exploitation of areas which get into a twilight zone as far as the 1958 convention is concerned, and we face the possibility that the private attempts at exploitation result in public accommodations that are made, and might push us on an ad hoc basis into a stance with regard to what should be the precise national claims, and then we would later feel constrained to defend that, although we might not have come to the same conclusion had we considered it *a priori*.

You are quite correct, I think, in your statement that there appear to be wide differences in the evaluation of the wealth of the potential minerals on the seabed. I am a contributor to these wide differences, and for that reason I obviously am not rendering objective judgment here today.

Both our study for the Marine Sciences Council and our previous work at Resources for the Future led me to the quite definite feeling that there was no foreseeable mineral shortage for the balance of this century that could have any appreciable effect at all in slowing the growth of the U.S. economy.

If this is so, and it can hardly be critical to the U.S. economy as to whether or not seabed minerals are quickly brought under exploitation—

Senator METCALF. You are including oil?

Mr. FISCHMAN. I am including oil.

I don't mean to say that minerals below the surface of the seabed will not be making a substantial productive contribution to the economy. They are already doing so, as Dr. Spangler has pointed out. If this production were suddenly to disappear, it would be a serious economic shock.

Had it never existed, on the other hand, it is doubtful that the real level of U.S. gross national product would have differed materially, if at all, from the levels it has actually reached, and this, to me, is the test of criticality, I believe, of marine production.

Prospective production beyond the boundaries of the shelf can have even less of an effect on the total GNP. Such production, under any circumstances, has to remain a very small proportion of the total marine mineral production, let alone of all mineral production. I am talking about the extension beyond the shelf and slope.

This limited potential contribution for the farther offshore and marine minerals is not a function of technological feasibility which can be taken care of by appropriate technological research. It is a matter of economic feasibility. There is a tendency to think of our marine mineral wealth as being the arithmetic product of the tons of contained valuable minerals, such as copper, nickel, cobalt, and so on, multiplied by current market prices.

Even disregarding any changes in market prices that might occur with large amounts being dumped on the market, the other important question is that there are costs in bringing these things to market. There are costs both on land and at sea, but at sea both the horizontal transportation costs and the vertical transportation costs and the costs of storage are almost always much higher than in the terrestrial mineral recovery situation.

For all minerals, both on land and at sea, there is also the initial cost of discovery and evaluation of deposits. These, too, are generally significantly higher at sea than on land.

I would say that, given the present state of knowledge, the actual value, in place, of much of this marine mineral wealth, perhaps one could even say most of it, is less than zero.

Technological development may, of course, give more and more of these marine deposits a plus value, but, at the same time, technological development will also improve the value of deposits on land, and it might be a warped allocation of our research and development resources not to recognize the generally higher benefit-cost ratios which obtain for land-oriented minerals recovery research than for marine minerals recovery research.

There are undoubtedly exceptions to these generalizations. For example, in certain respects oil prospecting and maybe even recovery can bring higher dividends per dollar than research investment at sea. But I would say that in view of the basic geology of the seabed, and I mean by this that bedrock, for example, is a good distance below the surface, and the other problems of working at sea, the burden clearly rests with the prospective investor, whether it is the Government or private firms, and I would say our concern should be with the investment of Government funds, to demonstrate that there would be a higher dollar return from an investment at sea compared with a comparable one on land.

To turn to your question about mineral deposits beyond the Continental Shelf and slope, I have already indicated that I have little claim to precise knowledge, but I do have the impression that, particularly because of the manganese or cupro-nickel nodules, or whatever you want to call them, and assuming that there is some regime under which U.S. companies may exploit them, that there may be production forthcoming from that area well before there is too much coming from the slope, let alone the continental rise.

Aside from the deep sea, there is also considerable prospect of nodules or phosphorous recovery from the Blake Plateau, as has been mentioned.

I don't know how to classify that geologically, but there is considerable question as to whether that can be considered part of our shelf and slope, and if Californians permit it, there seems to be, perhaps already, certain potential production of oil from areas of the west coast which is probably part of the slope rather than the shelf.

I want to underline, however, that just because economic activity may develop under certain conditions in various parts of the marine environment, this does not necessarily make it an economic contribution. Dr. Spangler has also pointed this out. This is particularly so in a fully employed economy. If the marine exploitation takes place solely because special advantages have been constituted which were not

available for other types of activity, such exploitation might actually constitute a negative contribution to the U.S. economy rather than a positive one.

Now, your second set of questions relating to incentives I have already answered in part, or by implication. The commercial value of seabed minerals can certainly be enhanced by any Federal programs which, as we tend to say, externalize the cost of exploration and recovery, or by giving that exploitation relative advantages over other exploitation.

Unless there are other values, the enhanced value, however, would have been bought at more than equivalent costs.

With a couple of qualifications, I do not believe there is compelling national reason to give consideration to the exploitation of marine minerals. One thing is the balance of payments, which has already been mentioned. My guess, however, is that whatever contribution to a more favorable balance of payments marine mineral exploitation will make, will come about with essentially no more Federal incentives than we have at the present time.

The only really substantial contribution is being made, and I think will ever be made, by oil production, and this is going on apace under the relative setup of relative incentives.

It is also easy to exaggerate the balance-of-payments problem, which is receding rather than increasing, not because our balance-of-payments gap is narrowing, but because the world is more and more becoming conscious of the fact and accepting the fact that they can't afford to force the U.S. into a balance-of-payments crisis, and in fact the bankers of the world are on the whole ready to adapt to the maintenance of the current full value of the dollar.

Another value, and this is an important one which has also been mentioned in accelerating exploitation of the sea, is national prestige.

The question is, What is the most economical way to purchase this particular value, and because it has other values in addition, I happen to think that the concentration of Federal expenditure and effort should be on basic research rather than on encouraging commercial exploitation.

The basic research will have an indirect encouragement to commercial exploitation. I think the basic research should be, for the Federal effort, should also include the publication of maps and scholarly articles and the popularized dissemination of information on what is being done in this respect in the sea.

I might add that the production of scientific information and dissemination in this fashion is becoming one of the more important elements in national consumption, even though it is not fully measured by the GNP statistics.

To say that special incentives, or additional ones, should not be given to commercial exploitation is not to say that the ground rules for such exploitation should not be adapted to the scale of risk which is involved. Dr. Spangler has touched on this, too. It does make sense to have higher lease blocks and allowable allowables for the offshore production, because the necessary investment to bring something into production is greater and the scale of return has to be correspondingly greater.

I don't think this upsets the competitive aspects as between land and sea exploitation so as to result in a misallocation of resources.

I think it is also important to think about the special controls and disincentives that have to be applied to marine operations. Terrestrial mining can have, as we know, serious environmental consequences, but as we have seen recently, the ecological damage done by insufficiently controlled marine operations can be a lot more devastating.

Mineral operations at sea, and particularly in the nearshore areas also have potential for greater interference with other uses of the sea, such as navigation and fishing, than do operations on land, where there is a greater choice of locations of activities.

It is important that government authority pursue its proper regulatory role. These conflicts of view also relate to your set of questions regarding appropriate rules and regulations for the exploitation of minerals in the area beyond the national limits. I think that the principal requirement for entrepreneurs to operate in the greatest economic efficiency in the area is essentially long-range assurances as to what the rules are and what they are going to have to pay for the privilege of operating.

I don't think the requirement of royalties or bonuses or such is restrictive, if set at a level which will encourage maximum development consistent with economic values. In other words, don't kill the golden goose.

Whether these royalties, et cetera, for deep sea operations accrue to the United States or to an international agency, I don't see that would be detrimental to have them determined on a competitive basis. I think that such bidding could appropriately take place whenever any one entrepreneur became interested in exploitation.

I do think in view of the scale of risk involved, that it would be uneconomic not to grant some amount of exploitation option whenever an exploration concession is given, and I think that should be subject to the qualification that any data gathered in the course of such exploration becomes available to all interested parties.

Now, your fourth set of questions with regard to possible conflicting uses, again I touched on this in several respects, and I really don't feel much qualified to go beyond that. I feel even less qualified when it comes to the possible conflicts and areas of overlapping jurisdiction.

I do have the feeling, however, that if a dual jurisdiction zone did exist, that such difficult questions would be inevitable. I think there is considerable merit in having a single jurisdictional boundary line for minerals, fishing, or whatever. As Dr. Spangler has said, I do not think that this would need interfere with the maintenance of the right of free transit on the water above the area of resource exploitation, or even—on the water, above it, or even in it—so long as the right of such transit is guaranteed by the coastal state having this exclusive jurisdiction.

Moreover, it is conserved by appropriate regulations and control of the exploitative activity. For example, you can't set drilling platforms all over the place and still be effectively preserving the right of free transit.

It is also important, I think, that the lines be as clear and definite as possible. I think this is more important, actually, than where the line is drawn, and if it happens to be based on subsurface geology, then I

think it ought to be immediately delineated on maps so that any operator can know his position with regard to that line at any time.

Do I have a few more minutes?

What I have said so far essentially adds up, I think, to the conclusion that this is more of a political question than an economic question, that the economic constraints are not compelling us to any conclusion, and the decision really should be made primarily on political grounds.

As a personal unexpert opinion, I would think there are advantages in having demarcation lines leaving rather more than the world's oceans under international jurisdiction than national jurisdictions. Even if the lines were narrowly set around the United States, I doubt that the United States could seriously claim to the international community that its wealth and economic opportunity were being seriously limited by such narrow lines.

Similarly, I think it would involve small economic loss, and would provide considerable political advantages for the United States to concede all mineral resources beyond the line of demarcation.

In view of the increasing impact of fish catch, I would think that the same type of international control and benefit might also be extended to the privilege of ocean fishing.

Finally, you asked for other relevant factors, and one of the most relevant ones about which I know nothing is military use of the sea bottom. I know nothing, but I doubt very much if this factor can be ignored.

To make a brief recapitulation, I feel there is no critical need for the United States to insist on a more extensive rather and less extensive line of demarcation between national and international jurisdiction. There is some question in the Gulf of Mexico, where I believe some of the exploitations go beyond the 12-mile limit, so I don't think this would be a convenient place to set an international line. But to go on, I think there would be no disadvantage, and considerable advantage, in having the same line apply to all kinds of ocean resource exploitation, including fishing as well as minerals.

I don't think there is any justification for trying to accelerate minerals exploitation with special incentive or subsidies other than would be appropriate in the scale of risks involved.

I do think it is important for the Government to pursue low-cost programs of research, including mapping.

Senator METCALF. Thank you very much for a challenging and affirmative statement. I know that Dr. Spangler, Professor Mead and I will come back to those things in a few minutes.

At the present time we have Professor Mead, with the Department of Economics at the University of California, with us, so we have somebody where the action is.

We are delighted to have you here with us this morning, Professor Mead.

STATEMENT OF WALTER J. MEAD, PROFESSOR OF ECONOMICS, UNIVERSITY OF CALIFORNIA AT SANTA BARBARA

Dr. MEAD. Thank you.

When you introduced Mr. Fischman, you suggested that an honorary doctorate would be appropriate. I would like to endorse that move. I liked his paper. It enables me to economize a bit on my own presenta-

tion by saying that I can endorse almost all of his oral testimony. I haven't read the written document.

The two points I would like to comment on is the reference to allowables, suggesting that allowables in the case of oil might be increased for Outer Continental Shelf drilling as a means of encouraging production. I think that in about 10 or 15 minutes of private conversation, we could resolve any differences we may have on that.

The allowables situation has two parts. One is an intent to determine what is the maximum efficient rate, the so-called MER, the maximum efficient rate of production. I would suggest one should not tamper with this in order to subsidize a given type of production, because it is an attempt to estimate what is the maximum physical and, hopefully, economic rate of production from a given field. We should not tamper with that.

The other part of the allowables picture is called "Market Demand Prorationing." This is similar to our farm programs, where the Federal Government has directed farmers to reduce output to increase prices. That is what market demand prorationing is in the oil industry.

I personally strongly object to that kind of interference with the market mechanism in order to raise the price of oil, and I would not want to extend allowables in any way to accomplish a further subsidy to a particular kind, or geographical kind of production.

Second, he made a comment that I think may have been misunderstood. He said that he was speaking about the regime, the proper regime, for Government marine mineral exploitation, and with reference to that point, I believe he said that this is a political problem and not an economic problem.

Someone might have misinterpreted his comments to say that the whole series of questions regarding marine mineral exploitation is primarily political, and I would say, no, it is not, and I think he would probably agree with me. There are questions of leasing policy, of exploitability, which are economic problems, whereas the regime matter is the political matter.

My paper was sent back here some time ago, and somehow didn't get reproduced, and I regret that there are only about eight copies available. If people in the audience wish to have some, if they will give me their card, I will send them one from Santa Barbara.

There are a number of points I want to comment on. My main concern is with leasing policy.

On page 3 of my paper, I list minerals by value that have been produced from the Outer Continental Shelf, and one can see from that that oil and gas overshadow everything else. Nothing else is really important. There is a small value of sulfur and a small value in salt produced from the Outer Continental Shelf mineral reserves.

Therefore, oil and gas are really the only things we are talking about when we talk about present consumption. The value of oil and gas production can be easily misinterpreted, because those values reflect current prices of oil.

Now, taking the figures of the President's Task Force on Oil Import Quotas, we find that the value of oil on the east coast is \$3.95 per barrel. The value of oil in the free work market, in the free market, in the absence of quotas, in the absence of interferences, would be not \$3.90 per barrel, but \$2.25 per barrel.

There is a difference of \$1.65. In other words, \$1.65 out of the \$3.90 is a totally artificial value. One cannot, therefore, add up the value of all oil production and say oil is of great importance. You cannot say that, because you are working with an artificial value.

If you wish to do it, the figures to be used should be about \$2.25 east coast market, and even that should be carried back to the field to get even a lower value.

Now, we interfere with this price mechanism and lead to this problem by two devices. One, and the dominant one, is oil import quotas, restricting the supply of foreign crude in order to jack up the price of domestic crude. The second device which elevates the price of oil is the market demand prorating system, which I have already referred to.

Senator METCALF. I am informed that official copies of your prepared statement are going to be available today, so if some people in the audience didn't have an opportunity to get a copy of this statement, they can get it later today, or, if not, you can leave your name with Professor Mead, and he will provide it.

I don't know when the printed hearings will be available, but they will be available sometime.

Go ahead, Mr. Mead.

Dr. MEAD. Thank you.

The question of what minerals, what is the future of marine minerals, has been studied to the extent that data permit, and that is not much. We have a lot of science fiction going on in this area, partly by promoters of marine stocks and partly by people who ultimately hope to get subsidies to do various things in the ocean.

My own examination of the profitability, future profitability, of various mineral output from the OCS indicates to me that there will be many, many years to come before production will be profitable from the marine environment. The two minerals that are often cited as most promising are the manganese nodules in the deep Pacific and the Blake Plateau, and the deep phosphor right off the coast of southern California.

I studied both of these, and the articles that contain my findings are given in footnotes on pages 11 and 14 of the paper. Both studies conclude that the cost of recovering these minerals would far exceed the value when they are recovered. Hence, it would be unwise for any company under present technology to undertake production, and in the case—

Senator METCALF. In your papers have you touched on the cost of recovery and the feasibility of smelting? As I understand it, the technology of separating them hasn't been quite as far developed as our technology in minerals when we find them on land.

Dr. MEAD. That is partly true, and yet there are peculiar problems that one runs into in the case of the marine manganese, because they contain the four minerals that Mr. Fischman and others have referred to, and they need to be separated, and it is possible that one may not be able to recover and market all four.

So there are particular problems, and yet, also, the point is valid that anything you do to improve the technology of smelting marine minerals will probably also benefit the technology of smelting land-based minerals. Hence, it will not necessarily improve the competitive position of the marine minerals. But the point that is important is that recovering the stuff is not profitable right now.

This raises the question of, should the Federal Government enter with a subsidy in order to make it profitable? And you have in your letter raised the proper question, what is the basis for a subsidy to these things?

Now, economists have worked on this question: What is the economic basis for a subsidy? And our answer runs about as follows: There should be no subsidy except in those cases where there are benefits to society, what we call "externalities"—external benefits, benefits that accrue to society which the entrepreneur, the man who invests in the marine environment, cannot complete.

If there are these spillover benefits to society, then there is a logical basis for Congress giving that producer a subsidy equal to the value of the external benefits.

Well, I tried to study this question for the marine environment and asked myself, "What are the external benefits, if any?" and I have developed only one answer to this thing, and that one answer comes from the possibility that there is a brandnew technology involved here, and where there is a new technology, the historic pattern is, first you get into very high costs. Then you learn more about that new technology and costs go down in the future.

If it is true that given second generation, third generation, fourth generation plants, and so forth, if it is true that ultimately recovery of, say, marine manganese becomes very profitable, then there is a basis for a public subsidy.

But current research into this question does not indicate that any technological benefits spilling over to other producers in society amount to a great deal. Therefore, I find very little basis for a public subsidy.

Now, there is also the opposite possibility, that there may be spillover costs which offset some of those spillover benefits, and anyone living in Santa Barbara is, as you know, well aware of certain spillover costs that may come from exploiting marine minerals.

So there are possibilities of external costs, from pollution and so forth, and it is hard to estimate, but the really important question is, any subsidy granted to marine mineral exploitation, in my opinion, must be justified in terms of external benefits, and it is hard to see them. Current research doesn't show them.

Senator METCALF. I was thinking when Mr. Fischman was testifying that we are all very much aware and very much concerned with what is happening in areas such as Santa Barbara, and these so-called spillover costs. If you drive through West Virginia and Pennsylvania and Kentucky and Ohio in the coal mine areas, or through Montana and see what the gold dredges did to the valleys of that State, there have been quite a few spillover costs that we haven't paid adequate attention to.

Dr. MEAD. Precisely.

Senator METCALF. They were just as detrimental to the environment as the oil spills; we should learn from experience.

Dr. MEAD. Right. The point is that the people of Montana paid for the desecration of their environment, and the people of West Virginia do, but the producers may not.

Senator METCALF. They didn't pay at all.

Dr. MEAD. Right. So you get an incorrect resource allocation from this.

Senator METCALF. They destroyed farmland, perhaps forever, in order to get gold in those valleys, just as we destroyed recreation and farmland in the Appalachia region. It changed the tax base, changed the living habits of the people, and nobody paid for that except the public interest.

Dr. MEAD. Right. You know how a private businessman will make his decisions. He will look at his expected revenue, and then he will look at his expected costs, and calculate profit, and if profit turns out to provide him with an attractive rate of return on his investment, he makes the investment.

That is the way a free enterprise decision works and is supposed to work. But where there are external benefits to society that he can't collect on, then his profit estimate is too low; or where there are external costs he may make an investment which he shouldn't make.

In the latter case, there is a justification for Congress imposing a cost on that man, a special tax, or just an outright prohibition, or a requirement that he do something to restore the environment.

But the point that is important is that a subsidy should be justified in terms of a showing of external benefits.

Now, when it comes to leasing policy, I have written extensively on this, and my views are reasonably well known. I have examined in great detail the record of bidding for oil on the Outer Continental Shelf.

You know that the act specifies competitive bidding. I have examined how well it works, and my initial findings somewhat alarmed me, because I found that there were cases where competition didn't seem to work very well, particular cases.

But, finally, I looked at the whole picture, and to be specific, I examined the leases sold in the Gulf of Mexico by the Federal Government in the years 1954 and 1955, a couple of hundred of them, and I developed information on the exact amount of oil and gas production and its value from those leases, and estimated the costs of recovering and exploring, et cetera, to recover that oil and gas, and asked, "What was the rate of return on those investments in leases?"

My findings indicated that the rate of return was slightly below normal, and this establishes the point that competition for Federal leases has, in fact protected the public interest very well. Competition has worked very well in the leasing of oil and gas minerals. I see no reason why other minerals on the Outer Continental Shelf should not also be leased by competitive methods.

If we, in fact, reject competitive methods and go to noncompetitive leasing, then we are confronted with two difficult problems right away. One problem is determining who gets that lease. If you have several firms interested, you can put it up for competitive bidding and then the market answers the question of what firm is to get the lease.

If you don't use competitive bidding, then some bureaucrat in the Department of the Interior must make that determination, and all kinds of possibilities of corruption will appear.

The second question that has to be answered is, "At what price will the leases be conveyed to a private firm?"

Competitive bidding answers that question. In the absence of competitive bidding, it has to be determined, and this is a difficult matter to determine.

If only one firm is interested in a given lease, then competition will convey that lease to him at minimal cost. If there are several firms, then it becomes very important to have competitive bidding. The alternatives are first-come, first-served. That is one alternative.

Well, that is not necessarily the most efficient firm, the one that happens to be first, and if the free enterprise system is to operate correctly, it has got to allocate its resources to the most efficient.

Well, the most efficient firm is likely to be the one that can bid the most for it. So you get resource allocation to the most efficient.

Another way is lottery, and we use that system in the United States on our land-based resources, for a lot of them. But lottery is a chance method of allocating resources. It doesn't allocate resources to the most efficient. In fact, it might allocate it to the least.

The competitive market works well, and I would propose that it be used for mineral resource allocation.

Now, there are a number of miscellaneous points that come up. Once you agree on the competitive method, then you have to decide on what is to be the objective of bidding. Well, bonus bidding seems to work very well in oil, and I see no reason why it should not work equally well in other areas. But you have alternatives.

One can go to profit-share bidding. It is difficult to administer, but where the risks are very great, profit-share bidding has something to be said on its behalf.

You may go to royalty bidding. I have criticized royalty bidding extensively, and the thing that is wrong about it, and difficult, is that a firm bids on how much it is to pay to the Government in the way of royalty, but that royalty is a payment on the basis of per unit of output. In other words, it raises the cost of production, the royalty does.

The problem is that it leads to resource misallocation. It leads to premature abandonment of a productive lease. Economically, I cannot justify royalty bidding, and economically, there is even an objection to any royalty at all, fixed or the objective of bidding. Perhaps we can bring this out in discussion to follow.

A couple of other miscellaneous points: The Department of the Interior in its oil leases, you know, has a fixed term, 5 years, a fixed term for Gulf of Mexico leases, for example. That fixed term has been introduced in order to force the lessee to exploit his lease quickly.

Now, there is no economic justification for this. It is, in effect, saying that the Department of the Interior has great wisdom in determining when resources ought to be exploited. Economically, the guy who gets that lease has a lot better wisdom on this matter.

What he should do is ask himself, "When does the economy need this oil?" And that is a matter of price. So he has to estimate future prices of oil, and if he believes there is going to be a future shortage, that means the price is going to go up, and he should save that oil for future exploitation.

If he is forced to do it in a 5-year term, he is producing oil when it is not needed as much—namely, when it is cheaper—and you get an incorrect resource allocation over time. There should be no lease term in mineral leases. Similarly, there should be no rental requirement.

The same point is there. You oppose a rental that forces the lessee to exploit early in order to minimize his rental payments. That assumes that the Department of the Interior knows when oil should be produced, and I don't see any evidence to confirm that point. So I would propose that in your consideration of further OCS mineral leasing that there be no lease term, and there be no rental. In other words, you convey a lease to an operator on a competitive basis.

When he puts his money down, then it is up to him when he wishes to go ahead and begin recovery.

Senator METCALF. And you say no royalty?

Dr. MEAD. That is right. It should be bonus bidding, and he pays a bonus based upon his estimate of the net value of that lease, and if you reduce the royalties, the bonuses will go up, so you are not giving anything away. You are simply taking it in the form of bonus rather than in the form of rental or of royalty.

Thank you.

(Dr. Mead's complete statement follows:)

STATEMENT OF WALTER J. MEAD, PROFESSOR OF ECONOMICS, UNIVERSITY OF CALIFORNIA, SANTA BARBARA

The value of minerals available from the Federal marine environment has been vastly overrated. Science fiction writers like to speak of the boundless riches of gold, silver, diamonds, etc. available in the marine environment. Investment promoters have prepared brochures to sell "the world's newest potential road to wealth." One such promotional piece advised that "every cubic mile of seawater contains \$93 million in gold . . . and another billion dollars worth of other materials", but did not point out that the recovery cost appears to exceed the recovery value.

This paper covers four points relative to mineral production from the Federal marine environment. In the first section the value of mineral production from the outer continental shelf will be reviewed. Evidence will be presented indicating that most of this production occurs only because it is heavily subsidized directly by the government and indirectly by consumers, and that in the absence of external benefits, most of this current production uses up more value in the production process than it produces. In the second section, prospective future mineral production from the outer continental shelf and beyond will be reviewed. Two of the most promising marine minerals, manganese and phosphorite, will be discussed and estimates will be presented of the probable private and social rate of return on investments in their production. In the third section, the economic justification for a public subsidy will be discussed. Finally, the fourth section will list and analyze certain important leasing policy alternatives requiring congressional attention.

TABLE 1.—VALUE OF MINERAL PRODUCTION FROM THE OUTER CONTINENTAL SHELF, BY YEARS, 1955-68

Year:	Oil and concentrate	Gas	Sulphur	Salt
1958.....	\$835,280,068	\$291,257,157	\$53,277,667	\$97,317
1967.....	682,179,835	227,694,353	37,291,107	49,396
1966.....	579,668,024	189,381,492	32,621,551	53,544
1965.....	443,805,831	126,977,562	23,387,005	52,334
1964.....	375,619,494	118,377,080	12,748,602	38,334
1963.....	332,965,755	106,783,758	11,069,637	47,334
1962.....	278,927,806	92,209,196	5,507,050	31,848
1953-61.....	661,390,065	198,076,063	9,015,797	105,906
Total.....	4,189,836,878	1,350,756,661	184,918,416	476,013
Grand total all products.....		5,725,987,968		

Source: U.S. Department of the Interior, Geological Survey, Mineral Production, Royalty Income, and Related Statistics, Washington, 1969, pp. 98-104.

I. VALUE OF MINERAL PRODUCTION FROM THE OUTER CONTINENTAL SHELF

Most mineral production from the marine environment occurs from lands under state control. There is currently no mineral production from land beyond the outer continental shelf. Currently there are only four minerals being produced from the marine environment under Federal control. In order of importance they are oil, gas, sulphur and salt. Outer continental shelf salt production is utilized in nearby sulphur processing. The value of mineral production from the outer continental shelf from its inception to date is shown in Table I. Clearly, oil production dominates all other marine minerals produced from the Federal marine environment. Oil, including condensate, accounts for 73 percent of the total value of mineral production from the OCS through 1968.

However, even this level of production from the Federal marine environment is not the free enterprise system rendering its uncontrolled verdict. Rather, mineral production is stimulated by a variety of subsidies. Since oil production accounts for 73 percent of the total value of all minerals produced from the Federal marine environment from the beginning of production through 1968, oil will be treated as a case study.

Following the rules of free enterprise economics, when an enterpriser considers an investment, whether in oil production or any other line of activity, he estimates his expected future flow of gross revenue and subtracts his estimated flow of expenses in order to compute his estimated net profit. Then he relates estimated net profit to the required investment in order to calculate a discounted rate of return. Thus, in order to make his profitability calculation, he begins with estimated physical production and anticipated price per unit of output.

But, the price of oil is artificially determined and is substantially higher than a free market would permit. There are two principal means by which the price of oil is raised above its competitive level. (1) Under "market demand rationing," introduced in 1935 by sanction of Congress, a state regulatory commission determines that producers within the state may produce at some specified percentage of their maximum efficient rate of production. For example, for the month of March, 1970, the Louisiana State Conservation Commission ordered a 48 percent allowable rate of production. The Commission makes its monthly determination, after consulting with crude purchasers who happen also to be crude producers and sellers. In fixing the allowable rate the Commission reported that it consulted with the following crude "purchasers": Atlantic-Richfield Co., Shell Oil Co., Marathon Oil Co., Kerr-McGee, Corp. and Amerada Hess Corp. In Texas, the Texas Railroad Commission determined that for the month of March, Texas producers may produce at 68 percent of their previously determined maximum efficient rate of production. The Texas Commission reported that it consulted with the following "purchasers": Mobil Oil Corporation, Cities Service, Continental Oil Company, Shell Oil Company, Standard Oil Company of Texas (a subsidiary of Standard Oil Company of California), Texaco, Inc., and Union Oil Company of California.¹

The obvious effect of restricting output below 100 percent of the maximum efficient rate of production is to raise the price of oil above its free market level. In order to legally accomplish this particular form of restraint of free competition, the oil industry secured the assistance of the Congress of the United States, and obtained passage of the "Interstate Compact to Conserve Oil and Gas" on August 27, 1935, in turn supported by the Connally "Hot Oil Act." This legislation, created in the depression, continues to authorize restriction of output and higher petroleum prices.

When output restrictions cause prices to be higher than a free market would permit, additional restrictions on free enterprise frequently become necessary in order to protect the protected market. With the passage of time, the U.S. oil market became a favorable market for foreign oil and imports steadily increased. In order to partially insulate the American oil market and maintain its relatively favorable price structure, the oil industry again appealed to the Federal Government. The appeal eventually bore fruit, and on March 10, 1959, the President of the United States by executive proclamation established import quotas to limit the importation of crude oil from abroad. Imports into the United States east of the Rocky Mountains are limited to 12.2 percent of the area's estimated domestic production, less exempted production from Canada and Mexico. West of the Rocky Mountains imports are limited to the difference

¹ *Oil and Gas Journal*, February 23, 1970, p. 71.

between domestic supply, including imports from Canada and Mexico, and total demand in this area. Thus, price levels as desired by crude oil producers are maintained by restricting imports.

The mechanism whereby import quotas increase the price of oil is shown in Figure 1. The domestic demand for oil is satisfied by domestic supply plus net imports. In the absence of any restrictions on free trade, Figure 1 illustrates that at a price of \$2.25 per barrel (delivered on the East Coast), total supply would equal total demand and the market would be in competitive equilibrium. The dollar values shown in Figure 1 correspond to estimates provided by the President's Cabinet Task Force on Oil Import Control.²

From the point of view of the owner of crude petroleum reserves, a high price is preferable to a low price. Clearly, if some segment of the competitive supply can be restricted, the new equilibrium price will be higher than before. The effect of import quotas is to permit the domestic supply (S_D) to be augmented by restricted imports. The domestic supply plus permitted imports is shown as S_{D+I} . With restricted imports, the new market price is shown at \$3.95 and Q_2 is the quantity that will be supplied and demanded.

The effect of import quotas is to force the American price of oil up substantially above the world price. Middle Eastern crude oil can be delivered to US East Coast markets for about \$2.15 per barrel. It is then subject to a tariff of 10.5¢ per barrel, hence, has a delivered cost, after the tariff, of about \$2.25 per barrel. Under this kind of competitive pressure, oil from Canada and Venezuela would be imported at comparable prices. The price of U.S. Gulf Coast crude delivered to the same East Coast ports is about \$1.65 higher than the world price. The proof of this statement is found in the fact that import quota tickets, which are given away free of charge to refiners, have a market value of at least \$1.50 per barrel.³

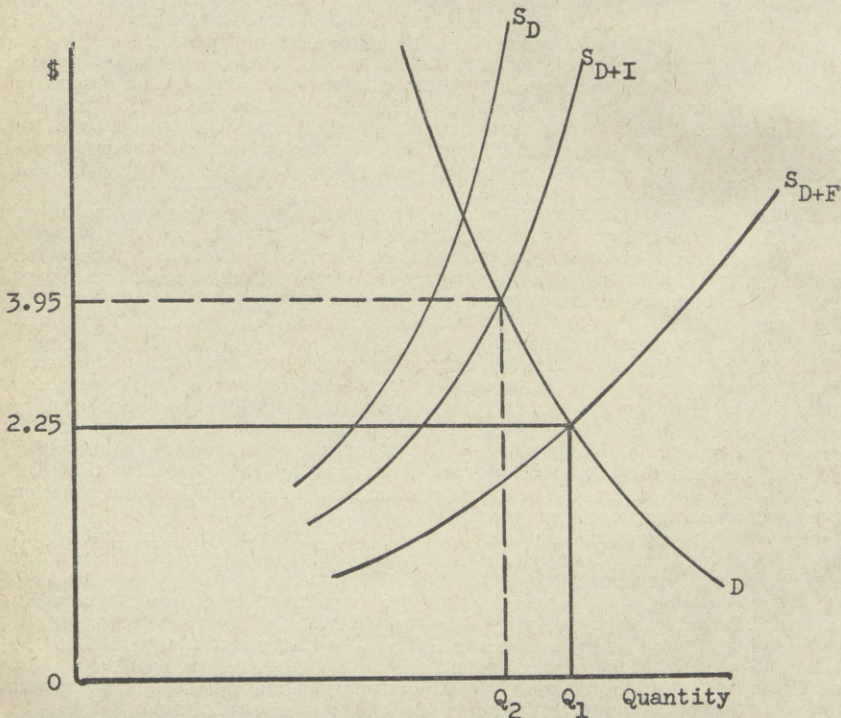


Fig. 1--. Supply-demand model showing domestic supply, imports, and foreign supply and demand relationships.

² Cabinet Task Force on Oil Import Control, *The Oil Import Question* (Washington, D.C.: U.S. Government Printing Office, February, 1970) p. 19.

³ *Ibid.*, p. 260.

The effect of market demand prorationing and import quotas combined is to artificially raise the price of oil above its real value as indicated by the world oil market. When an oil company considers investing in outer continental shelf oil leases and then in oil production, it estimates its revenue based on the artificially high world price. This artificially high price in turn makes investment in and production from certain fields profitable that would be unprofitable and uneconomic under free market rules. The net effect is over-investment in otherwise unprofitable oil development. Another way to state the consequence is to say, that where investment and production is stimulated by artificially contrived high prices, the effect is that more resources are used up in exploration, development and production than are produced as a result of oil production. This in turn lowers our standard of living and weakens the defense capability of the country.

Since both market demand prorationing and import quotas raise oil prices above the competitive level, they together represent an indirect subsidy paid for by consumers in the form of high prices. The total "consumer cost" of oil import quotas was estimated by the Task Force at \$5 billion per year, increasing to \$8 billion by 1985.⁴

In addition to this interference with the market mechanism to produce higher oil prices, additional interference reduces the after-tax cost of production. The principal devices which lower the tax rates for oil companies are (1) depletion allowance (recently reduced from 27.5 percent to 22 percent, (2) the right to expense intangible drilling costs, and (3) dollar-for-dollar reduction of U.S. corporate income tax liabilities for royalties paid to foreign governments. The net effect of these and other lesser important tax gimmicks available to the oil industry was to substantially reduce the effective federal income rate for oil companies. For the period 1962 through 1966 the twenty-two largest US oil companies had an effective federal income tax rate averaging slightly more than 6 percent.⁵

Decisions to invest in oil leases and then to engage in oil production are based on expected prices and costs on an after-tax basis. Where prices are artificially high, and through tax favors tax costs are low, rates of return on investment in oil production are relatively attractive. Investment is then carried beyond the point which would be indicated by a free market mechanism. High-cost oil fields become profitable. Scarce capital flows into new oil exploration, development and production until the rate of return on additional oil investment is lowered to a normal profit rate.

But the result is over-investment in crude oil production. When the nation devotes its scarce capital to high cost production, it is in effect using up more resources in oil production than it is producing, thereby lowering the nation's standard of living, and weakening (not strengthening) its defense capabilities.

While Table 1 shows that oil production from the outer continental shelf has amounted to \$4.2 billion from the beginning of production through 1968, we now see that this production value is based on artificially high prices. The average well-head price of this total production is \$3.10 per barrel. If this is reduced by \$1.25 per barrel to account for the artificially contrived price, the \$4.2 billion value of production would be reduced by 40 percent. The corrected value would amount to \$2.5 billion. However, at free market prices, and in the absence of tax favors, part of this production would not have occurred because it would have been found to be unprofitable. Thus, the real value of oil production from the outer continental shelf is substantially below \$2.5 billion.

This analysis has indicated that the present value of all mineral production from the outer continental shelf is much less than it would have been in the absence of various direct and indirect subsidies.

II. PROSPECTIVE FUTURE MINERAL PRODUCTION FROM THE OUTER CONTINENTAL SHELF AND BEYOND

Federal jurisdiction in the marine environment begins with the outer continental shelf outside the boundaries of state jurisdictions to a depth of 200 meters, and, following the wording of the 1958 Geneva Convention on the Outer Continental Shelf, "beyond that limit, to where the depth of the super adjacent waters admits of the exploitation of the natural resources of the said areas." Thus, in addition to the outer continental shelf, areas beyond the 200 meter

⁴ *Ibid.*, p. 262.

⁵ *Congressional Record*, Senate, August 28, 1967, n. 24310.

contour are at least potential mineral recovery sites if U.S. firms are able to demonstrate an operable production system.

Manganese nodules, containing in addition to manganese, iron, nickel, cobalt and copper, have frequently been cited as a potentially profitable future mineral production operation. The closest known manganese nodule reserves lie on the ocean floor at a water depth of about 350 to 1,000 meters on the Blake Plateau off the southeastern coast of the United States. They cover an area of about 1,800 square miles. However, far richer reserves are available near the center of the Pacific Ocean. But, these reserves lie between 12,000 and 18,000 feet below the surface of the water. A colleague and I have estimated the required investment, expected gross revenue, and expected cost of production for recovering minerals from this deep Pacific site.⁶ In attempting to estimate the private costs and revenues which may be expected in exploiting manganese nodules, a massive information gap is immediately encountered. An industry of this kind does not exist. Firms that have preliminary engineering designs for a dredge capable of recovering minerals at depths up to 18,000 feet are unwilling to make detailed cost estimates available to the public. Accordingly, our estimates are crude best-guesses based on history and analogy, plus some estimates by government agencies and conversations with individuals in private firms. We concluded that the capital cost of a single dredge capable of recovering manganese nodules would be at least \$150 million. An additional \$65 million investment would be required for a series of barges and a processing facility capable of separating the several minerals contained in the nodules. In estimating the probable revenue from the sale of manganese, nickel, cobalt and copper, we considered probable price declines due to an increase in the world supply of each mineral resulting from the deep sea production. When the stream of future income and expenses was discounted to the present using a 6 percent discount rate, we found that a private investor would suffer a capital loss amounting to \$122 million on a manganese nodule recovery operation.

In another paper we attempted to make some rough estimates of the probable external benefits (benefits which accrue to society but cannot be captured in the revenue stream of the private enterpriser).⁷ We found that the principal external benefit is likely to consist of a technological spillover wherein second, third and subsequent generation dredges will be substantially more efficient and therefore substantially less costly as a result of experience gained in the initial and prior dredge developments. There is considerable evidence that when a vastly new technology is introduced, the first stage operation is expensive, but there is a sharp decline in production costs in the couple decades following introduction of the new technology. We expect this experience to be repeated with development of a deep ocean dredge. Thus, subsequent producers and the economy at large would benefit from the pioneering but losing investments. However, on the basis of very preliminary and rough estimates it does not appear that the present value of discounted future cost savings would be sufficient to justify a present public subsidy in excess of the \$122 million needed to stimulate private production. We therefore conclude that marine mining operations of the relatively rich deep Pacific Ocean deposits is unprofitable, viewed both from a private rate of return and a social rate of return point of view. On the basis of our rough preliminary data, there is no clear justification for a public subsidy to stimulate marine manganese production.

Marine phosphorite deposits have excited considerable interest as a marine mineral recovery venture. Due to the large California fertilizer market, phosphorite deposits off the coast of Southern California and Baja California have excited special interest. The current annual demand for phosphate rock in California is estimated at slightly less than 500,000 tons. The offshore Southern California marine deposits have been estimated at one billion tons.⁸ These deposits are found in less than 1,000 feet of water. Investment, revenue and cost estimation for phosphorite recovery operations in the marine environment is subject to the same uncertainty difficulties cited above for manganese nodules. Our rough estimates indicate that about \$8 million capital cost is required for phosphorite

⁶ P. E. Sorensen and W. J. Mead, "A Cost-Benefit Analysis of Ocean Mineral Resource Development: The Case of Manganese Nodules," *American Journal of Ag. Econ.*, December, 1968, Vol. 50, pp. 1611-1620.

⁷ P. E. Sorensen and W. J. Mead, "The Principal External Costs and Benefits of Marine Mineral Recovery," forthcoming in the *Proceedings of the Offshore Technology Conference*, Houston, Texas, April 23, 1970.

⁸ K. O. Emery, *The Sea off Southern California* (New York, John Wiley & Sons, 1960), p. 319.

dredging equipment. The cost of dredging, beneficiating, transporting and unloading is estimated within the range of \$15 to \$22 per ton. We note that phosphate rock can be delivered from Florida or Idaho and marketed for prices ranging between \$12 and \$16 per ton, depending upon grade and source.⁹

Our analysis indicates that the private rate of return for marine phosphorite recovery off the California Coast is negative. A similar conclusion was apparently reached by the Collier Carbon and Chemical Co. (a subsidiary of Union Oil Company). This company purchased a phosphorite lease on 30,000 acres of the continental shelf on the Forty Mile Bank off the Coast of San Diego in 1961. The lessor was the Federal Government. Conversations with personnel of Collier Carbon and Chemical Co. revealed that the quality and quantity of nodules dredged in preliminary operations were "disappointing," and that dredging in an uncontrolled environment was more difficult and unpredictable than assumed in prior studies. Exploratory operations resulted in the recovery of several unexploded naval shells. The presence of live ammunition was used as a basis for requesting and obtaining a full refund of the \$122,000 paid to the Federal Government for the phosphorite lease.

Given an estimated negative private rate of return on marine phosphorite recovery operations, we investigated the possibility of net external benefits which might justify a federal subsidy. Our study revealed probable offsetting external benefits and costs. The major external cost from marine phosphorite recovery operations appears to be the cost associated with waste disposal at sea, assuming that the phosphorite undergoes initial beneficiation at the dredge site. Given the present concern for the ecology, water pollution resulting from contamination with mine tailings is likely to be assigned a rather significant social cost. A technological spillover benefit from phosphorite recovery is likely to be minor, or at best, equal to the external social cost of water pollution. Phosphorite dredging is unlikely to involve any major departure from conventional dredging and transporting. Our study concluded that the possibility of net social benefits is sufficiently tenuous such that the argument for a social subsidy to phosphorite recovery cannot be given serious consideration. Thus, the social rate of return, like the private rate of return, appears to be negative for marine phosphorite recovery operations off the Southern California coast.

Manganese and phosphorite recovery together are considered to be two of the most promising mineral operations in the immediate future from the marine environment under actual or potential Federal jurisdiction. We have found both to be unattractive from both a private and a social point of view, and on the basis of very preliminary estimates, we find no justification for a federal subsidy to stimulate activity in these areas.

III. ECONOMIC JUSTIFICATION FOR A PUBLIC SUBSIDY

Given effective competition and a reasonably equal distribution of income, a free enterprise system, which makes its investment decisions on the basis of pursuit of private profit, will produce an efficient allocation of resources except in those cases where there are uncompensated external costs or benefits. An externality may be defined as a real cost borne by, or a real benefit received by, economic units other than the production unit causing them. Air pollution is an excellent example of massive costs borne by society rather than the factory owners or the automobile owners who contribute to and cause air pollution. Unless the government levies a tax on the air polluter equal to the cost which society bears,¹⁰ or a series of market transactions take place between the initiating party and the injured party, the free market system will not produce optimum resource allocation. Where there are many injured parties or many initiating parties the cost of market transactions to adjust for externalities is prohibitive and it is virtually impossible for market transactions to eliminate resource misallocation resulting from externalities. Where external costs can be inexpensively internalized through the means of a tax levied by the government on the offending party, and where the external costs are large, it is probable that resource allocation can be significantly improved by the taxation procedure. In those cases of significant external benefits, a subsidy

⁹ P. E. Sorensen and W. J. Mead, "A New Economic Appraisal of Marine Phosphorite Deposits off the California Coast," Marine Technology Society, *The Decade Ahead, 1970-1980* (Washington, 1969), pp. 491-500.

¹⁰ This is not a sufficient condition for optimum resource allocation. See J. M. Buchanan and C. Stubblebine, "Externality," *Economica*, N.S., Nov. 1962, Vol. 29, p. 211.

paid to the initiating party and equal to the value of the external benefit accruing to society will significantly improve resource allocation.

These are the necessary preconditions which should exist and should be demonstrated before society can justifiably be taxed in order to subsidize a particular economic group. This rule applies to marine mineral development activities. Our analysis to date has not demonstrated that there is a clear case for subsidizing marine manganese and marine phosphorite mineral production activity.

In the case of oil, there is already a massive subsidy system in effect. There has been no demonstration of external benefits to society equal to this massive subsidy. The oil industry, in common with every other industry that appeals to Congress for a subsidy, claims a national security justification. It is doubtful whether the national security justification is valid. However, even if the national security argument is partially valid, there is no evidence that the present subsidy system is the least-cost method of meeting a national security requirement.

IV. MINERAL LEASING POLICY ALTERNATIVES

Once a governmental decision is made to proceed with development of a marine mineral, then the government is confronted with a series of policy choices. Given a strong commitment in the United States to private enterprise rather than government production, it becomes necessary to devise a system for conveying minerals under government control to private enterprise for processing. In this section we will consider some of the more important leasing policy alternatives.

1. **Competitive Versus Non-Competitive Mineral Leasing Procedures.** The present system employed to lease oil, gas, sulphur and salt resources utilizes the competitive bidding system. Persons interested in federal leases may nominate lands for consideration by the Bureau of Land Management. The BLM then makes its decision regarding which parcels if any are to be offered for lease. Sealed bids are requested as of a particular time and place. The lease is awarded to the high-bidder, subject to the government's right to refuse any and all bids.

In the aggregate, competitive bidding for OCS resources appears to be an efficient method of (1) determining who is to receive the right to exploit publicly owned resources, and (2) determining the price which the lessee is to pay for the rights obtained. In the long run it is probably true that the most efficient operators, by virtue of their efficiency, are able to cast the highest bids, and therefore obtain the bulk of the leases offered for sale. One objective of a market-ing method is to allocate resources to the most efficient operators.

A leasing system must also determine an equitable price. The evidence available to-date clearly indicates that the public interest is adequately protected by competitive bidding. Evidence to support this assertion is available in the record of bidding and production from early Gulf of Mexico oil and gas leases. In 1954 and 1955 the Bureau of Land Management conducted two oil and gas lease sales in the Gulf of Mexico. In these two sales 189 tracts were leased. The five-year lease term requires that production begin within five years, or that the lease be returned to the Federal Government. Thus, all of these leases are either productive, or found to be unproductive and relinquished. We have precise data on bonuses, rents and royalties paid to the Federal Government. In addition, we have precise data on oil and gas production by volume and value to-date. Estimates have been made by the author for exploration, development, production and transportation costs. In addition, estimates have been made of future productivity and profitability for the remaining life of the leases. The study shows that the internal rate of return realized by the lessees for all 189 leases, whether productive or not, averages 7.5 percent before taxes. Since income taxes paid by oil companies are minimal, the after-tax rate of return on these leases is estimated to be 7 percent.¹¹ This evidence lends strong support to the assertion that competitive bidding for petroleum resources adequately protects the public interest.

Non-competitive leasing procedures have been widely used by the Federal Government for onshore minerals. The general mining laws of 1872 provide

¹¹ W. J. Mead, "Federal Public Lands Leasing Policies," *Quarterly of the Colorado School of Mines*, October, 1969, Vol. 64, pp. 195-201.

for open prospecting, and upon discovery of a mineral, for location and purchase under non-competitive conditions. Federal oil and gas leases not on a known geological structure are also leased non-competitively.

The most common non-competitive procedure used in the United States is "first-come, first-served." This system is workable only where the mineral in question has a present value approaching zero. In this event there will be very few interested lessees. On the other hand, if supply is restricted and the value of potential leases is significantly greater than zero, then there will be a multitude of parties interested in a gift from the public domain. Under such circumstances, "first-come, first-served" as a method of determining the winner of a lease, occasionally leads to violence. In order to avoid the chaos of first-come, first-served, the lottery system has been adopted increasingly. On payment of a \$10 filing fee, one chance can be purchased in the lottery. The widespread practice of multiple filings increases the probability of a lease being acquired by a non-operator at the expense of a probable operator who abides by the law and files only a single application. The winner is determined by chance. In contrast, under a competitive bidding system the most efficient operator is in a position to cast the highest bid, and in the long run, efficient operators presumably win most of the leases under competitive bidding.

In addition to the resource misallocation consequence, there is an equity problem. A lottery is a means of giving away something of value. If the sum of all filing fees equals the competitive value of the property transferred, the equality is a chance event. Where the filing fees are less than the value of the lease, the public is deprived of a fair value for its resources, and the winner of the lottery is the single beneficiary.

The non-competitive leasing system is usually justified by what might be called the "little-guy" argument. Non-competitive leasing discriminates against large firms and enables the "little-guy" to obtain a potentially valuable claim on an asset belonging to the public. Since the asset is already owned by the public, composed of many little-guys, in reality the system takes a potentially valuable asset away from many little-guys and gives it away (for a modest fee) to a lottery winner or a first applicant.

The mining industry is apparently united in its view that the 1872 Mining Act should be extended to the outer continental shelf to permit noncompetitive leasing. Expressing the industry viewpoint, the Bear Creek Mining Co. (division of Kennecott Copper Corp.) argued that "exclusive exploration rights should be awarded to the first responsible filer", and upon payment of a filing fee, "nominal in amount", a permit should be granted which would "include rights to mine all hard minerals (excluding oil and gas), including the right to exploit serendipitous discoveries."¹² There are two arguments offered by this testimony on behalf of non-competitive leasing. The first is that the mining industry is different from the oil industry because mineral discovery technology is acknowledged to be in its infancy in the mining industry, and there is a long and expensive interval between discovery and production.¹³ The second argument offered in support of non-competitive leasing is that 100 years ago when the mining law was passed, it was deemed in the national interest to develop mineral wealth by "enticing the adventurer and the entrepreneur to invest his time, talent and money in the search for ore in the remote, unexplored and unchartered 'Wild West'."¹⁴

On the other hand, in a basically free enterprise economy, scarce and therefore valuable resources are allocated by means of a free market mechanism. If a mineral lease is of value, then its price may be determined and the buyer selected by means of the impersonal market mechanism as presently used in competitive bidding for petroleum leases. In the event that the prospective lease is so unattractive that only one bid is received, then the government is free to either accept or reject the single bid. If there is no evidence of restraint of trade, then the market has adequately performed its rationing function.

Negotiation is a third approach to non-competitive leasing. This method is not currently in use in the United States to any significant degree. However, Secretary Udall proposed a negotiated approach in his "Five Point Oil Shale Development Program."¹⁵ The negotiation approach to natural resource leasing

¹² Testimony of Mr. Thomas Walthier before the public hearings of the Public Land Law Review Commission, January 11-13, 1968, Washington, D.C., mimeographed, p. 16.

¹³ *Ibid.*, pp. 2-6.

¹⁴ *Ibid.*, pp. 16-17.

¹⁵ U.S. Dept. of the Interior, News Release, January 27, 1967, p. 21.

has been more frequently used by foreign governments in granting international concessions. The Canadian government negotiated with several oil companies and selected Sun Oil Co. to exploit the Canadian athabasca tar sands. Similarly the United Kingdom awarded licenses to exploit oil and gas resources in the North Sea fields under its jurisdiction on the basis of negotiated terms.

While negotiation appears to be non-competitive, it may turn out to involve a competitive element. When several potential lessees are interested in a given lease, not subject to formal competitive bidding, they can be expected to determine the criteria which will be used by the leasing agency to select the lessee. When these criteria are determined, the potential lessees presumably will present their case to the leasing agency in such a way as to maximize what they believe to be the bidable criteria. This becomes an informal type of bidding. However, it is not bidding on the significant variable, price.¹⁶ The fault of this kind of an informal bidding arrangement is that it maximizes the wrong variable. It can result in overinvestment in holes drilled and in exploration work or some other irrelevant variable. A second fault of the system is that it may permit corruption to enter the leasing process. Among the substantial advantages of a competitive bidding system in the usual sense in bidding is an arm's length transaction and the winner is determined on the basis of objective criteria as provided by the market mechanism.

2. Bidding Alternatives. Assuming that competitive bidding procedures are to be utilized, then a choice must be made between various objectives of bidding. Three prominent choices will be discussed here. (a) Royalty bidding, (b) Bonus bidding and (c) Profit Share Bidding.

(a) *Royalty bidding.* Under royalty bidding procedures the contestants are asked to make their offers in terms of a specified price per physical unit of the resource, or some specified percent of the value of the resource at a given point in the production process. Royalty bidding is normally subject to a minimum acceptable royalty and the amounts bid may be equal to or greater than the specified minimum. All other terms of sale are predetermined and fixed. Under pure royalty bidding, there is no bonus payment.

Royalty bidding (or fixed royalty payment) requires a metering system to count the number of units of the product that have been removed. This method is in common use by the U.S. Forest Service in its timber auctions. The Forest Service must maintain check-out points on roads leading from National Forest timber sale areas. This involves social costs in the form of man-hours for those employed as checkers as well as costs in facilities and in transportation time lost. Royalty bidding is less common in oil resource auctions. The system has, however, been used by the State of California in both its on-shore and submerged lands oil and gas auctions.

The principal economic problem arising out of royalty bidding (or fixed royalty payments) is that the system requires that the buyer pay for the resource utilized on a unit of production basis even though the cost to society may not be a function of number of units utilized from any given lease. Alternatively stated, the system treats a lump sum cost to society as a marginal cost and accordingly leads to under utilization and resource misallocation. The same reasoning applies to a severance tax when the tax is levied on each unit of output.

The utilization problem is illustrated in Figure 2. Marginal costs are shown both with and without a royalty charge. In the absence of a royalty charge, a maximizing producer would recover oil resources up to point Y. Where a royalty charge is imposed on each unit of output as illustrated, recovery would be halted at point X. The net cost to society is indicated by the triangle ABC. The value of the net cost is a function of the value of the royalty, and the slope of the cost and revenue curves at the margin. Where bidding is based on the royalty and the royalty is consequently high, the misallocation result will be great.

When a new oil field is developed, individual wells will normally yield a high output per day in the early stages of their life and subsequently decline as underground pressure is dissipated. Marginal revenue is probably a horizontal line

¹⁶ One student of the North Sea gas lease situation determined that informal bidding for these leases was on the basis of such things as holes drilled and exploration work undertaken. "This system would thus be characterized as a competitive bidding system in which the bid was the work program of the applicant." K. W. Dam, "Oil and Gas Licensing and the North Sea," *Jour. of Law and Econ.*, October 1965, Vol. 8, p. 59.

since oil is relatively homogeneous throughout the life of an oil field. A point is ultimately reached where costs become relatively high because oil recovery in barrels per day becomes low and marginal revenues no longer exceed marginal costs. The 16 $\frac{2}{3}$ percent outer continental shelf royalty charge, where the well-head value of the crude oil is about \$3.00 per barrel, requires a royalty payment of 50 cents per barrel, thus having a significant impact on the marginal cost structure. Production will be halted at an output corresponding to point X in Figure 2, unless producers are required by regulation to produce beyond their profit maximizing point. Again, the result is a misallocation of resources. The royalty charge takes the form of a marginal cost to the producer, but it is not a real cost to society. This argument assumes that petroleum which is not recovered at the point where lifting operations cease, has approximately zero economic value to society.

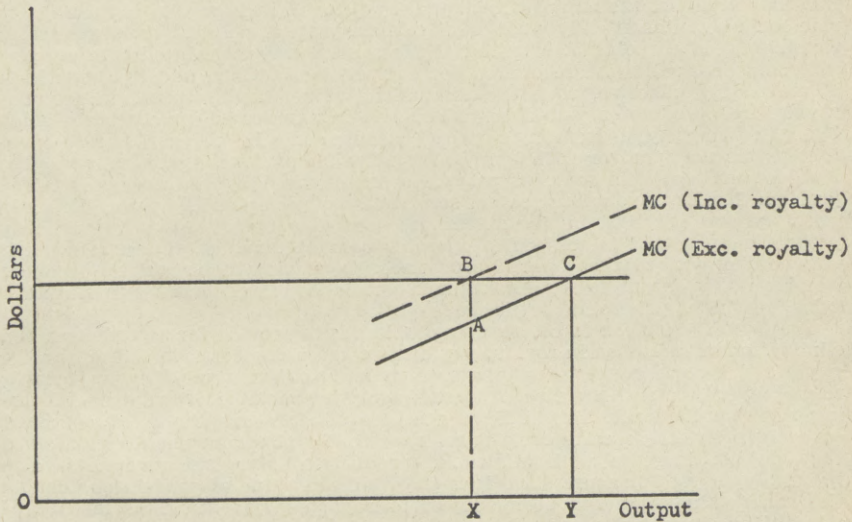


Fig. 2-- Model of marginal output.

The consequences of imposing a non-real marginal cost in the form of a royalty requirement on oil production may be even more serious where the secondary recovery process is introduced only at considerable cost. A profit maximizing operator must determine whether the added value realized as a result of secondary recovery measures will yield a sufficient discounted rate of return. Where royalty charges are involved, it is possible that otherwise profitable secondary recovery operations may be foregone. Where this is the case, the net loss to society may be quite large. Physical recovery may be doubled by secondary recovery efforts.

A sliding scale of oil royalty rates has been proposed as a means of minimizing the misallocation problem and also of capturing for the landlord a higher share of the profits from highly productive leases. A sliding scale would result in lower royalty rates as output per day declines in the later productive life of an oil field. The State of California permits the State Lands Commission to select either of two forms of a sliding royalty scale. It may specify a sliding scale having a minimum rate of 16 $\frac{2}{3}$ percent and (1) require bonus bidding or (2) require bidding on a factor by which the royalty scale is to be multiplied.¹⁷

Where sliding scale royalty rates are in effect, supervision by the landlord is required to insure that the operator's self interest does not result in restrained daily production or overinvestment in drilling in order to qualify for lower

¹⁷ State of California, Public Resources Code, Sec. 6827.

royalty rates. Accordingly, all leases "contain a reservation to the Commission of the right to determine the spacing of wells and the rate of drilling and rate of production of such wells so as to prevent the waste of oil and gas and promote the maximum economic recovery of oil and gas from, and the conservation of, reservoir energy . . ." ¹⁸ The author of a consulting report prepared for the California State Lands Commission nevertheless pointed out that "the State would find it extremely difficult to impose controls that would force an operator to operate wells at the maximum rate at which they could be produced without waste, when it is obviously to the advantage of the lessee to produce wells under a sliding scale royalty at the lower rate of production per well per day." ¹⁹ Thus, sliding royalty rates establish a conflict between landlord and lessee that, unless effectively (and expensively) policed, will result in overinvestment in wells per lease, and underutilization of each well.

The sliding scale system suggests a means of avoiding the misallocation problem that arises at the margin illustrated by point X in Figure 2. If the royalty rate could be automatically "triggered" to a zero rate at point X, then production would proceed to point Y. Further, if the system was introduced into all new contracts before they were offered for competitive bidding, and if competition is reasonably effective, then the discounted value of the future anticipated royalty-free production would be reflected in higher bonus (or other variable) bids. Alternatively, a declining royalty schedule could be "triggered" into effect that leaves the operator with a profit incentive to continue operations while the landlord still collects most of the value represented by the area ABC. The problem that has no obvious present solution is how can point X be unequivocally identified and specified in a contract. As pointed out above, average monthly production per well is subject to operator control. Further, this arrangement is in conflict with market demand prorationing systems which require a producer to restrict his output to some maximum permissible level in order to maintain a desired (high) price of domestic crude oil.

One possible solution to the royalty problem is to provide for a predetermined elimination or reduction in royalty payments when rising costs, including royalty payments, become equal to or greater than marginal revenue. Marginal cost is relatively easy to measure since it includes only the variable costs due to recovering additional output. The difficult costs to allocate are the fixed overhead costs. Happily, these costs are not relevant to the abandonment decision since they do not increase with additional production. Marginal revenue is also relatively easy to measure since it is the wellhead value of production. This is the same value that has been subject to royalty payments. This method of eliminating the royalty payment problem when it becomes operational, while continuing to realize the benefits of royalty charges, has never been tried.

Another variation of a royalty bidding arrangement, also as yet untried, would require a fixed bonus payment by the successful royalty bidder. Since the fixed bonus would increase the operator's cost, he would bid a lower royalty in order to earn his required rate of return. In computing the royalty bid, a required fixed bonus payment is a trade-off against a royalty bid. The advantage of this variation of the royalty bidding system is that resource misallocation would be reduced as a consequence of a lower royalty payment. The required bonus payment is a fixed cost for the purpose of determining when to cease recovery operations or to engage in secondary recovery. The disadvantage of the system is that, given the great uncertainty of present value in the case of oil leases, the leasing agency could not establish a bonus requirement that would insure a relatively low royalty bid. If royalty bids substantially exceed 16 $\frac{2}{3}$ percent on the outer continental shelf, the resource misallocation problem would be substantial. If this variation produced royalty bids less than 16 $\frac{2}{3}$ percent on the OCS, then the resource misallocation problem would be moderated relative to the present system.

Royalty bidding also has some advantages. One advantage is that it minimizes the capital requirement for entry. Where barriers to entry are high, competitors are few, particularly in the case of the outer continental shelf resource auction markets. Reducing barriers to entry must be considered a significant advantage of royalty bidding over bonus bidding. A second advantage of royalty bidding from the buyer's point of view is that payments are made for the resource only if an oil field in fact is discovered and production occurs. Under bonus bidding, in contrast, the bonus is due and payable whether production occurs or not.

¹⁸ *Ibid.*, Sec. 6830.

¹⁹ Herman H. Kaveler, *Recommended Tidelands Oil and Gas Leasing Policy*, a report submitted to the State Lands Commission, State of California, February 3, 1958, p. 11.

(b) *Bonus bidding.* By this technique an interested buyer submits a lump sum bid which would entitle him to exploit all of the resources offered on or under a previously described area of land. Any other fees are fixed and are not subject to simultaneous bidding. After a bonus payment has been made, it becomes a fixed cost with respect to the operator's decision-making problems, that is, the bonus payment is not a function of output. The buyer in effect owns all the resources offered. If the buyer is able to devise better operating procedures which enable him to economically utilize more of the resources, such resources are available to him free of marginal charges, where no royalty payments are required. Bureau of Land Management oil and gas leases, where there is "known geological structure," and all OCS mineral leases, are offered on a bonus bid basis. However, fixed royalty payments are also required.

Like royalty bidding and charging, bonus bidding also has its problems. First, is the uncertainty problem.²⁰ With respect to oil and gas leases, presale exploration, short of actually drilling a test well, may at best, indicate an oil bearing structure. Very little is known about the quantity of oil present, let alone its quality. One oil company landman testified "we bid in the dark, really."²¹ In petroleum resource auctions, the seller does not know what he is selling, and the buyer, who may have purchased some geological and geophysical research, may have only a slight advantage over the seller. The bonus bidding procedure nevertheless requires a competitive bidder to estimate the probable flow of future net value from a given lease, discount it to the present and offer a present cash bonus. The high cost of errors in bonus bidding is well known.

A second problem of bonus bidding is that a significant barrier to entry may be added when bonus payments go as high as \$60 million. This is an appropriate field for relatively large and well financed firms. Others may, and commonly do, buy a participation in this high risk activity through joint bids and joint ventures. For example, in Gulf of Mexico leases offered by the U.S. Department of the Interior from 1954 through 1964, 624 joint bids were submitted compared to 1,577 single bids for tracts having two or more bids received. Thus, 28 percent of all such bids were joint bids.²²

The barrier-to-entry introduced by bonus bidding may be even more important in oil shale resource development. The potential entrants will be few in number, at least in the early years of an oil shale industry. The number of participants will be limited by two factors. First, there are only about twenty firms at most that have a sufficient technological background to be considered serious contenders for oil shale leases. Second, the capital requirement for mining, crushing, retorting and upgrading facilities is estimated in the range from \$100 to \$150 million.²³ Bonus bidding is likely in the future to add another \$100 million to this cost of entry.²⁴ Thus, a bonus bidding arrangement might substantially increase the barriers-to-entry into the oil shale market.

As a third problem arising from bonus bidding one might argue that the discount rate employed by oil companies to convert expected future net income into present value may be inappropriately high as a representation of the public time preference rate. Presumably the discount rate used by oil companies will be based on their marginal internal rate of return. In effect, the bonus bidding system requires that the public landlord accept the private time preference rate. If there is an acceptable argument for holding that the public time preference rate should be lower, then the bonus system involving present payments for future values becomes less attractive relative to an alternative system that involves future payments.

The disadvantages of bonus bidding listed above must be weighed against the single but important advantage, that bonus bidding avoids the resource misallocation problem associated with royalty bidding where the latter imposes a non-real marginal cost on marginal units of output.

²⁰ The economic analysis of uncertainty and risk has been adapted to the petroleum exploration case by James W. McKie, "Market Structure and Uncertainty in Oil and Gas Exploration," *Quarterly Journal of Economics*, November 1960, 74, pp. 543-571.

²¹ State Lands Commission, Testimony of D. E. Clark, Shell Oil Company, in Public Hearings before the State of California, May 3-June 1, 1960, (Sacramento, 1960), p. 10.

²² U.S. Department of the Interior, Bureau of Land Management, Oil and Gas Lease Sale Reports, New Orleans, 1954-1964.

²³ These estimates are based on interviews conducted with oil shale development personnel employed by major oil companies.

²⁴ A production facility capable of producing fifty thousand barrels of oil from a retort per day would require a shale lease large enough to yield about 500 million barrels of oil over a 25 year amortization period. A bid amounting to twenty cents per barrel of oil would require a bonus of \$100 million which, in the pattern of bonus bidding for oil resources, must be paid in advance of production.

In order to solve the barrier to entry problem, a schedule of delayed payments might be established to liquidate the bonus obligation. This procedure would permit some revenue from production to be utilized for the bonus payment. It is appropriate only in low uncertainty situations such as the Long Beach East Wilmington oil field to be discussed later. In high uncertainty situations, such as outer continental shelf oil explorations, some irresponsible firms would probably choose bankruptcy where only dry wells are found, and would gladly pay the scheduled amount where productive wells occur. In the bidding process, and with this procedure in mind, they could outbid the more responsible firms. As a result, the seller would inevitably be placed in a risk-bearer position for which he receives little compensation.

(c) *Profit share bidding.* Profit share bidding is seldom used, but offers some promise for situations characterized by exceedingly high uncertainty. This system might be suitable for marine mining operations, particularly for sub-surface hard minerals. By this device, interested buyers are asked to bid the percent of net profit which they would pay to the landowner for the privilege of utilizing his resources. Since the required payments to the landowner are a function of profitability and the percentage bid, the marginal unit of production makes no contribution to profit and hence does not increase the total payment to the landlord.

This system has been used on occasion by both the State of California and by the City of Long Beach for its vast Wilmington oil field. In the East Wilmington field, the City of Long Beach conducted pre-sale studies to define the oil reserve to be offered for competitive bidding. Thus, with a relatively high degree of knowledge about the quantity and quality of the resource, and relatively little uncertainty about technology, bids were invited for specified shares of the field's oil production. Winning bids were as shown in Table 2. The 80 percent working interest included responsibility for serving as Field Contractor for the entire unit. The winning bid for this unit was submitted by a combine of five major oil companies bidding 95.569 percent of net profit on the operation. Bids for each of the six working interests were submitted and opened on separate successive working days beginning on February 9, 1965. For all but the first working interest, bidders had knowledge of winning and losing bids submitted on prior working interests. For the third working interest involving five percent of the total oil production, a 100 percent of profit bid was submitted by Standard Oil Company of California and Richfield Oil Corporation. Winning bids submitted for the last four working interests were clearly higher than for the first two. The obvious reason for the higher bids by Standard of California and Richfield was to increase their probability of participation in the units. This partnership had failed to win either of the first two working interests. Sealed rather than oral bidding was employed, hence there was no second chance to bid on any specific working interest.

TABLE 2.—WINNING PROFIT-SHARE BIDS FOR EAST WILMINGTON FIELD WORKING INTERESTS, LONG BEACH CALIF., 1965

Successful bidder	Working interest (percent)	Number of bids	High bid (percent)
THUMS Long Beach Co. ¹ (Texaco, Inc.; Humble Oil & Refining Co.; Union Oil Co. of California; Mobil Oil Co.; Shell Oil Co.)	80.0	2	95.569
Pauley Petroleum, Inc.; Allied Chemical Corp.	10.0	9	98.277
Standard Oil Co. of California; Richfield Oil Corp.	5.0	7	100.000
Do	2.5	8	99.540
Do	1.5	6	99.540
Do	1.0	6	99.550
Total	100.0	38	96.253

¹ Field contractor for unit.

Source: City of Long Beach, Department of Oil Properties, Annual Report 1965, p. 35.

Given the extremely high profit share bids in the Long Beach case, it is obvious that the buying companies expected to receive their gains in some form other than the residual profit share. Five observations are relevant: First, uncertainty was minimal in this instance. The field has been called "a tank of oil in the ground." More was known in advance of bidding about the quantity and quality

of oil in this reserve, and about operating costs and revenues, than in any other oil field on record. The auction was unique in this respect. Second, the successful bidders were in effect buying oil for their refineries, on which they expected to make normal refining and merchandising profits. Third, the captive production as "refinery throughput" yields oil import tickets which are of marketable or use value. Fourth, there may be some anticipated value due to possible under-valuation of the crude oil production utilized by the participating companies. Fifth, there may also have been some anticipated depletion allowance benefits. In view of these possible values beyond any retained profit share, a bid in excess of 100 percent of the net profit would not have been surprising.

Profit share bidding, of course, requires a careful definition of the term "net profits". Consequently, the formal Contractors' Agreement specified what income items were to be credited to the contractor's net profits account. The contract language covers such nebulous items as "the net salvage value of unit facilities at the termination of the unit agreement . . ." ²⁵ Indirect company overhead charges for any of the parent companies are not permitted as a charge against net profits. Instead, the agreement provides that the field contractor shall receive a fixed administrative overhead allowance. Otherwise, net profit is defined conventionally as gross income minus normal operating expenses.

There are two classes of problems arising out of profit share bidding. First, there is a resource allocation efficiency problem. Where the profit share paid to the landlord is high, the efficiency incentive will be correspondingly low. The decision making effect is similar to the World War II experience with the excess profits tax where the after-tax cost of an expenditure was only eighteen cents on the dollar. Given the very high profit shares bid, as shown in Table 2, there is virtually no remaining efficiency incentive. For the 80 percent working interest, the THUMS group retains only 4.43 percent of net profits and therefore gains only 4.43 percent of all cost savings resulting from operating efficiency. At the same time the THUMS group, as the Field Contractor, receives an administrative allowance amounting to three percent of all operating expenses. Thus, the lower the expenses, the lower will be the administrative overhead allowance. The net share of cost savings retained by the Field Contractor as a reward for efficiency is therefore reduced to 1.43 percent (4.43 percent minus 3.00 percent). Where the real economic incentives of the buyer-operator are in such factors as refining profit and import quota tickets, his interests lead him to maximize crude oil production regardless of recovery efficiency.

Second, there is a problem of administrative interference by the government in the management affairs of the operator. Since payments to the government are a function of profits, the operator has an incentive to shift expenses from the parent company to the lease operating company, and to shift income items in the opposite direction. This leads to overstatement of overhead expenses, and to understatement of the value of oil or other products of the lease company which are utilized by the parent company. Accordingly, in order to protect his economic interests, the landlord must carefully supervise the management of the lease. The operating contract must specify in detail how overhead is to be allocated, how products are to be valued, what expenses are chargeable to profits, etc. The Long Beach Wilmington contract provides that "the City Manager . . . shall exercise supervision and control of all day-to-day unit operations . . . and . . . shall make determinations and grant approvals in writing as he may deem appropriate for the supervision and direction of the day-to-day operations of the Field Contractor, and the Field Contractor shall be bound by and shall perform in accordance with such determinations . . ." ²⁶ A written contract cannot anticipate and resolve in advance all of the conflicts that will develop due to opposing economic interests. One interviewee stated that "hassel after hassel has developed regarding charges to the net profits account."

The significance of the above problems may be reduced by judicious application of the profit share bidding system. First, the system should be used only in situations characterized by great uncertainty. Given the low degree of uncertainty characteristic of the Long Beach unit, bonus bidding, perhaps with a delayed payment schedule, would have been a more appropriate pricing and buyer selection system. Second, measures should be taken to insure that the profit share bid will be less than fifty percent. One means of accomplishing this

²⁵ Contractor's Agreement, Long Beach Unit, Wilmington Oil Field, California, Art 4.

²⁶ Contractor's Agreement, Long Beach Unit, Wilmington Oil Field, California, Art 14.

objective is to require a lump sum payment similar to a fixed bonus that is not chargeable as an expense in computing net profit. Bidders would then reduce their profit share bid by an amount necessary to compensate for the payment. If the seller wishes to minimize the barrier-to-entry effect of a large lump sum payment, or to avoid assumption of a high private discount rate, a schedule of delayed but unavoidable payments might be established.

The advantages of profit share bidding are of four kinds. First, in situations characterized by great uncertainty, profit share pricing protects the government seller from the political charge of "give away" where great windfall profits are realized by the operator, and reduces losses for the buyer where no profits are realized. In contrast to a bonus bidding arrangement, no payment is made where there is no net profit. For this protection the seller gives up his certain present bonus and the buyer gives up part of his occasional big windfall profit. Relative to a royalty pricing system, profit shares provide a better means of sharing windfalls since payments vary with profit rather than number of, or value of, units of output. Second, barriers to entry are lower by profit share bidding than by bonus bidding. Payments to the landlord are not due until after the source (profit) has become available. Third, the resource misallocation problem may be less severe than under royalty bidding, but are more severe than under bonus bidding. Fourth, if the discount rates used by oil companies to compute present values are felt to be inappropriately high for public use, then profit share bidding is preferable over bonus bidding since the need for discounting income to the present is avoided.

3. The Right to Reject Any and All Bids. The government currently reserves the right to reject any and all bids received under conditions of competitive bidding. This right should be retained in any extension of competitive bidding procedures on the outer continental shelf, and in addition, the right should occasionally be exercised. Data supporting this recommendation are available from the record of outer continental oil and gas lease sales offshore from Louisiana over the period from August 11, 1959 through June 13, 1967, and two OCS lease sales offshore from California dated May 14, 1963 and February 6, 1968. During this period of time, 78 high-bid offers were rejected by the government and subsequently 26 of these tracts were re-offered and leases awarded. In a study which I conducted of these re-offers, it was shown that 25 of the 26 re-offers generated higher bids than the initial rejected bid. The total initial bids received for the 26 rejected tracts amounted to \$4,597,995 for an average of \$42.41 per acre. When these 26 tracts were re-offered the total high-bids generated amounted to \$44,926,452 and averaged \$411.38 per acre. Thus, re-offer developed nearly ten times the original bonus bids.

The most obvious factor to account for the relatively high bids received in the subsequent re-offer is that the initial bids failed to reflect the true value of each tract. However, it is possible that the 26 tracts selected for re-offer were the best of the 78 initially offered and rejected. The total of high-bids received in the subsequent re-offer of the 26 tracts, however, was approximately four times the \$11,315,049 initially bid for the entire 78 tracts. Thus, while the study of effective competition reported earlier demonstrated that in the aggregate, competitive bidding adequately protects the public interest, in the particular we should expect to find cases of inadequate competition. These cases may however be offset by other instances of over-competitive behavior. The results suggest that in particular instances where the government believes competition to be clearly inadequate, it should be armed with the right to refuse any and all bids. Furthermore, the evidence clearly indicates that in certain cases this right should be exercised.²⁷

4. Lease Term. The Outer Continental Shelf Lands Act provides that oil and gas leases shall be issued for a "period of five years, and as long thereafter as oil and gas may be produced from the area in paying quantities, or drilling or well reworking operations as approved by the Secretary, are conducted thereon. . . ." For sulphur, the Act provides for a lease period of not more than 10 years. The purpose of these relatively short lease terms is to encourage early exploration and to prevent lands from being held for the purpose of speculation. The provision of a lease term is based on questionable economics. The economic issue involved is the allocation of scarce resources over time. If the

²⁷ For detailed data on rejected bids and subsequent re-offers see Public Land Law Review Commission, *Study of Outer Continental Shelf Lands of the United States*, Vol. 1, Washington, D.C., October, 1968, pp. 472-475.

owner of a lease, or the fee owner of natural resources, exploits his resource in such a manner as to maximize his own present value, then he would consider present and probable future prices and cost of production. If his required rate of return is say 10 percent and he believes that either through technological improvements which reduce production costs in the future, or through price increases expected in the future, his resource would increase in value by more than 10 percent per year, then he would hold his resource in inventory for the present in order to exploit it in the future. By so doing his action would raise current resource prices, and lower future price. The net effect is that by maximizing his own present value (speculating) he serves the general interest by acting in such a manner that prices attain a greater degree of stability.

In contrast, when the government specifies a five or ten year lease term, it says in effect that the output from resource exploitation is needed in the immediate period more than it will be needed in the more distant future. In fact, there is no evidence that the government has made a study of probable future technological change, and probable future price increases prior to a determination of the minimum lease term. Rather, the lease term is prescribed by statute. The assumption seems to be made that speculation is evil and should therefore be proscribed. From the point of view of economic theory, speculation serves a useful function, that of allocating resources over time. Unless the government has evidence of its own superior wisdom in determining when specific natural resources should be exploited, the statutory provision of a lease term should be eliminated.

5. Rental Requirements. Outer continental shelf oil, gas and sulphur leases also require payment of a specified annual rental. The amount specified varies from sale-to-sale. For recent oil and gas leases the annual rental has varied from \$3 to \$10 per acre per year, and for recent sulphur leases \$3 per acre per year rental payments are required.

The purpose of a rental requirement, in addition to raising revenue, is the same as that of a minimum term, that is, to encourage immediate exploitation. The rental requirement has this effect by making it expensive to hold land in an idle condition. Rental payment requirements cease when production begins and royalty payments commence.

The rental cost is not a *real* cost of production and instead is a transfer payment. Since its effect is to provide a strong economic incentive for immediate exploitation, it is capable of leading to resource misallocation over time. Because of this adverse effect, rental payment requirements should also be eliminated. However, since rental requirements simply make delayed production expensive, whereas lease terms absolutely limit delays, rental payment requirements are preferable to lease terms.

To the extent that rental payment requirements exist in order to produce revenue, they may be replaced by the requirement that the present equivalent of five or ten years rent is payable in the form of a minimum bonus. If rental payments are eliminated, the long-run effect will be that bonus payments will be correspondingly higher. This follows from the fact that bidders calculate their bonus bid by estimating future revenue, subtracting future expenses including rental payment requirements, then discounting expected net profit to the present. Thus, as expenses are reduced, estimated present values and bonus bids will correspondingly be increased.

6. Incidental Requirements. A mineral lease contract, in addition to requiring the payment of rent and royalty and specifying lease terms, may also include a series of requirements to be met by the lessee. For example, he typically is required to observe certain safety and pollution precautions. He may also be required to engage in certain research and development expenditures. Before Congress or the Department of Interior adds further incidental requirements to the lease contract, it should make a careful calculation of (1) the cost of compliance, (2) the cost of enforcement, and (3) the value of the benefits which accrue to society due to the incidental requirement. An incidental requirement should not be added if the value of the benefits which flow from it are less than the cost of compliance and enforcement. The cost of enforcement is clearly a real cost and the money cost is clearly borne by the taxpayer. The cost of compliance with the incidental requirement is also a real cost, but some observers may feel that the corresponding money cost is borne by the lessee. Such is not the case. As indicated earlier, when any bidder calculates his bonus bid he considers all costs which he must bear including the cost of compliance with incidental requirements. Thus, as such requirements are added, they appear to be a burden borne by the lessee, but in fact, are fully paid for by the public in the form of reduced bonus receipts.

V. SUMMARY OF RECOMMENDATIONS

1. Competitive bidding is strongly recommended as a means of (a) lessee (buyer) selection and (b) price determination. Non-competitive procedures for allocating mineral resources are inefficient. They also are inequitable because they give away potentially valuable public resources.

2. Among the competitive bidding procedures, bonus bidding is recommended for most situations. However, when uncertainty is extremely high, profit share bidding may be more appropriate. Royalty bidding should be avoided. Fixed royalty payments should be avoided unless a device is introduced which automatically eliminates them when the marginal cost of production rises above the value of the product.

3. The right of the government to reject any and all bids should be retained and used where evidence indicates that competition is inadequate.

4. The specified mineral lease term should be eliminated.

5. Similarly, the annual rental requirement on mineral leases should be eliminated.

6. Preliminary evidence indicates no basis for a public subsidy to stimulate manganese or phosphorite production from the marine environment.

7. Subsidies should not be granted for mineral production except where there is clear evidence of large net external benefits accruing to society. In the absence of such evidence, interference with the free market mechanism should be avoided.

Senator METCALF. I know that all of you have raised questions in each other's minds, even though Mr. Mead said he agreed largely with Mr. Fischman. I want to start this off by asking Mr. Fischman a question.

It is a question about natural gas, Mr. Fischman. I don't see how you can justify your statement that the actual value of our mineral resources under the sea and on the seabed are less than zero when we consider the fact that hearings before this committee and other committees have demonstrated that we have a substantial shortage of natural gas.

It would seem to me that the need to develop natural gas alone, which doesn't cause the environmental problems that oil does, would justify exploration.

Mr. FISCHMAN. I did not mean to give the impression that there were no minerals of value—

Senator METCALF. You didn't give that impression. You pointed out that there were minerals of value.

Mr. FISCHMAN. Oil is quite clearly a major exception, and natural gas is also an exception, but each of these exceptions has a boundary, and it is probable that natural gas has a more confined boundary than oil.

When oil production at sea gets too far for economic transport to land by pipeline, it can fairly economically be barged, carried by vessel. Natural gas costs a lot more to carry by vessel, with the result that, so far, a positive cost for actual natural gas production offshore has not—I mean positive value for natural gas deposits offshore—does not seem to have extended very far offshore.

This is only a general impression, and I am ruling what we learned during the course of our study, but one has the impression that a great deal of natural gas has been discovered which is not being produced simply because it does not have a value at the present time. It may have at some future time.

Dr. MEAD. May I comment, also?

Senator METCALF. Yes.

Dr. MEAD. Again, I would like to endorse the statements of my colleague, and extend them. With respect to natural gas, we have a price mechanism that isn't really the market at work. Rather, the price of gas is artificially held down, just as the price of oil is artificially held up, so the price system really isn't doing its job there.

Mr. Fischman's statement really was about other minerals, and with respect to these other minerals, I have looked at some of their costs and I fully agree that the cost of getting them out would far exceed their value. Gold is an excellent case in point. You have a lot of gold—

Senator METCALF. Let's not talk about gold. It is a special sort of a situation.

Dr. MEAD. With respect to oil and gas—

Senator METCALF. Yes; and copper and manganese and these things, because gold is such an artificial sort of a thing that it is hard to equate it with the rest of the things.

Dr. MEAD. Right. So the same thing is true with copper, and nickel, and cobalt, and manganese. The cost of getting those minerals out from the manganese nodules is far greater than its value when it is recovered.

That means that if we do it, if we subsidize that enterprise and get those minerals out, we in effect are using up more resources than we are producing. Now, if we do that, that will cause our standard of living to go down, not up, because we are using up more resources than we are producing.

It will also impair our military efficiency, because we don't become a strong military Nation by efficiently using our resources. One cannot, in my opinion, use the balance-of-payments justification for this sort of thing.

That is another problem, and if we have a balance-of-payments deficit, there are far better ways to take care of it than by subsidizing gold or any other production, namely, go to a freely fluctuating system of foreign exchange. That is a far better way of taking care of any foreign exchange problem.

Senator METCALF. Did you have a comment?

Dr. SPANGLER. I think the areas where the gentleman on my left and I agree have pretty well been defined and the areas where we disagree. At least the points at issue have been set forth. I don't think that in a few minutes I can properly represent my views, nor give them adequate time for rebuttal. However, I think perhaps the main function of a session of this sort is to set the stage for a continuing debate on honest disagreements of opinion.

One thing I feel rather strongly about is how one defines the question of urgency. The people who point to the great reserves of land resources have little information available to them on which to say what the future cost of recovery will be. This is not only to say that the owners of the resources have not published the information, but in many instances they don't even know very precisely themselves what it will cost to recover the lower quality reserves which may not be fully delineated.

Typically, the highest quality of reserves are mined first, and just by looking at the quantity of land resources, one gets a false impression of what future costs will be, and hence what the externalities will

be in terms of national interest if we turn our backs on the ocean and say it is not wise to have policies for earlier rather than later market development for these resources.

Another point of disagreement is the valuation placed upon the potential contributions of research and development. Just last month I talked with a gentleman who is staking his career on mining manganese nodules. He is an engineer and is surrounded by a number of other qualified engineers. They have looked at the processing problem, and I get a rather different picture from them than what Professor Mead presents.

I am not sure Professor Mead's view is wrong. The point I would like to make is that we must look at the specific resources that are going to come out, or that we think may come out of the ocean, and recognize that there are probability linkages with what we spend either in the private or the public sector of the economy on the R. & D. to find the answer to the question of whether profitable operations are possible. I don't think the answer will come in an armchair. I think, in terms of manganese nodules alone, the potential savings to the economy from reduced prices of metals extracted from these nodules, the strategic military importance of these metals, and the balance-of-payments contributions all are collectively of much greater consequence to the national interest if the research and development is successful than are the potential profits to private industry.

Private industry, when it gets into this business, is going to bump up against heavy competition with alternative sources of supply, first in manganese and then the cobalt and nickel, to get rid of the surpluses the prices of those metals will depress, bringing savings to the economy. But this may cause a profit squeeze. Ultimately, this will mean diminishing returns to industry unless the costs can be reduced a corresponding amount.

So it is a question of how the two curves come down; that is, the prices of some of the byproduct metals and the costs of producing them. It would be very difficult to predict the slopes of these curves at this point in time.

But these are the kinds of difficulties we are trying to face up to, and funds will need to be committed before very precise answers can be obtained. I would say the potential rewards are much less for the entrepreneur than for the Nation. Under too strict an observance of the free-market mechanism we run a serious risk of losing technological leadership in exceptionally important areas of marine resource development. Unless we do something early to encourage private enterprise we may have a poorer chance if other countries move ahead of us. I see evidence to suggest that they may be doing just that.

Senator METCALF. Senator Hansen has a question.

Senator HANSEN. Dr. Spangler, did you mean to imply by the statement that you have just made that very possibly the presence of these minerals offshore, the knowledge that they are there, that they are extensive, could bring about a development in the technology of recovery so as to lower the per-unit cost of recovery and, hopefully, bring about that happy point in time that it would be profitable and would not present the situation that Dr. Mead referred to when he said on the basis of his knowledge of them now, we would expend

more natural resources than we would recover, thereby proving that it was an inefficient operation and, as such, could not contribute strength to our national security or anything else?

Were you implying that if we do try to recover them, that very probably we might develop new technologies, new ways of accomplishing this recovery, and that the price, the per-unit cost in terms of the input could go down?

Dr. SPANGLER. Yes; I think there is a very good chance of that happening. Some people are deterred by the thought that the high quality nodules are in 15,000 feet of water. Yet we exploit oil at even greater depths than this. Moreover, as Senator Metcalf has pointed out, we go very deep in the ground to recover land resources. These are mixed at increasingly high cost. The manganese, or cupro-nickel, nodules are lying on the surface of the ocean floor. There are problems to be overcome to raise these to the surface, but you don't have to dig down through a couple of hundred feet of overburden to get at them.

So I think we have to look at this in broad perspective. I think it would be surprising indeed, whatever the cost of the first recovery proved to be, if further advances in mining technology could not bring down the cost substantially. This cost reduction has happened in almost every historical technological development one can think of. I think this is the kind of thing we must keep in view in the potential development of such resources.

Senator METCALF. Professor Mead?

Dr. MEAD. This is really the point I was making, too, and there is no disagreement between us on this, before you arrived, Senator Hansen.

I tried to identify what I thought was the proper basis for a public subsidy to a developing marine mining industry. I pointed out that this does involve a new technology. I didn't elaborate, so let me do so now.

The technology is one of dredge, a dredge to bring the mineral up. Our current dredges are capable of recovering things from about 60 feet of water—60 feet.

The marine phosphor right now is located in excess of 600 feet, and the marine manganese, the rich manganese in the deep Pacific, are 18,000 feet, in excess of 3 miles. Well, we have no technology that exists, so we have to develop one.

Now, we know from new technology such as nuclear power, desalination, even some commercial products like rayon, that when you develop a brandnew technology, that the first plant is high cost. The second plant will be lower cost, and the third and so forth.

Now, you know from your State the problem of shale, and you probably read the Interior Department's study, which says something about the cost of processing shale by currently known technologies, and then it estimates the costs of a second generation plant, much lower costs, and a third generation plant.

This is based on solid economic research. We know it is going to happen. We know it is going to happen on marine mineral recovery. The trick is to estimate what is likely to be future cost. Mr. Spangler points out that we have very little information, but we must do the best we can.

Where I disagree with him is that he seems to be rather loose in his suggestion that subsidies ought to be handed out. I want to ask this question: What are the costs and the benefits involved?

Dr. SPANGLER. Excuse me. I don't believe I indicated that subsidies need be involved. If I recall, I said that the Federal Government should consider supplying certain R. & D. investment funds to be recovered out of profits of private industry operations.

Now, of course, if there are no profits, I suppose you might claim that there is an element of subsidy, but also there is an element of risk sharing which may be in accordance with the unequal benefits. I have indicated I thought if one compared the benefits to private industry with national benefits, that the latter may far outweigh the former. I would assume in competitive bidding that there would be money coming from private enterprise, and there would not be a 100-percent contribution of funds by Government. So I don't really think it is a fair statement to interpret my suggestion as being one of subsidy.

Also, I think I should put on record at least that one gentleman of DeepSea Ventures, Mr. John Flipse, in an article "An Engineering Approach to Ocean Mining," outlined a prototype technology for mining deep sea nodules. Currently, they are preparing to test this equipment in 3,000 to 5,000 feet of water off the Blake Plateau, so they are going much beyond the 60- to 100-foot capability of present dredges.

One of the statements Mr. Flipse has made in this article, and I suppose it is open to contention, but let me quote it anyhow:

All of the above approaches have been subjected to trade off studies of alternatives, including that of ignoring that aspect of the problem altogether. This has been an interesting process which produced significant changes as experimental and development work proceeded. The chosen methods which are presented are all within the present state of the art, and their detailed development is expected to be a logical debugging and perfective process. The time is now and the tools are in hand.

Now, he may be wrong about this. I am just saying that this is another point of view being offered by someone who has dedicated his career to proving or disproving whether this can be done, and his company is backing him up with quite a bit of investment resources. So this is not a flip judgment, as I see it. I wouldn't want to dismiss this point of view out of hand.

Senator METCALF. We know that out there on the seabed are these nodules, and they have copper and cobalt and so forth. Those are metals that we need. Those are resources that are available.

Now DeepSea Ventures, when they were before this committee and showed us some of the nodules, have a sort of a glorified vacuum cleaner that they use to sweep them up from just off the Carolina coast or somewhere down there.

Now, how can we justify not spending some money for research and development to try to make those resources economically recoverable?

Mr. FISCHMAN. I guess we might as well take turns at this. Just as the preliminary, I have also had a conversation with Mr. Flipse, and this was almost a year ago, and I would say that his enthusiasm and confidence is justified, if that is so, then there is no need for a Federal subsidy.

He is going to pull it off by himself.

Dr. SPANGLER. My answer to that relates to the multiplicity of risk factors which may deter full-scale investments. What he was making a plea for when I visited him last February was support for the idea that we need an adequate political regime for exploiting this resource in international waters. He certainly was not saying commercial recovery couldn't be accomplished without subsidy.

Senator METCALF. They were here, and were saying, "We are going to spend millions of dollars off the coast in uncharted waters, and don't know, that if we develop something, something else will come along and jump our claim and move right in alongside us."

That, of course, is a political matter. It is something that we have to have; some way of registering, some way of protection. But we are opening up a great big pit in Montana, the Anaconda Co., is closing up all the shaft mines; they are taking the overburden off that they didn't used to be able to handle, and taking low grade ore that was being thrown in the dumps before, to get copper.

Every time you open up the financial pages, you see the price of copper has been raised by one or another of the big copper companies. We know that offshore there is copper, and we are going to need it, and we are going to need it as part of our national security.

Our demands for these resources are insatiable. So shouldn't we go into research right now to try to make those economically recoverable?

Dr. SPANGLER. I think you have a very fine point. The prices of a lot of these metals have been rising. Messrs. Morse Barnett, who have developed a very fine paper on the scarcity of metals, presented data to show that up through 1957, advances in technology have enabled the recovery of lower quality resources from the land with price rises less than the general price rise of the economy. Although this relationship was valid through 1957, let us take a look at what has been happening since then. Prices of copper, nickel, and cobalt which could be gotten from the deep sea nodules have been rising lately at much faster rates than the increase in commodity prices generally. So what I object to is leaning too strongly on a rearview mirror approach in forecasting the future. One ought to be starting with trends since 1957 rather than with trends ending in 1957. Also, one must take a longer view. For example, who would plant an oak tree if one stopped with the argument, "Well, in only 5 years what would be the board feet of lumber you could get out of it?"

One has to take a 20- to 40-year look ahead on some of these potentially important and difficult marine resource developments. My plea again is that because of the very free market forces these gentlemen espouse, we are going to be in a difficult spot if we don't take Federal initiative to get out ahead of the pack.

One might question whether our country should have higher wages and salaries than other countries, but as long as we do, we are rather compelled to preserve this differential from sudden collapse. You can't say that automobiles are only x percent of the economy and, therefore, if we were to go back to horse and buggies, our GNP would suffer only y dollars.

The point is you can take all the thousands of products in the GNP and say what fraction they are of it, and you will find that each is not a terribly large fraction. So you can't use that kind of logic in my

opinion to say it is unimportant whether a nation gets behind one developmental regime or the other for specific kinds of resources.

If one looks at the promotion of land versus ocean resources, I would say that land resources have benefited from subsidies and all kinds of encouragement programs for a century or more, and now we are saying, "Well, don't disturb equities between land and marine resources.

Senator METCALF. A lot of those subsidies weren't justified.

Dr. SPANGLER. That may be the case, but we have those technologies today, and they have a history of development.

I would like to make the same point with regard to oil. I would like to ask what the price of oil might be 10 years from now if we open the door to all kinds of imports. I would readily concede that oil prices immediately would fall. But what kind of a scenario would one write in terms of future reactions of foreign oil producing countries when they find they have an advantage over us as our own oil supply relative to the total has contracted drastically?

Senator METCALF. I want to get Professor Mead in here.

Dr. MEAD. I would like to answer your question, which has not been answered yet. It is the right question. The question was, "Can we afford not to recover resources?"

Senator METCALF. Not to do research directed toward the recovery.

Dr. MEAD. Yes. The issue is this in an economic sense: What is the cost of getting out? Once gotten out, what is its value, including external benefits?

Suppose that the copper we recover, in a box on the table here—if you can imagine that—suppose that copper is worth, say \$10. Now, suppose that the cost of getting that copper to where it can be processed is, say, \$20.

Now what we do, when we produce anything, is simply to take resources and convert them into something else. That means that we are using up \$20 worth of resources in order to get \$10 worth.

Our standard of living is defined as all the goods we produce, divided by the people. We, in effect, by using up more resources than we produce, are lowering that pile of goods. That weakens our standards of living, and weakens our defense capability.

Senator METCALF. That is today.

Dr. MEAD. Right.

Senator METCALF. The whole point is that we are using up those resources, and your box of copper 10 years ago wouldn't have even made it practical for some of the mines that we have in full operation today.

Dr. MEAD. Let me get to that.

Senator METCALF. All right.

Dr. MEAD. Let me continue the illustration of 20-buck cost and 10 bucks of value. Suppose with rapidly changing technology in this dredging process, suppose the cost goes down from \$20 to \$15 to \$10 to \$5. Now its value is \$10 and its cost now has gone to \$5.

If we have any reason for believing that will be the case, then a public subsidy is justified, because somehow you have got to get through that first pledge, and if some guy invests in it, he is going to lose his shirt.

So, if it is true that at some future point costs go down so far that ultimately it will be profitable, then we ought to have a public sub-

sidy. But the question that we have got to study and get an answer to is, "What is the best guess about the future costs?"

If we conclude that the costs will never be below \$15, and the price will never go over \$10, then it is a waste.

Senator METCALF. Our demands on our resources, and you people know more about it than I, are insatiable. They are going up in geometric proportions, and at the same time we are exhausting resources that are the most easily recoverable.

Dr. MEAD. Correct.

Senator METCALF. Now, can we sit here today and say out there on the ocean floor is a lot of copper and cobalt that is not going to be practicable for us to recover in the year 2000? The only way we are going to get down to \$5 is to do something in research so that we get into that second and third generation plant.

Dr. MEAD. Yes. This really involves speculating about the future, and we must do it. I wouldn't deny this for a minute. But my point is, let's not grant subsidies without asking the question, "What is likely to happen to cost?"

Senator METCALF. I think your point is well made, but we still have to do something about having the resources that we know are there, recoverable sometime in the future. If we don't do it, there are great nations in the world that are going to do it.

Dr. MEAD. Let's simplify again, and going back to this \$20 cost and \$10 revenue. Let's assume that we have studied this, and after thorough study, we conclude that the best we can ever do is to bring that cost down to \$18.

Now, just assume that for the moment. Now that \$18 cost is resources, too. Those are resources we use up in order to get resources.

Senator METCALF. Your box of copper is worth \$20.

Dr. MEAD. That is another matter, and that you have to estimate that, too.

Dr. SPANGLER. We can't guess very accurately the costs without doing it. If you look at the development of jets, transistors, atomic energy and synthetic rubber, the best guess of people studying these matters prior to development was that the future cost and the performance of these technologies wouldn't reach in a reasonable period of time the achievements that actually were made. We sometimes underestimate such technological accomplishments. So I think if we join up with a "Let's-not-think-boldly" group that I see developing we will fall behind other nations in marine technology. For example, witness the achievements of the Japanese in implementing advanced technology of high-speed trains, much of it developed in other nations. In terms of what our nation can afford, I don't think \$100 million or \$200 million invested in R&D on stimulating a cupro-nickel module industry is going to break this country if the potential benefits are large. The Commission has recommended a Federal marine program of \$8 billion, and \$100 million is less than 2 percent of such a sum.

Senator METCALF. Senator Hansen?

Senator HANSEN. Thank you, Mr. Chairman.

I wanted to be on record here today. These are very important hearings. I recognize that they cut in their impact over a far greater percentage of our population than those of us here today realize. I think the point you made needs underscoring, though you express it very well.

I simply do want to emphasize that we should be concerned not only with the point that you make, Dr. Mead, as to the cost or the value of the resource we recover from the ocean and it is quite appropriate that we should compare that value with the cost that is entailed in the recovering of this resource. That is one fact.

Of equal importance, Mr. Chairman, is the fact that we ought not to be concerned all the time with looking in the rearview mirror, as you were saying, Dr. Spangler, but occasionally looking through the windshield to see what is ahead, because this could happen, too.

The cost of recovering this resource may be, insofar as we can project it, may be capable of being lowered to \$18 from the \$20. But let's not forget that as our dependence upon foreign sources increases, those crafty foreigners might just happen to think that they could hike the price a little, and if they were to do that, then we could find ourselves dealing with a unit of material that might not be worth \$10 tomorrow, but might be worth \$25 tomorrow, so that \$18 would be a pretty good bargain.

I happen to believe that it is our responsibility, as we consider the ramifications of this Nation's security, to examine all of the critical things we need, not only oil and gas, to which my distinguished chairman has alluded on many occasions, and it is important, because three-fourths of our energy comes from oil and gas, and 99 percent, I am told, of all the transportation we have in America today is the result of the propelling power of either oil or natural gas in one form or another.

That is important, but it is also important that we look at all of the resources that are on this Outer Continental Shelf, and to be certain that our long-range policy, and I will admit that the military can make a good case, if we take the long-range view to say, "Let's stop here," because the latitude of the seas is an appealing concept.

The closer you can get to a foreign nation with all of the technology, with everything we have, with the sensors that we can monitor the movement of ships and so forth—I don't know what all we have. I just read in the paper from time to time that maybe we have lots of things going on.

So that the argument that can be made by the Defense Department is a rather persuasive one, but I am more inclined to think that I would like to know, I would like to be sure that the things this country needs, that the demands that are put upon our mines, our fields, our oil wells, can be sufficiently assured as to supply so as to make certain that we will never have to depend upon one foreign nation for a very significant proportion of those things.

Because if I learned one thing, it is simply this: Nothing is more costly than something that you have to have that someone else owns, and as quickly as we find ourselves in that position, then I am certain that the great logic of my distinguished chairman will be borne out, and I hope, not to our sad regret, but rather that it may reflect our omniscience in looking ahead and taking steps now, whether through subsidy or whatever.

I don't know what it should be. I just know this: We are going to need more of all of these things, and whatever must be done in order to assure the adequacy of that need when the time comes, I think will reflect or will indicate the kind of policy that our Government now ought to embark upon in order to assure that we can remain strong,

that we will have what we need when the time comes that we must use it, and I don't suppose I am arguing with anybody.

I just happen to think that in the operation of this free enterprise economy that we have, and I will admit that it has been modified from time to time, I am not certain that anyone is going to go out today and say, "Well, this country is going to need this cobalt, or this copper," or whatever it may be in the year 2000, so I am going to stick my money in there to recover it, unless he thinks that the chances are good that he will make a profit on that operation, and some of these things, frankly, are sufficiently remote from our grasp now that I suspect it is going to take just a little bit more than the incentive that comes from the operations of a capitalistic economy to give the encouragement to an individual that will be necessary to have us make this certain.

And to develop these processes and to go into the expensive undertaking that will be required to assure that we will have them when we need them.

I would hope that out of these hearings, and I think this panel has a very fine contribution this morning in calling attention to important economic facts of life which I hope we will consider, because, after all, all of us—and I am sure that I speak for almost every citizen in this country—would hope that we can have a national policy which will assure the adequacy of the supplies of those things which we are going to need even more significantly in the future than we may need them today.

Mr. Chairman, I, too, offer my long—but I did want to say what I said, because I agree so completely with what you are saying that I just wanted to take this occasion to underscore those points.

Senator METCALF. I am very glad, Senator Hansen, that you made this contribution.

Is there any comment from the panel?

Mr. Fischman?

Mr. FISCHMAN. I think I had better start by warning Senator Hansen that the economists are very unreliable people to depend upon. We have very slippery statements and analyses. So by the time I get through, perhaps you won't find quite as much support in what I am saying.

There are a lot of things that have been said, and some which I missed, but essentially the question has revolved around need for these marine resources and what it is worth for the Government to invest to insure that these particular resources, such as the manganese nodules, and the more uncertain ones, will be available at some future time.

We devoted a 20-page chapter to this question of need in our study for the Marine Sciences Council. There are various kinds of needs, and they can be satisfied in various kinds of way. If we accept, for example, that it is an overriding need not to be embarrassed by having the Japanese recover these first, then it is worth any amount of money to research the thing and get there first.

We decided this sort of thing in getting to the moon, and we spent a lot of money to make sure we weren't in effect, forever embarrassed. But this is a judgment an economist can't make.

I think one has to consider whether it is going to be fatal if the

Japanese should recover manganese nodules first. I am not sure they are. When they got down to it, they might find the nature of the speculation is too great to warrant their going into it, too.

This gets to a second question, how much of a speculation is worthwhile? I would be the last to say that a speculation is not worthwhile. I am willing to go and gamble \$5 in the casino, but there is a limit. I want to begin to have some assurance of return, or some notion of the probability of return before I begin to invest major amounts.

There are numerous Government programs in which the return for a \$100 million expenditure is fairly predictable. I would certainly agree with Mr. Spangler to the extent that it is worth researching the question of the probability of return for this \$100 million if it were spent on developing R. & D. for the recovery of manganese nodules.

Getting back to the fundamental question of what is the need, how badly do we need extra sources for these minerals, we know it is not an absolute need, because we are importing many of them now, and we are living with that more and more. We also know that most of these minerals—and this includes copper—don't have a unique source.

Our bets are pretty well hedged in terms of copper, and if we don't get it in one place, we will get it in other places, including overland from Canada and Mexico.

What I am alluding to now is what we call a strategic need. What is the risk of a possible interruption of supply of a particular commodity? This has to be in itself analyzed in two different ways, a sudden interruption, which could come about by a political change or a war or something like that, or a long-term switch in availability because other countries in the world are increasing their assumption very rapidly.

This is subject to analysis, but any analysis we have done so far does not suggest that there is an overriding need to develop additional sources of domestic copper.

To the extent that there is a need for domestic sources of copper, it is not clear that investment in terrestrial copper will not return much surer and higher dividends than investment in the recovery of the manganese nodules.

If the price is rising at the same time, it is incessantly bringing more and more domestic copper into the category—these things go up geometrically. By the time to get down to a quarter of a percent or something like that—I don't know where we are near that.

Dr. SPANGLER. We are at 0.6 of 1 percent in the United States.

Mr. FISCHMAN. There is a lot of it. By the time the price of something is high enough for us to get it out of granite, there is an unlimited amount of it.

So the question simply has to be analyzed, and you have to, after analysis, make the best estimate you can of the relative prospect of reward for a particular line of R. & D. as against the expense involved.

Dr. SPANGLER. I think Dr. Fischman takes too stringent a view of the term "need."

For instance, we may wish to reduce the risk of experiencing a nickel shortage, or the risk of an interruption in copper supply from a nationalization in Chile or of tin in Bolivia. If we don't want to risk these things, then we have a different concept of need. Also, we may

not wish to encounter the suits of balance-of-payments problems that may arise during the next 10 or 15 years. We may possibly experience a war of major proportions within 20 years. Who knows for certain? People are tired of war, and I think they tend to put too little weight on the military risks through increasing imports of strategic goods or raw materials. We need to take a total view of these problems. We need to look at the whole set of national interests, not just economic considerations.

Senator METCALF. Professor Mead?

Dr. MEAD. There is one other thing still hanging from our discussion. I think this is one thing we can all agree on, this matter of the appropriate regime. I fully share Mr. Flipse's point of view, that he can't go out in the deep ocean and begin to recover manganese until it is certain that his position will be protected. This has got to be resolved, relatively soon, and the Geneva Convention does provide an answer.

I would be inclined to suggest to Congress, or whoever is required to give the entrepreneur the assurance that he needs, that his position will be protected. He obviously is not going to move before he knows that. He would be crazy to do so.

Another thing that is closely related to it. If we expect a man to sink his millions of dollars in a marine venture, we have to make all the rules as clear as possible. We can't set up a leasing arrangement which leaves a contingent sale which says, "If you happen to make a profit, we are going to raise the royalty on you."

These things should be specified and absolutely clear and fixed, so that he can make his investment, make his bid for a bonus, if that is what we are going to do, and to the degree that we leave uncertainty there, he will be forced to reduce the amount of the bonus that he will bid.

We therefore, the public, are paying for uncertainty, and we ought not to leave any. This would facilitate production.

Senator METCALF. I think this question of regime is bothering us all. I hope that sometimes before these hearings are over, we will have some definitive statement from the administration as to whether or not we are going to be committed as far as the foreign policy of this Nation, into a wide, or narrow shelf, or something of that sort. They are as torn down there as we are up here, the State Department, the Department of Defense, the Department of Interior, and I was interested—I forgot which one of you suggested it—that the regime be the same for the water pilot, the 12-mile limit, and the high seas, or did I misunderstand you?

Mr. FISCHMAN. I think I was the one that made the remarks. What I was trying to say is that whatever the boundary line between national jurisdiction and nonnational jurisdiction, which I think really should be international, that that boundary line might well be brought to apply to recovery of resources of a mineral nature and living resources as well.

Senator METCALF. Would you have the same boundary line for fishing?

Mr. FISCHMAN. Yes, for fishing as for minerals.

Senator METCALF. For right of entry on high seas?

Mr. FISCHMAN. No, not for right of entry.

Senator METCALF. Just for resource recovery?

Mr. FISCHMAN. Yes. I think it is possible to make a distinction between the right of transit—

Senator METCALF. It seems to me to make possible a distinction a recovery of the resources from the seabed and the water column above, too.

Mr. FISCHMAN. It is possible, and yet I think there is merit in bringing these two into line, because we are more and more facing the same kinds of problems and conflicts with respect to finding that we are, obviously, in these relationships.

Let me state my own understanding. I don't pretend to be an expert.

Senator METCALF. Yes. I am just trying to get information.

Mr. FISCHMAN. I believe that the terms of the extension of the exclusive fishing rights were such as to leave untouched the 3-mile territorial limit as far as sovereignty is concerned. What we really agreed to and proclaimed was a 12-mile exclusive fishing zone, so that you have free transit in international waters for every other purpose other than fishing.

Beyond the Geneva Convention demarcation, whatever it may be, presumably the high seas are now accessible for any purpose to anybody.

Dr. SPANGLER. There is one further aspect with regard to fishery resources. Shellfish, lobsters and sedentary organisms on the sea floor are regarded in the same category as mineral resources with regard to the convention on seabed resources. Russia harvests certain of these kinds of fishery resources off the coast of Alaska beyond the 12-mile limit with some kind of an agreement with our State Department. But it is a temporary agreement and can be changed.

Senator METCALF. We are going to have the State Department up here, and we will ask them those questions.

Does anybody else have any comments?

I think this has been a most fruitful hearing. Several of these panels have been helpful in that they have brought about discussion, and this has been one of the better ones. I am grateful to all of you for participating in a frank discussion, and I hope that as a result of this series of hearings there will be some information about the complexity of this problem. This is something that is going to get more and more complex and grow more and more a part of the political and economic life of this country.

The International Parliamentary Conference in New Delhi last year set oceanography and law of the seas, set it down as one of the questions that would be of importance to the parliamentarians in the future. There is also the matter concerning the United Nations, and we are already troubled by the ambiguities of international decisions in the Geneva Convention.

I don't think that any of us can shrug this thing off and say it is going to go away, because it is going to be an increasing problem, and this kind of discussion, I think, has helped us in our understanding.

The transcript of this hearing will be provided to each of you for editing. We would appreciate it if you would return the edited transcript as soon as possible so we can go to the printer.

If you have any supplemental material that you think might be of informational value to the committee, or supplement your basic statements, would you please return it along with the transcript, and the staff of the subcommittee will decide whether it should be put in the file or be incorporated in the printed record.

NATIONAL PLANNING ASSOCIATION,
CENTER FOR TECHNO-ECONOMIC STUDIES,
Washington, D.C., April 30, 1970.

Mr. JERRY T. VERKLER,
Staff Director, Committee on Interior and Insular Affairs,
U.S. Senate, Washington, D.C.

DEAR MR. VERKLER: In the way of supplemental materials as requested on p. 351, I would request that my published report of the study sponsored jointly by the National Science Foundation and Marine Sciences Council be included because of its relevancy to new Federal programs and regulations. Its title and availability is as follows:

A Preliminary Review of Alternative Federal Measures of Encouraging Private Investment Enterprise in Marine Resource Development (Springfield, Va.: Clearinghouse for Federal Scientific and Technical Information, May 1968).

It was a pleasure and an honor to have participated in these hearings and I certainly commend the objectives of the Subcommittee on the Outer Continental Shelf.

Sincerely yours,

MILLER B. SPANGLER, *Director.*

(The material referred to in the letter was retained in the committee files.)

Dr. SPANGLER. I have an article from the Wall Street Journal of Friday, March 27, that I wish to include in the record.

(The article referred to follows:)

[From the Wall Street Journal, Friday, Mar. 27, 1970]

SHARING THE WEALTH—NIXON IS URGED TO YIELD SOME OCEAN-FLOOR OIL TO HELP WORLD'S POOR—AIDES SAY RIGHTS SOME MILES OUT SHOULD GO TO THE U.N.; OILMEN REACTING ANGRILY—ASKING OTHERS TO JOIN IN

(By Jerry Landauer)

WASHINGTON.—In greatest secrecy, influential counselors are urging Richard Nixon to renounce American rights to billions of dollars worth of offshore oil far out under the Atlantic, the Pacific and the Gulf of Mexico—and to deed it to the United Nations for the benefit of needy people.

This is not a visionary scheme of idle dreamers. On the contrary, the advocates include ranking Defense Department civilians and at least a dozen admirals and generals, most likely all the way up to Army Gen. Earle G. Wheeler, Chairman of the Joint Chiefs of Staff.

The oil these men want the President to relinquish lies beyond a line averaging 25 to 35 miles offshore. Some of it can be recovered by existing drilling technology. Much, much more—perhaps as much as \$10 billion worth—lies under deeper water and is not yet accessible.

Oilmen getting wind of the proposal are furious. Industry wants the Chief Executive to claim all the deep-sea oil exclusively for the U.S. and swiftly. Delay "risks our vital national interests and security," according to the National Petroleum Council, an official Government advisory group.

TELLING THE WORLD

No decision has been made, but any Presidential offer to yield up these untold riches for global uplift would be made in dramatic fashion. Probably Mr. Nixon would address the world, inviting nations to a UN conference at which details would be negotiated. Other coastal countries would be expected to renounce their own mineral rights to proportionate blocks of ocean bottom and to join the U.S. in a treaty disowning territorial ambitions underwater. If too many refuse, there would be no deal; also, such a treaty would require Senate ratification.

Seeming magnanimity by any great power is never entirely divorced from self-interest, of course. In making his bold offer, Mr. Nixon would, in turn, expect certain other nations to be satisfied with "territorial" seas of only modest extent. The goal: To preserve maximum freedom of the sea for our commerce and our Navy.

A territorial sea is a legal concept, a belt of water demarcated not by marks on a map but simply by a nation's appetite. The coastal country's claim of sovereignty over its neighboring sea extends to the air space above and the resources below.

A second legal concept—"continental shelf"—is involved in the Nixon deliberations. A 1958 international convention in Geneva granted coastal countries sovereign rights offshore for the sole purpose of hunting for and digging up minerals, most importantly oil. These exclusive rights reach seaward at least to where the water is 200 meters (about 650 feet) deep and at most to where the depth of water "admits of the exploitation of the natural resources"—so long as the mineral-digging or oil-drilling remains "adjacent" to the coast.

DIVIDING INTO CAMPS

Essentially, the world divides into two major camps: Those nations (largely the maritime trading powers) seeking to inhibit the expansion of territorial seas, and those nations seeking "broad" continental shelves because entrepreneurs or commissars see profit or personal advancement in endeavors far offshore. Mr. Nixon must also keep in mind demands from a third category—landlocked nations, mostly young and often poor, claiming loudly that it isn't fair for coastal countries to hog all offshore wealth.

The U.S. is in both major camps, which explains why the Chief Executive hears inconsistent urgings. America is a naval-maritime power with interests requiring maximum mobility; these interests are served by averting expansion of the territorial seas. The U.S. is also by far the world's biggest oil consumer, and offshore drilling now accounts for more than 12% of all U.S. oil production; these interests are served by broadening the continental shelves.

So far no President has found it necessary to make a clear choice. Mostly the Government has ignored the doctrinal conflict. While U.S. diplomats try to discourage other nations from claiming the oceans (the State Department withholds recognition of territorial seas beyond three miles), American businessmen reach expansively for the ocean floor (the Interior Department lets oilmen drill as far as 88 miles from the Louisiana shore).

A GLOBAL ISSUE

The basic conflict—narrow territorial sea vs. broad continental shelf—is arising around the globe.

In recent years, as American oil explorers moved ever outward unhindered by any legal barrier except Geneva's "adjacency" provision, nations having no offshore minerals to claim seized the seas (and fish) instead. Already 66 claim territorial seas exceeding three miles, once the traditional limit, and 12 claim 200 miles. But Brazil joined the 200-mile bandwagon just this week, leaving only the U.S.—and Castro's Communist Cuba—as upholders of the three-mile limit among Western Hemisphere countries.

Island nations (the Philippines, Indonesia) took a different tack, wrapping themselves in what had been free high seas and calling the result "inland waters." The government of Canada, seeking to satisfy growing nationalism among its citizenry, may join the trend by formally proclaiming sovereignty over the vast waters of the whole Arctic archipelago.

Further, Ottawa is known to be contemplating a new doctrine: The right to enforce pollution rules over a wide expanse of ocean. From there it takes little imagination for some other state to establish non-nuclear zones far from shore—and even the right to inspect U.S. Navy atomic-powered ships, on grounds of protecting the population against fallout danger.

In whatever guise it's done, all this grabbing obviously inhibits the naval-maritime powers, primarily the U.S. Indeed, Defense Department concern publicly expressed about "growing anarchy in the law of the seas" actually reflects private worry about the Navy's legal right to sail strategic straits. Our acceptance of national claims to broad territorial seas without receiving rights to navigate narrower straits at any time, the Pentagon said last month, "would involve fundamental and far-reaching consequences adversely affecting security."

Theoretically, international law lets foreign ships traverse territorial seas, so long as they steam on "innocent passage"—in a manner "not prejudicial to the peace, good order or security of the coastal state." But the meaning of these words obviously hinges on how the two governments are getting along. Significantly, although the State Department says the U.S. doesn't recognize anybody's territorial seas beyond three miles, the Navy seems invariably to refrain from going any closer to a foreign coast than the limit that country prescribes. The spy ship *Pueblo*, for example, was trying to stay outside North Korea's 12-mile limit when she was captured in January of 1968.

Pentagon interest in stopping grabs for the sea explains why generals and admirals urgently want the Commander-in-Chief to resolve the conflict of a narrow territorial water vs. broad claims. Naturally, the Pentagon-backed plan pending at the White House emphasizes the strategic arguments for a Nixon nod to limited claims for territorial seas—a course that would surely anger his many Republican friends in the oil industry.

Maintaining free seas also suggests why otherwise conservative military men might support national renouncing of billion-barrel oil deposits to a UN-sponsored "resources authority." Their hope: If the vast ocean resources belong to scores of little nations, troublemakers among them won't so readily seek bigger territorial seas that convey legal rights to minerals beneath. For instead of asserting claims injurious only to a relatively few big powers, the grabbers would really be robbing the whole international community.

The oil industry wants to keep marching outward, claiming that "adjacency" to the coast, as defined in Geneva, permits exploitation of natural resources on the geological continental "shelf," on the continental "slope" and on the continental "rise," where the submerged land mass meets the ocean floor. This applies, say the oilmen, "irrespective of depth of water or distance from shore." On the average, the "rise" is 100 miles out and the water depth is 2,500 to 5,000 meters (8,205 to 16,410 feet).

The Interior Department essentially supports industry though not to the extent of seeking a Nixon proclamation extending national sovereignty over oil to the farthest distance allowed by international law. Apparently Secretary Walter Hickel will let oilmen move outward as far as drilling techniques allow; his stance amounts to annexation by technological conquest rather than by Presidential proclamation.

Interior's support can be important, even on the diplomatic front. Late last year Hickel men helped persuade the State Department to oppose (in vain, it turned out) a UN General Assembly resolution calling for a moratorium on mineral-digging that isn't plainly within a coastal nation's jurisdiction. Little countries pushed the resolution, fearing that galloping technology is moving out so far so fast that soon all the sea-floor riches will be spoken for.

Now State seeks to soothe this fear and to make a generous gesture to poor nations—and yet avoid stirring too much domestic fuss. It proposes an "intermediate zone" stretching from the Geneva 200-meter depth limit to the edge of the continental "margin"—a term collectively embracing the shelf, slope and rise. The coastal country would manage the zone resources, leasing plots on the ocean floor to entrepreneurs. A percentage of the leasing royalties would flow into a multinational pot for sharing.

Senator METCALF. For the information of those here, this subcommittee now plans to turn to those Federal departments involved in the legal and policy aspects of the Continental Shelf and deep sea-bed areas.

Our present plan is to lead off with the Interior Department, to be followed after approximately 1 hour by the Department of Defense, on next Wednesday, April 8.

On Wednesday, April 22, we will call witnesses from the Department of Transportation, the Department of Commerce, and from the scientific community; namely, the National Science Foundation.

On Wednesday, April 29, it is our present plan to hear spokesmen for the Treasury Department, and finally the Department of State.

In May we will ask for suggestions from spokesmen for conservations.

It is our present plan to conclude these hearings with one on May 13. To that hearing will be invited the chairmen, or spokesmen for, other congressional committees and subcommittees who share our interest in this important and complex subject.

You realize, of course, that this hearing schedule is tentative. We will keep you advised.

Again, I am very grateful for your participation, your appearance here. It has been most worthwhile.

Thank you.

(Subsequent to the hearing, the following papers were submitted by Dr. Mead.)

[From the Amer. Jour. of Ag. Econ., Vol. 50, No. 5, Dec. 1968]

A COST-BENEFIT ANALYSIS OF OCEAN MINERAL RESOURCE DEVELOPMENT: THE CASE OF MANGANESE NODULES

(By Philip E. Sorensen and Walter J. Mead*)

In recent years, both popular magazines and scholarly journals have, in increasing numbers, heralded the imminent opening up of the "inexhaustible treasures of the oceans," leading some investment advisory services to conclude that ocean mining will be "the growth industry of the 1970's." At the same time, committees of the United Nations are studying the implications of ocean mineral exploitation for the underdeveloped nations fearing the impending loss of major export sales and hoping to arrive at a "law of the sea" which protects these nations' presumed "natural right" to a basic inheritance of mankind. Is this optimism justified? And are there externalities connected with these developments of sufficient value that a case can be made for government inducements to growth? The present paper attempts to answer these questions by applying cost-benefit analysis to the most promising untapped ocean mineral resource, manganese nodules.

THE PRESENT STATUS OF MARINE MINERAL RECOVERY

Although the oceans and the lands beneath them are potential sources of all minerals, only oil, natural gas, and sulphur are presently being produced in significant quantity. All other presently exploited ocean minerals, including tin, diamonds, sand, gravel, magnesium, bromide, and gold, represent less than 30 percent of the total value of mineral resources recovered from the ocean in 1964, estimated to be about \$5 billion, one-third of this amount being attributed to U.S. production [6, p. 25]. At present the most important potential ocean mineral resources are phosphorite, a high-grade fertilizer available in great quantities on the continental shelves, and manganese nodules, porous, spherical concretions containing varying quantities of nickel, cobalt, and copper, which are widely distributed on the sea floor.

The relevant geographical areas from which a manganese nodule inventory is legally available for the United States are (1) the territorial waters over which states have jurisdiction, (2) the outer continental shelf beyond the boundaries of state jurisdiction to a depth of 200 meters, and (3) following the wording of the 1958 Geneva Convention on the Continental Shelf, "beyond that limit, to where the depth of the superadjacent waters admits of the exploitation of the natural resources of the said areas." Thus, all areas outside the 200-meter contour are at least potential mining sites if U.S. firms are able to demonstrate an operable production system.

The closest known manganese-iron oxide reserves lie at depths of 350 to 1,000 meters on the Blake Plateau off the southeastern coast of the United States, an area of about 1,800 square miles. These reserves, estimated to total 1.45 billion tons, contain 20.5 percent Mn_2O_3 , 15.8 percent Fe_2O_3 , 0.43 percent nickel, 0.3 per-

*We are engaged in a general study of the economics of ocean mineral resource development. We gratefully acknowledge the research support of the John Randolph Haynes and Dora Haynes Foundation. (Philip E. Sorensen is assistant professor of economics and Walter J. Mead is professor of economics, both at the University of California, Santa Barbara.)

cent cobalt, and 0.13 percent copper [10, p. 49]. All of these concentrations compare unfavorably in ore grade with available land deposits or with Pacific Ocean nodules. Reserves of manganese nodules in the Pacific have been estimated to be as great as 1.7 trillion tons [12, p. 175]. Their average composition is estimated to be 24.2 percent manganese, 14.0 percent iron, 1.0 percent nickel, 0.35 percent cobalt, and 0.53 percent copper [12, p. 180]. The enrichment of the nodules with trace minerals is a function of depth, however, and those deposits of economic importance may be expected to lie at depths of from 12,000 to 18,000 feet.

SUPPLY AND DEMAND CONDITIONS

The recovery and processing of manganese nodules will result in significant output of manganese ore, cobalt, nickel, and copper. The principal use of manganese is in steel production to counteract the effect of sulphur and to impart various qualities of strength and hardness. Known world reserves (about 2 billion tons) are large relative to annual consumption of 16 million tons. Since 1964, the price of manganese ore has doubled from \$30 to about \$60 per ton in recent quotations. Since the demand for the ore is derived from the demand for steel, and since "there is no satisfactory substitute for manganese in the major metallurgical uses and manganese as a metal has no uses of its own" [5, p. 570], the demand should be highly inelastic.

Cobalt has a wide application in the making of high-strength steel alloys. World production averages about 15,000 tons per year, one-third of which is consumed in the United States. Known reserves are over 3 million tons. Prices have trended downward from \$2.60 per pound in 1955 to \$1.87 in 1967. Although its own price elasticity of demand may be close to one, the fact that its uses substantially overlap those of nickel means that any joint decline in prices following manganese nodule recovery would result in a smaller increment in quantity demanded for either mineral than that estimated by the conventional formula.

Principal uses of nickel are in stainless steel, nickel platings, nickel alloys, and steel castings. World reserves are plentiful and widely distributed, totaling 70 million tons as compared to annual consumption of 400,000 tons, 45 percent of which is U.S. consumption.

Despite adequate reserves, the rapid growth in world demand for nickel since 1964 has resulted in shortages which have pushed prices from about 70¢ per pound in the decade before 1965 to 94¢ in 1968. A tight supply situation is expected to continue through 1970, but major new production facilities are now under construction, and these, together with continuing substitution of other metals for nickel in stainless steel, contribute to an expectation of stable or falling nickel prices after 1970.

Copper's major use is in the transmission of electricity, other uses being plumbing, automobile and home appliance manufacturing, and decorative and architectural applications. World copper production is expected to reach almost 7 million tons in 1968, of which the United States will consume some 30 percent. Estimated reserves of copper (270 million tons) are adequate, even in relation to the increased consumption levels expected in the next decades. The combination of a prolonged labor dispute in the United States and high military demand have caused extraordinary recent price increases for copper in free metal markets of the world. The present copper price (42¢) is not expected to persist beyond early 1969, however, because of excess stocks of copper scrap and loss of some part of the copper market to aluminum and plastics as a result of the strike. Technological advances in copper mining and processing have made it possible to mine ores containing as little as 0.3 percent copper in the United States, as compared to the 2-percent figure regarded as marginal fifty years ago [7, p. 62]. All these factors point to long-run stability in copper prices.

PRIVATE COSTS AND REVENUES

In attempting to estimate the private costs and revenues which may be expected in exploiting manganese nodules as a resource, a massive information gap is immediately encountered. At almost every level of the production system, new and unknown processes must be applied, whose costs and operating characteristics can only be speculated upon. What follows, then, is not a listing of known engineering and construction costs for all parts of the system but instead the best available estimates, based upon history and analogy, drawn upon by government agencies and private firms and synthesized by the present writers.

Where conflicts of opinion exist, we have generally sought to use conservative figures for costs at all stages in the total system and have likewise applied a conservative hypothesis concerning demand functions in estimating revenues.

Ignoring exploration costs, there are three connected production systems involved in manganese nodule exploitation: dredging, transportation, and processing. These systems will be described and cost estimates for them given separately. On the basis of the estimated proportions of minerals recovered from gross tonnage processed, a revenue estimate will be derived. The present value of the expected revenues will then be compared to the total investment required.

Dredging

There are no presently operative deep-water dredges; there are, indeed, no final engineering designs for such dredges, despite the profusion of fantasy models illustrated in various publications. As noted earlier, those manganese nodules of economic interest lie at depths of from 12,000 to 18,000 feet. To bring up materials from such depths will require a new hydraulic dredge capable of withstanding tremendous pressures, both from ocean depths and within the water column supplying the pressure differential. At the same time, the dredge line must be reasonably flexible, able to withstand current changes and adjust to the varying topography of the ocean floor. Despite attempts by promoters of ocean mining to explain away these difficulties, it appears that the deep-water dredge will require an order of creative engineering to date unknown in world mining. Attesting to the limits of present technology, a recent survey of available undersea mining equipment noted that suction dredges operate at depths of from 30 to 90 feet "but are being built to operate at depths up to 250 feet" [17, p. 112]. The adjustment of production techniques required to move to 18,000 foot depths is clearly not a simple, continuous function; it is a technological challenge of an entirely different order.

What will it cost to develop and produce a practical deep-sea dredge? Some experts confess that they don't believe such an engineering feat is within the financial capacity of any private firm; some say that a deep-water dredge simply won't operate.¹ Engineers at the Bureau of Mines express the belief that such a dredge could cost as much as \$150 million.² When this figure was put to a managing engineer for one of the world's largest dredge manufacturers, he agreed to it only as a minimum estimate.³ Further evidence of the magnitude of the required investment was given by a speaker at a recent oceanography conference, who used the figure \$200 million as the amount a major mining firm has "agreed to commit" over the next decade in research prototype construction, and final system construction for manganese nodule recovery and processing.⁴ We believe it reasonable to conclude that the capital cost of the deep-water dredge required to recover 5,000 tons of nodules (net dry weight) per day (averaged over 360 days, on the hypothesis of 250 working days per year and 18 hours per working day of operations)⁵ will be \$150 million.⁶

In the absence of design specifications for the deep-sea dredge, operating costs can only be roughly estimated. Welling and Cruickshank note that large conventional dredges already require over 10,000 horsepower [17, p. 113]. We assume that the proposed system, with greater pressure requirements, using an underwater vehicle and possibly carrying a television camera on the ocean floor, would require a minimum of 15,000 horsepower. The power costs alone would then be in the neighborhood of \$1.5 million per year (at 2¢ per operating horsepower hour). Conservatively estimated, additional costs of \$7.5 million in operation and maintenance and \$7.5 million in insurance⁷ would bring the yearly operating costs of the dredge alone to \$16.5 million.

¹ They believe that the nodules will lodge in the joints of a flexible system—that only a vertical dredging column is capable of generating the required lift, and that a "telescoping" vertical column cannot be built to operate in this environment.

² Conversation with M. J. Cruickshank, Marine Minerals Technology Center, Tiburon, California, June 6, 1968.

³ Conversation with K. W. Posselt, Standard Dredging, Inc., New York City, June 24, 1968.

⁴ A confidential confirmation of this figure was given us by a consultant to the project. He agrees with us that only a small part of this amount will be spent unless some major change in conditions of demand or supply takes place.

⁵ Gross tonnage dredged would be much higher; water, sand, and silt would be screened out on the receiving barge. Cf. Webb [16, p. 12], who reports an average gross dredging rate of 2,340 tons per working day at depths of from 35 to 100 feet in sea diamond mining.

⁶ Mero estimates the cost at \$7.2 million [12, p. 270]; Brooks uses a figure of \$100 million, including processing facilities [4, p. 35].

⁷ Transport barges of the type required for the system carry a rate of about 2.5 percent of insured risk per year. Prototype undersea vehicles carry rates of 25 percent and higher, if insurance is available. (Communication from Royal Globe Insurance Company.)

*Transportation*⁸

Transport of manganese nodules will require an almost continuous movement of ore-carrying barges from the point of recovery to processing plants in the United States. The costs of operating this fleet can be more accurately estimated than were dredging costs, though the optimum ship design for this purpose is still unknown. Consideration of a number of alternatives has led us to conclude that the least-cost method of transport for nodules would be a system of barges, pulled by ocean-going tugs, and moving in a continuous cycle to and from the recovery site. Construction costs for the required barge (having an ore-carrying capacity of 10,000 short tons) is about \$550,000. Annual maintenance costs of about 5 percent of original cost and insurance costs of 2.5 percent of insured risk per year could be anticipated. Ocean-going tugs of the type required may be chartered at \$1500 per day, which we regard as a competitive exemplification of the total operating cost of such a vessel. The original mining sites are expected to lie in the South Pacific, some 4,000 nautical miles from the (expected) location of the processing plant (near Los Angeles). The speed of these vessels ranges between 9 and 11 knots. We therefore conclude that a fleet of 18 barges and 16 tugs will be required to complete the 180 round trips associated with one year's operation. A port facility with specially designed off-loading equipment will also be required, the cost of such a facility being about \$5 million, with an annual cost for labor, maintenance, and power required for off-loading of about \$1 million. Summing up, the transportation of manganese nodules will require an investment of \$15 million and annual operating costs of about \$10.5 million.

Processing

Manganese nodules are a true mineralogical phenomenon, and the best energies of a number of outstanding chemists and geologists have been devoted in recent years to unraveling the mysteries of their origin and geochemical properties. There is no way adequately to summarize the difficulties of extracting trace minerals from manganese nodules without entering into some discussion of complex chemical and mineralogical relationships such as oxide phases, lattice structure, and chemical reaction functions. It may be concluded, however, that the difficulties of selective leaching are such that no immediate or simple process of obtaining large proportions of the contained trace minerals from manganese nodules is now known or anticipated. Functional characteristics of the most commonly suggested process of extraction (using an acid leach) are described in detail by Hoover [8, pp. 29-64]. Despite his optimism, the acid leaching process has several apparent drawbacks: the dissolution of copper and nickel from the nodules takes an extraordinary length of time, requires an unacceptable quantity of acid as an input, and results in high cobalt dissolution only where the iron content of the nodule is low (less than 5 percent). The later separation of the cobalt from the nickel in solution, while theoretically possible, appears to be both difficult and expensive. Present indications are that technical and economic factors rule out acid leaching, direct smelting, sulphur dioxide leaching, and other direct reduction methods. A recent intensive study concluded that the most effective extractive method involves a reductive roast-ammonium carbonate leach process.⁹ Using this process, the maximum percentages of contained minerals extracted (depending upon the presence of oxygen) were 75 percent Mn, 78 percent Fe, 85 percent Co, 90 percent Ni, and 10 percent Cu [15, p. 2].¹⁰ The capital cost of a processing plant capable of handling 5,000 tons of manganese nodules per day is estimated (in this same study) to be \$50 million. The estimated variable cost of processing nodules using this system is \$30 per ton, although the figure could fall as low as \$25 per ton in the future, as we have assumed in the cost calculations below.¹¹

⁸ This section was written with the assistance of J. R. Paulling, Professor of Naval Architecture, University of California, Berkeley.

⁹ The study [15] was made at the Bureau of Mines Metallurgy Research Center in Salt Lake City. Further conclusions of the study have been reported to us by Mr. L. Schack, director of this research.

¹⁰ We have employed even larger recovery percentages in our revenue estimates, accounting for possible increases in efficiency: 85 percent for Mn and Fe, 90 percent for Co, 95 percent for Ni, and 20 percent for Cu.

¹¹ This is also the figure used by Mero [12, p. 272].

TABLE 1.—EXPECTED CHANGE IN PRICES OF MINERALS AS A RESULT OF INCREASED SUPPLIES FROM MARINE RECOVERY OF MANGANESE NODULES

Mineral	Present world output (thousand tons)	Increase in world output (thousand tons)	Percentage increase in output	Percentage decline in price, assuming unitary elasticity of demand ¹
Manganese ore	18,000	585.00	3.25	3.13
Nickel	450	17.10	3.80	3.67
Cobalt	15	5.67	37.80	27.43
Copper	7,000	1.90	(2)	(2)

¹ The actual elasticities, we believe, would be lower; the assumption of unitary elasticity is made for purposes of comparison only.

² Negligible.

Employing the accepted estimate of the average proportions of contained minerals,¹² a plant processing 5,000 tons of manganese nodules daily (or 1,800,000 tons yearly) and recovering maximum percentages of the contained minerals would recover 585,000 tons of manganese-iron ore, 17,100 tons of nickel, 5,760 tons of cobalt, and 1,908 tons of copper.

If the present prices of these minerals are used as estimates of future prices, the annual gross revenue generated by the system is about \$90 million. Yearly operating costs (combining the estimates developed above for the three phases of the system) total \$72 million. Discounted at 6 percent, the present value of net operating revenue is about \$99 million, as compared to a capital cost (discounted to allow for a five-year development period) of \$175 million.¹³

When account is taken of the expected change in prices brought about by the increased supplies made available, the outlook is blacker still. In Table 1, current world production of the relevant minerals is compared with incremental outputs, and the proportions are then used to predict the percentage decline in market price which would occur if price elasticities of demand are assumed to be unitary for all outputs.

At these more realistic price levels, total revenue would fall to about \$81.6 million, the present discounted value of net revenue (at 6 percent) falls to \$53 million, and the prospective capital loss becomes \$122 million. At any higher rate of discount (which would approximate the degree of risk involved), the loss would obviously be greater still.

SOCIAL COSTS AND BENEFITS

Given this dismal outlook for profits in mining manganese nodules, why does the prospect continue to excite interest among a number of major American firms? We believe that there are two explanations. First, mining companies must, for defensive reasons, engage in sufficient individual research to assure themselves full knowledge of the economic potential of marine minerals which could eventually destroy their present markets [13, p. 182]. And second, it is widely believed that the United States (or even some foreign governments) may, in the near future, be willing to underwrite all or most of the basic exploration and prototype construction required for marine mining. Many firms are willing to enter the field under these circumstances and are presently preparing their credentials.

The likelihood of federal assistance to undersea mining in the explicit form now hoped for depends upon a number of political or international exigencies, but from a purely economic point of view should be based solely upon an evaluation of the social rate of return which might be expected on the investment involved. In a recent study [11, pp. 11-14], we have attempted to identify and give some order of magnitude to the major external costs and benefits associated with marine mining generally. For the specific case of manganese nodules, the principal external cost is likely to be associated with disposal of detrital materials in the ore beneficiation process at sea, which could have a

¹² For example, 24.2 percent Mn, 14.0 percent Fe, 0.99 percent Ni, 0.35 percent Co, and 0.53 percent Cu [12, p. 180].

¹³ An appendix giving details of these calculations is available from the authors upon request.

major effect on the ecology of the area. The great distance of anticipated mining sites from inhabited areas obviates the additional forms of environmental pollution which would be observed in near-shore mining. Problems of disposal of wastes from processing plants on land and navigational hazards attributable to the mining and transport of the nodules are not unique to this industry, and recreation site destruction is unlikely so long as processing facilities are located in industrial areas. Thus, external costs peculiar to the contemplated system appear to be negligible.

There are, however, some significant external benefits: (1) pure research benefits flowing from enhanced knowledge of the ocean floor, (2) national defense benefits connected with increased engineering capability in the underwater environment and improved knowledge of undersea geology, and (3) technological spillovers, affecting follower firms in the same industry as well as firms in other industries.

The most important of the listed benefits is likely to be technological spillover effects. A new industry, employing radically different or complex technology, will experience a fall in production costs as it matures, both through physical improvements in the capital used and through greater understanding of the production process. For example, the deflated cost of producing rayon declined from about \$1.15 per pound in 1930 to \$0.58 in 1940 and to \$0.38 in 1950 [11, p. 14]. The cost of sea water desalination by various methods declined from an estimated \$10 per 1,000 gallons in 1960 to \$1.15 in 1963, \$0.80 in 1965, and \$0.50 in 1968 [14, pp. 1, 16]. Nuclear power generating costs have similarly declined from about 50 mills per kwh in 1958, to 6.2 mills in 1962, and to 4.4 mills in 1964, a cost improvement for the most part attributable to the construction of larger generating units [2, p. 20; 3, p. 21]. Cost reductions flowing from rapidly changing technology are distinct from and in addition to what has been called the "learning curve," a reflection of increased operating efficiencies as workers accumulate experience in handling a new process in the context of a nearly constant technology [1, p. 87].

Some increase in the efficiency of transporting and processing manganese nodules attributable to both of these causes may be expected (and for the processing phase are allowed for in the cost estimates given above), but any dramatic improvements will likely occur in the manufacture and operation of the deep-water dredge. Second-generation dredges, engineered in the light of experience gained by the pioneering firm, may produce much higher recovery levels. It is impossible for such benefits to be completely internalized by patent protection, for neither knowledge diffusion nor imitative art can long be controlled. So it will pay to wait, to be the second or third firm in the industry. And, in time, firms in other industries which now use conventional dredges will similarly enjoy the benefits of a perfected technology for whose development they have not paid.

Thus the question is posed: Are the external benefits of deep-water mining sufficient that a reasonable case can be made for direct federal assistance? The analysis in our section on the present status of marine mineral recovery indicates that, under optimistic assumptions concerning demand elasticities and discount rates on expected net revenues, a manganese nodule mining system would, at present, result in massive capital losses. Furthermore, we see little cause for optimism that the prospect for profitability will improve in the next decade. The existence of large, untapped land-based reserves of all the contained minerals, together with continuing improvements in the technology of extraction and processing, make it unlikely that conditions of supply will force general price increases. Any revolutionary breakthrough in techniques of processing manganese nodules would immediately open up vast new reserves of low-grade ores on land, obviating the need for ocean mining. And there is no reason to assume that the estimated pioneering costs of a deep-water dredging system will fall in the future.

It is difficult to place values on the major external benefits of the system—technological spillovers to other industries, pure research benefits, and national defense benefits; but these values would not, in our opinion, equal the present cost to society of the investment required. We conclude that there is not, at the present time, a sufficient prospect of private or public reward for any major investment in manganese nodule exploitation to be economically justifiable. Continued defensive maneuvering by interested firms and widespread publicity which even now threatens ocean mining with "promotional overkill" should not distract us from recognition of cold, economic logic.

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[From the Marine Technology Society, *The Decade Ahead, 1970-1980*, 1969, Washington D.C.]

A NEW ECONOMIC APPRAISAL OF MARINE PHOSPHORITE DEPOSITS OFF THE
CALIFORNIA COAST

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ABSTRACT

The assumption that an ocean mineral "bonanza" in the form of marine phosphorite lies open to exploitation off the coast of California is seriously disputed in this paper. Analysis of (1) the limited market for phosphates on the West Coast; (2) the costs of mining, beneficiating and transporting marine phosphorite; (3) the massive size of competitive landbased reserves and produc-

*The authors are currently engaged in a general study of the economics of ocean mineral resource development. Research support provided by the John Randolph Haynes and Dora Haynes Foundation is gratefully acknowledged.

tion capacities; and (4) the absence of any net social benefit connected with phosphorite; (3) the massive size of competitive land-based reserves and productive phosphorite mining which might justify federal subsidization of initial ventures in the area leads us to conclude that the off-shore California phosphorite deposits will not be economic to mine in the foreseeable future.

INTRODUCTION

This paper will attempt to estimate the present and potential economic significance of the marine phosphorite deposits lying off the coast of Southern California. For reasons that will be made clear in what follows, we have not made any detailed investigation of other marine phosphorite sites, such as the continental shelf areas off Florida, Baja California or Australia, although these areas are known to be potential sources of marine phosphorite from geological surveys. We believe that technological and economic factors point to non-U.S. sites as having the greatest immediate economic potential. Until these foreign sources come into production and yield positive economic results, the Southern California sites must be considered sub-marginal given the present structure of markets and competing sources. We recognize that the immediate availability of marine phosphorite deposits so near to California markets has stimulated considerable interest in their profit potential. Our paper will evaluate the findings of other investigators and will present a new set of conclusions based upon both private and social costs and revenues (or benefits).

The widely accepted estimate given by Emery [8, p. 319] that some one billion tons of phosphorite is deposited off the coast of Southern California explains the interest in mining this resource. The most attractive deposits are those located at reasonably accessible depths (up to 1000 feet) and in required concentrations (a minimum of five pounds per square foot). It has been assumed that these marine phosphorite deposits might be competitive with present sources in Florida, Idaho, Wyoming and Utah. Whether or not they are economically feasible to mine depends upon five considerations:

- (1) The size of the market open for penetration and the expected market price.
 - (2) The technical cost of dredging, beneficiating and transporting marine phosphorite.
 - (3) The risk premium required in offshore operations.
 - (4) The *in situ* resource cost; i.e., the policy of state and federal governments in respect to lease arrangements.
 - (5) The likelihood of any tax subsidies from state or federal governments.
- In the sections which follow, each of these points will be explored.

CURRENT AND PROSPECTIVE MARKETS

The current demand for phosphate rock in California is variously estimated at from 350,000 to 450,000 tons annually. Adopting 500,000 tons as an optimistic figure and compounding at the predicted market growth rate of 6% per year, the total demand for phosphate rock in California will double by 1980 and reach 3 million tons annually by the end of the century. But even this dramatic growth will present a minor challenge to present suppliers. The estimated reserves of phosphate rock in the United States exceed 7 billion tons; "potential reserves" inferred from geological data, are estimated at an additional 49 billion tons in the U.S. alone [15, p. 704].¹ One calculation has shown that, assuming a rate of population growth equal to past trends (7.4 billion world population in the year 2000) and projecting present rates of increase in phosphate rock consumption to that date, aggregate world consumption of phosphate rock, from 1966 through 2000 A.D., will equal only 7.6 billion tons [12, p. 60]. By no stretch of the imagination can marine phosphorite be considered a strategic reserve commodity.

California presently imports all its phosphate rock from Florida and the Western states. Should phosphorite become available from offshore sites, it would not completely displace these current sources, even if lower prices were offered, for the reason that a major share of the imported rock is processed by firms either vertically integrated to the mines or tied to Florida producers by long-term contracts. Earlier studies of the market for California phosphorite have stressed the potential for exports to Japan and the South Pacific [25, pp. 160-167]. These exports (currently about 2.5 million tons per year to Japan and

¹ Potential land-based world reserves are over 150 billion tons, *op. cit.*

Asia) would be an attractive incentive to potential investors if delivered prices from Florida could be undercut. Nevertheless, the long-run outlook for these export sales cannot be considered bright, we believe, because whatever improvements and demonstrations of working production systems occur in operations off the Southern California coast must surely be transferable to the equally rich resource sites off the coasts of Australia or India, and these sources will then undersell California producers through savings in transport costs alone, ignoring other possible savings. The long-run prospect, then, is that California phosphorite can command only a portion of the limited West Coast market, sharing that market with fertilizer and chemical processors whose captive mines in Florida will, in all likelihood, continue to operate.

COSTS OF PRODUCTION

There were widely diverse estimates of the cost of dredging marine phosphorite, Mero's 1960 estimate of \$4.50 per ton [20, p. 53] has encouraged great interest in the economic potential of these resources.² Hess, for example, has adopted Mero's prediction [13, p. 88]. Overall's recent study [22, p. 62] adopts Mero's \$4.50 figure for mining costs as a working hypothesis, concluding that the indicated spread between this figure and a maximum permissible figure for "mining, washing, drying and grinding costs" of \$8.26 leaves open the possibility of a profitable California operation involving exports to Japan. Estimating on the basis of 600 foot dredging depths, Isard and Choquill concluded that the cost per ton mined would be \$11.69 [14, p. 7], much closer to Mero's estimate of the costs of recovering manganese nodules at 1000 foot depths also using a drag dredge (between \$11.50 and \$12.10 per ton) [19, p. 257]. Translating the cost projections given by Davis and McKay [7, p. 69] for bucket line dredges operating at 200 foot depths and recovering 100 cubic yards (75 short tons) of materials per hour (or 1200 short tons per operating day, which could be then beneficiated to yield about 600 tons per day of nodules) we deduce that the capital costs of the required dredge would be approximately \$8,000,000; the direct cost per short ton of materials dredged would be \$1.00 (or \$2.00 per ton of nodules). Maintenance costs of the dredge are included in direct costs, though no obsolescence factor is calculated. Assuming the minimum rates of marine insurance are applicable (2.5 percent of insured risk per year), annual insurance costs for the dredge alone would be \$200,000.³ A minimum opportunity cost for the capital invested in the dredge (considering the risk factor) is 10%. The rental cost of the dredge, therefore, would be about \$3500 per operating day. The estimated total costs would then be about \$8.00 per ton of nodules dredged. It should be assumed that the costs of dredging at greater depths (the target depth of most surveys is 600 feet) would be higher. Consideration of this figure and the estimates earlier cited leads us to conclude that the cost of dredging phosphorite nodules is likely to range between \$10 and \$12 per short ton, at an annual production rate of 180,000 tons.

Earlier studies have assumed that marine phosphorite can be upgraded to the required 31% P_2O_5 concentration by simple calcination. The cost of this process, depending on the richness of the original nodules, would range between \$1 and \$2 per ton. Indications are, however, that marine phosphorite contains excessive quantities of iron oxides and other impurities which limit the potential uses of the phosphorite and reduce its market value, irrespective of P_2O_5 content. To submit the phosphorite to the necessary chemical process of upgrading—presumably involving an acid leach—would add an unknown but considerable cost to the product.⁴ It must be assumed that a product comparable to current land-based phosphatic rock can be derived from marine phosphorite only at an additional beneficiation and processing cost of from \$2 to \$5 per ton.

Our estimate of the costs of transporting nodules from the mining site to the port of Los Angeles (between 100 and 200 miles, RT) is adapted from a recent study by Miller of the economics of bulk carrier operations (21, pp. 277-287). That study was designed to point out the general economic desirability of barges versus ships. Annual transport costs for dry bulk carrying barges on a coastwise service whose RT operating route was 850 miles long, were estimated to be \$1.33 per short ton at a minimum [21, p. 280]. Inference from

² Mero earlier set mining costs at "\$4-7 per ton depending on the depth of dredging and the mining method used" [19, p. 72].

³ Communication from Royal Globe Insurance Company.

⁴ Leaching would cost a minimum of \$5 per ton according to one University chemist.

Miller's table of annual transport costs as a function of various distances [21, p. 280] leads us to conclude that the similarly computed costs for a RT distance of 200 miles would be 70¢ per short ton. Miller's estimates do not include overhead, depreciation, taxes, loading or unloading costs and apply to a relatively large (780,000) total yearly tonnage, thus including some economies of scale not anticipated in a marine phosphorite venture. We believe it is reasonable to assume that transport costs alone will be approximately \$1.00 per ton minimum.

A separate docking and unloading expense has not been included in previous studies of marine phosphorite. This cost is by no means negligible. It is possible to off-load bulk cargoes using automatic machinery, as in the Great Lakes iron ore transport, but this presumes tremendous volume—not a possibility in the case of phosphorite. Inquiries to shipping agents and harbor department officials have produced varying estimates for unloading costs depending on barge size, contract period, frequency of unloading, and other variables. The harbor fee alone (collected by the City of Los Angeles) is 45¢ per ton. The costs for unloading run from \$1 to \$2 per ton. Since there may be possible modifications of the barges used in the operation which will simplify unloading, we have estimated the cost of this phase of the operation to be from \$1.00 to \$2.00 per ton. Our estimated total transport costs (including off-loading) of \$2-\$3 per ton may appear high in relation to the cost of transporting phosphate rock from Florida (about \$5.00 per ton). The latter figure is made possible, however, only by backhauls of rice and other commodities from California to Florida, and the phosphate shipments, therefore, carry only about half of the RT costs.

OPPORTUNITY COSTS AND RISK FACTORS

It is not commonly recognized that the attractiveness of any potential investment in marine phosphorite recovery cannot be determined on the basis of *absolute* expected profits independently of (a) "opportunity costs," facing the individual firm; and (f) the *range* of statistical distribution of possible profits. Potential operators will first consider alternative investment opportunities in current (known) processes or activities. And if the "maximum likelihood" estimates of profits in a new or untested endeavor exceed rates of return available in known activities, the *variance* of the (expected) distribution of potential profits in the pioneering process will then be considered in reaching an investment decision. Presumably, the greater the variance of the distribution of possible profit outcomes, the higher the risk premium which must be attached to the activity. A look at rates of return currently realized by firms potentially interested in phosphorite gives some indication of minimum levels of return that must be anticipated in marine mining before practical operations take place. Gulf Oil Corporation, for example, realized net income *after* taxes of 13.1% of invested capital in 1967. The comparable (1967) figure for Union Oil was 11.2%; for Lockheed, 15.5%; for Texas Gulf Sulphur, 26.4%. Considering the risk involved in a phosphorite venture from the point of view of both costs and eventual markets, it is not unreasonable to predict that expected net rates of return on investment in marine mining of from 30 to 40 percent will be needed to bring the required capital on line.

LEASE POLICY

Since Southern California phosphorite is found on the continental shelves within the jurisdiction of the federal (and in some cases the state) government, a question arises as to possible payments for leasing rights. No firm will make the major investments required for phosphorite mining in the absence of some clear understanding regarding a legal regime permitting exclusive development and exploitation. The accepted procedure in the case of federally owned resources is to offer leases for sale at public auction. It was in this manner that Collier Carbon and Chemical Company (a subsidiary of Union Oil Company) obtained leases on 30,240 acres of the continental shelf on the Forty Mile Bank off the coast of San Diego. Collier (the only bidder) paid \$4.03 per acre in leasehold bonuses, and entered into active exploration and dredging of the area during 1962 and 1963. The company dredged up several unexploded naval shells remaining from a gunnery range used during World War II and on the discovery that the area was not "clear and mineable," as the lease agreed, was awarded a full refund of the bonus payment by the Bureau of Land Management.

Our conversations with Union Oil Company personnel connected with the Collier experiment (as expected) produced no detailed explanation of Colliers' findings during the pilot operation. This information is regarded as proprietary. However, we did learn that the quality and quantity of nodules dredged were "disappointing" and that dredging in an uncontrolled environment is more difficult and unpredictable than is assumed in any of the known project studies, most of the latter being based upon dredging operations involving such minerals as cassiterite, conducted in sheltered coastal waters.⁵ The presence of the naval shells, while clearly representing a risk, provided (it would appear) a happy pretext for escaping from an uneconomic contract.⁶

The effect of the Collier experience, in the years since 1963, has been dramatic. No further phosphorite leases near California have been requested and neither Union Oil nor any other firm has felt that sufficient economic incentives exist to stimulate development of a successor production system. As one observer recently put it, if any future off-shore phosphorite venture is to succeed, "The various governments involved must provide incentives to the risk takers more liberal than the policies in effect at the time of the Collier Carbon lease" [22, Nov. 1968, p. 52]. Whether or not federal and state governments have sufficient reason for providing incentives to potential phosphorite operations in the form of subsidies or otherwise is the subject of the next section.

EXTERNAL COSTS AND BENEFITS

Given the discouraging outlook for profits in mining marine phosphorite, why does the prospect continue to excite the interest of a number of American firms and private individuals? We believe there are two explanations. First, some companies must, for defensive reasons, engage in sufficient individual research to provide themselves with protective knowledge of resources that could strongly affect their present markets [18, p. 1618]. This "watchful waiting" is typical of competitors on the fringes of a new industry. And second, there is some possibility that the federal government may, at some time in the future, be willing to subsidize initial ventures in marine mining. Many firms would be willing to enter the industry under these circumstances and are presently preparing their credentials.

The likelihood of federal assistance to undersea mining in the explicit form now hoped for depends upon a number of political or international exigencies, but from a purely economic point-of-view should be based upon an evaluation of the net benefit to society, computed in the form of a social rate of return on the investment involved. In a previous study [17, pp. 11-14], we have attempted to identify and give some order of magnitude to the major external costs and benefits likely to be associated with marine mining generally. In the case of phosphorite, the major external cost is likely to be associated with waste disposal at sea, assuming that the phosphorite undergoes initial beneficiation at the dredge head. So serious are the prospective effects on the ecology of near-shore areas as a result of contamination with mine tailings that there is no possibility, given the present "conservation minded" political climate, that the California state government would permit either dredging or waste disposal in waters under its jurisdiction.⁷ The federal government has recently come under widespread criticism for improper control of offshore oil drilling and inability to limit the use of chemicals such as DDT, in both cases leading to damage to many forms of life in the ocean. Any process involving waste disposal (particularly if toxicants are discharged) in federal waters will be scrutinized more closely now than has ever before been anticipated.⁸ It is not without reason that mining firms look upon U.S. controlled waters as the most strictly regulated environment in the world ocean.

⁵ For some reason the environment difficulties experienced by Marine Diamond Corporation in dredging off the coast of South Africa between 1961 and 1965 seem not to be similarly analogous [25, esp. p. 8].

⁶ We have recently been informed by a Union Oil Co. official that Collier was *required* to stop dredging in the area by the U.S. Navy after the shells were discovered. Thus, the bonus payments had to be refunded, and no other leases in the area will be permitted until a determination is made that accidental explosions cannot occur.

⁷ This fact has been confirmed by an active ocean mining firm in a private communication.

⁸ Any doubt concerning the potential ecological damage caused by dredging and attendant waste disposal is dispelled by George Laycock in his article, "Deep in the Mud of Texas," *Audubon*, Nov./Dec. 1968, pp. 98-118.

Other external costs associated with phosphorite mining are less important: increased navigation hazards and noise creation, the latter relevant only to dredging nearer to shore than is presently contemplated.

External benefits are likely to be smaller still, however. In an earlier study [18, pp. 1618-1619] we discussed the significance of technology spillover effects which occur when a new or innovative technology is applied to a basic process and later becomes available (at no cost) to other firms or sectors of the economy. In this situation, a case can be made for subsidy payments to the innovating firm equal to society's net "spillover" benefit. Phosphorite mining is unlikely to involve any major departure from conventional dredging and transport. It is true that beneficiation processes may be developed out of the marine phosphorite experience which will open other land-based phosphorite sources to exploitation which are currently sub-marginal. The irony of this case is that marine phosphorite spillover benefits could then be said to have destroyed their creator. The benefits of such a breakthrough would accrue to the phosphate industry generally, probably including the firm whose marine phosphorite experiments brought about the new techniques. So tenuous is the argument for social subsidy in this case that it would be wise to ignore it in computing the *net* social effect of phosphorite mining. In summary, we find (1) no basis upon which a case for federal subsidization of marine phosphorite production can be built; and (2) sufficient cause for concern over environmental pollution to support strict federal regulation of off-shore dumping of wastes major pollution problems [See 7, pp. 60-61 and 3, pp. 158-59] stands as a warning. It will be difficult to shift this kind of pollution to another site.

SUMMARY

Our survey of expected private costs of Southern California phosphorite production points to the following cost ranges as minimum estimates:

	<i>Per ton</i>
Dredging -----	\$10-\$12
Beneficiating -----	2- 5
Transporting, off-loading -----	2- 3
Land transport (100 miles) -----	1- 2
Total costs -----	15- 22

These figures may be compared to present prices for phosphate rock delivered from Florida or Idaho, varying from \$12 to \$16 per ton, depending upon grade and source [16, p. 32]. Further emphasis of the uneconomic character of the Southern California phosphorite deposits is added when these additional facts are considered:

(1) The phosphate rock industry has in recent years fallen into a serious economic recession brought about by significant increases in domestic production and the opening up of increased capacity throughout the world. In mid-1968, some 15 to 16 million tons of rock (about 48% of that year's output) were in inventory in the U.S. alone [3, p. 158]. By means of shutdowns and curtailments, the industry averted an even greater crisis [11, pp. 66-67]. Despite this unfavorable economic climate, new investments in phosphate rock production facilities added some 7.2 tons per year to U.S. capacity in 1968. Significantly, one project which was terminated in the face of the poor economic outlook for the industry was the development by New Idria Mining and Chemical Company of an 1800 acre phosphate deposit near Bakersfield, California [23, pp. 98-102]. This deposit would presumably enjoy a competitive advantage over marine deposits and would therefore enter production for the California market prior to offshore production.

Omitting the U.S.S.R., present investment projects in other parts of the world will add between 18 and 20 million tons per year to annual capacity in the next three years, and these figures do not include two massive foreign projects: the first involving development of the world's largest phosphate deposits in the Spanish Sahara, which will add (initially) 10 million tons per year to outputs; the second involving continuing investments in projects in Morocco which are designed to add 18 million tons to yearly capacity by 1975 [23, pp. 98-102]. These projects assure fierce competition for American export markets (about 11 million tons in 1968) in the future and do not encourage commitment to the development of offshore phosphorite in so risky a situation as that presented by the California sites.

(2) The Collier experience does not represent the only serious look by operating firms into the feasibility of mining the Southern California phosphorites. International Minerals and Chemical Corporation entered into a joint study venture with Lockheed Aircraft Corporation in the fall of 1963 and spent two years evaluating the business opportunities offered by ocean exploitation. After considerable investigation, including sample dredging, they concluded that the economic prospects for California phosphorite were negative. Global Marine, Inc., has also explored these sites and reached a similar negative conclusion concerning their present value.

(3) Our cost estimates (above) have not included allowance for exploration and leasing costs, royalties, or taxes. If open sea disposal of dredging wastes is not permitted, our cost figures for transportation and unloading would have to be doubled and an additional cost added for on-land disposal of waste materials. Considering the costs of comparable by-product disposal in the Florida operations, this expense together with the other added costs would push the delivered cost of phosphate from these off-shore sites above \$20 a ton (minimum).

(4) In spite of many programs by government agencies and private firms to accomplish exhaustive sea-floor sampling, we know very little about the quality and quantity of phosphorite lying off our coast. Resource delineation is an expensive, painstaking process. There has been too little coordination of exploration and research activities. For example, some published and widely-quoted figures concerning P_2O_5 content in dredged samples from various sites off the California coast were later found to be exaggerations for the simple reason that surface areas of the samples alone were tested and these contained the highest concentrations of the desired compound. Recent extensive sampling by scientists from the U.S. Bureau of Mines on the Coronado Bank, in contrast to earlier findings, revealed the surprising results that 85% of the sand ran less than 1% P_2O_5 (upgradable to 4% by screening) and that the average P_2O_5 content of all materials dredged was only 3.29%.^{*} While the character of all potential California mining sites is not called directly into question by these findings, the fact remains that there is not sufficient evidence of deposit quality and quantity presently available upon which to base the major investments required for ocean mining.

Thus it appears that development of marine phosphorite off the California coast is not presently economically feasible and may not be so within the present century. We await the results of pilot operations involving the phosphatic sands off the West Coast of Baja California funded by the government of Mexico. We know of disappointing experiments in dredging phosphorite off the coast of Australia, but at the same time we are privately informed of a "surprisingly" rich deposit of phosphatic mud off the West Coast of South America for the development of which a major oil company has obtained leases and is conducting extensive physical and chemical (beneficiation) studies. We believe that marine phosphorites will come into production in the next decade, but not off the U.S. coast and not in amounts sufficient to significantly affect the world market for land-based phosphates.

In respect to this and other heralded ocean mineral "bonanzas," we would repeat these words of caution: "During the past decade the layman has 'discovered' the ocean. His view of it as an enormous source of food, minerals and energy for future generations has been colored by exaggerated claims based on enthusiasm or commercial interest rather than on scientific inquiry" [10, p. 95].

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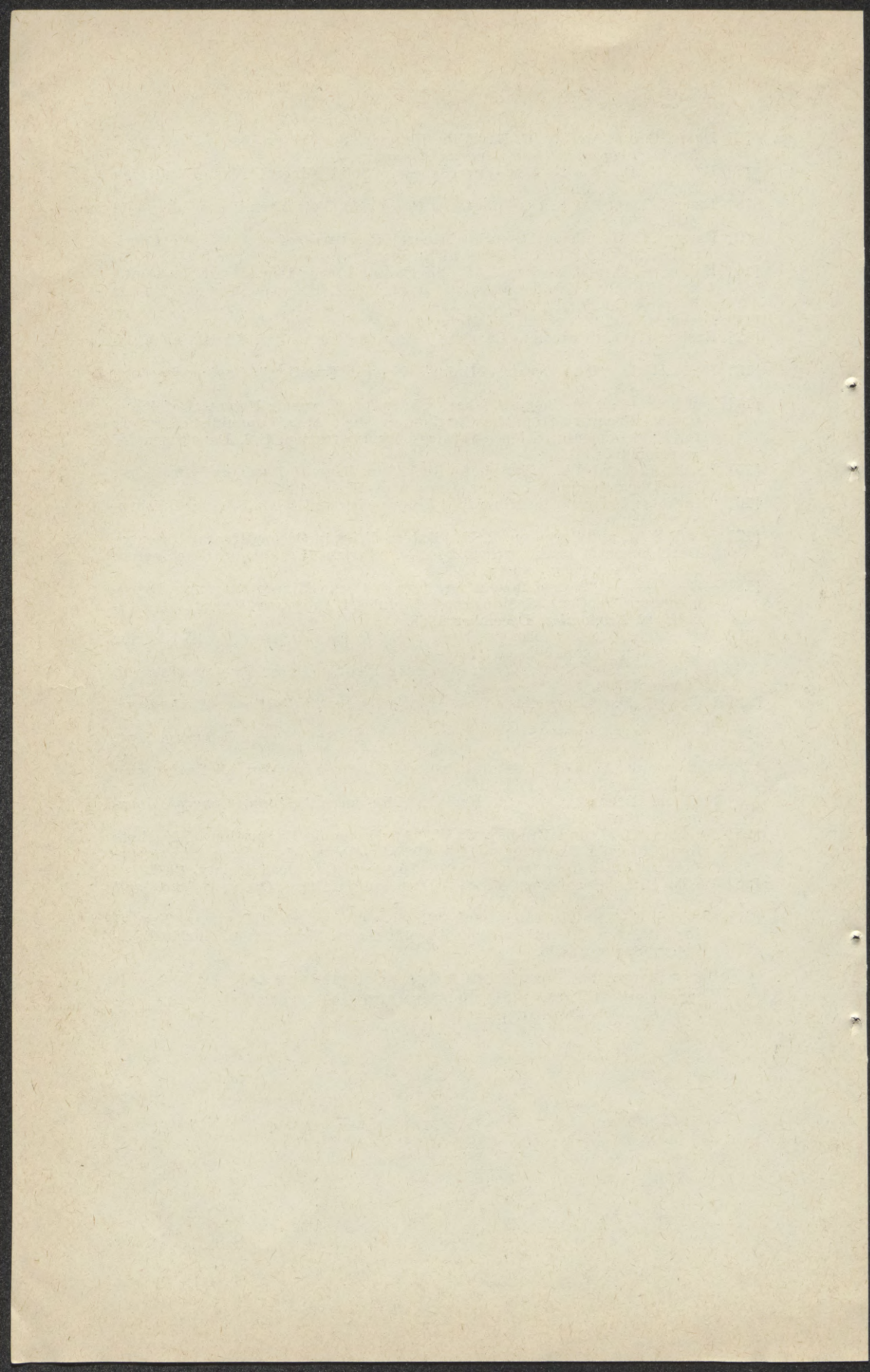
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Senator METCALF. The subcommittee will be in recess.

(Whereupon, at 12:35 p.m. the subcommittee recessed, to reconvene on Wednesday, April 8, 1970.)



OUTER CONTINENTAL SHELF

WEDNESDAY, MAY 20, 1970

U.S. SENATE,
SPECIAL SUBCOMMITTEE ON OUTER CONTINENTAL SHELF,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The subcommittee met, pursuant to recess, at 10 a.m., in room 3110, New Senate Office Building, Senator Lee Metcalf, chairman, presiding.

Present: Senators Metcalf, Hansen, Hatfield, Stevens, and Bellmon.

Also present: Jerry T. Verkler, staff director; Stewart French, chief counsel; and Charles Cook, minority counsel.

Senator METCALF. The committee will be in order.

At previous hearings the Special Subcommittee on the Outer Continental Shelf has always extended an invitation to those who share our interest and jurisdiction to join with us as we heard testimony from various witnesses regarding our Continental Shelf boundary issues. Today, in response to my invitation of the 16th of April, we are privileged to receive the views of several Members of the Senate and House.

Senator Pell was gracious enough to appear in person to present his comments.

It is a pleasure to welcome you before this subcommittee, Senator Pell. You have sat with the subcommittee from time to time and certainly contributed to its deliberations. Your active interest and contributions to our Nation's marine affairs is well known. We appreciate your appearance this morning and look forward to hearing your remarks.

STATEMENT OF HON. CLAIBORNE PELL, A U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator PELL. Thank you very much, Senator Metcalf. Let me acknowledge the very real fairness in which you have conducted these hearings and permitted me to present one view and others another. I will never forget the informal hearing we had and I only wish it had been on the record.

Senator METCALF. I also wish we had that on the record.

Senator PELL. It was simply great. If the Chairman will forgive me, I want to really go through several of these points for the record, and to have them in the record.

To my mind, it has been clearly stated that we have begun already a systematic and scientific probe of the ocean space. Our undersea technology is developing at a pace never envisioned by the framers of the

1958 Geneva Convention on the Continental Shelf; and as a result, we are in danger of having our advancing technology determine the legal and political framework for the recovery and disposition of sub-oceanic resources. The urgent need to come to grips with this issue was perceptibly underscored in the Stratton Commission report which states:

Unless a new international framework is devised which removes legal uncertainty from mineral resources exploration and exploitation in every area of the seabed and its subsoil, some venturesome governments and private entrepreneurs will act to create faits accomplis that will be difficult to undo, even though they adversely affect the interests of the United States and the international community.

And then the Commission recommended:

That the United States seize the opportunity for leadership which the present situation demands and propose a new international legal-political framework for exploration and exploitation of the mineral resources underlying the deep seas, that is, the high seas beyond the outer limits of the Continental Shelf.

Mr. Chairman, it was with this same thought in mind more than 21½ years ago that I began to formulate basic principles for governing the use of ocean space; in setting forth the provisions in these resolutions, I have been guided by President Johnson's assertion, "We must ensure that the deep seas and the ocean bottoms are, and remain, the legacy of all human beings."

This is a statement which, I believe, the present administration endorses and which it is hard to argue with.

In pursuance of the objectives set forth by this principle, the resolutions which I have introduced seek to guarantee that ocean space will be explored and exploited in the interests of all mankind; that it will be free from national appropriation; that it will be open to scientific investigation; that it will be exempt from atomic wastes and other pollutants; and that it will be developed in accordance with and respect for existing international law and the charter of the United Nations.

I will not go into detail on the provisions of my measures providing for an international Sea Guard to enforce the laws and the regime and a jurisdiction indicating authority which would provide for a panel of justices and then with the appellate authority resting in the International Court of Justice.

In the granting of licenses for exploration, these resolutions would seek to provide for those factors vital to the making of profitable investments while also establishing safeguards.

Now, Mr. Chairman, I am led to the controversy surrounding the location of the Outer Continental Shelf boundary. As you know, my resolutions establish the Outer Continental Shelf boundary at a depth of 550 meters or a distance of 50 nautical miles from the baselines used to measure the breadth of the territorial sea, whichever gives the coastal State a greater area offshore for purposes of mineral resource exploitation. To my mind this formula is a sound one in that it is in keeping with both the spirit and letter of the 1958 Geneva Convention. At the same time, it strikes a simple but effective compromise between those advocating a substantially narrower zone and those seeking a considerable larger one.

I selected the 550-meter figure on the basis that the edge of the Outer Continental Shelf is not known to occur at any greater depth. In other words, this criterion encompasses the world's continental shelves—as

you and I understand this term and as it was understood by the framer of the Continental Shelf Convention.

I am confident in making this assertion on the basis that, if the framers of this convention had anything else in mind but the Continental Shelf as a topographic feature, the 200-meter criterion contained in the convention would be meaningless. This criterion is significant only from the standpoint that it denotes the average depth at which the Continental Shelf ends and the continental slope begins. The distinction between these topographic features is frequently made in literature on the subject. And in this regard I believe the article entitled "The Continental Shelves" from "Scientific American" would make a contribution to the record of these hearings, and I respectfully request that the Chairman include it in the record at the end of my remarks.

Senator METCALF. Would you supply us that article?

Senator PELL. Certainly.

Senator METCALF. Without objection, it will be included at the appropriate place at the end of your remarks.

Senator PELL. Thank you.

In addition, I think it is important to point out that the 200-meter criterion, or its approximate equivalents, 100 fathoms or 600 feet, has consistently formed a part of our legislative history on the Continental Shelf issue.

Senator METCALF. Has your article in the Saturday Review been made a part of the record of these hearings?

Senator PELL. I do not believe it has.

Senator METCALF. Without objection, if you will supply that to the committee, that article, which is I think a very forthright and important contribution to the literature on this area, should be included.

Senator PELL. I would be honored to supply it.

Senator METCALF. Thank you.

Senator PELL. For example, the White House press release which accompanied the Truman proclamation of 1945 stated:

Generally, submerged land which is contiguous to the continent and which is covered by no more than 100 fathoms (600 feet) of water is considered as the Continental Shelf.

Perhaps it would be appropriate to have that press release inserted in the record at this point.

Senator METCALF. Without objection, so ordered.

At this point?

Senator PELL. At this point; yes.

(The articles referred to above follow:)

[From the Scientific American]

THE CONTINENTAL SHELVES

(By K. O. Emery)

The shallow regions adjacent to the continents are equal in extent to 18 percent of the earth's total land area. They are alternately exposed and drowned as the continental glaciers advance and retreat.

The continental shelves were the first part of the sea floor that was studied by man, chiefly as an aid to navigation and fishing. Perhaps the earliest recorded observation was one made by Herodotus about 450 B.C. "The nature of the land of Egypt is such," he wrote, "that when a ship is approaching it and is yet

one day's sail from the shore, if a man try the sounding, he will bring up mud even at a depth of 11 fathoms." A more recent example is found in the diary of a 19th-century seaman: "An old captain once told me to take a cast of the lead at 4 a.m. We were bound to Hull from the Baltic. He came on deck before breakfast and on showing him the arming of the lead, which consisted of sand and small pebbles, I was surprised to see him take a small pebble and put it in his mouth. He tried to break it with his teeth. I was very curious and asked him why he did so. He told me that the small pebbles were called Yorkshire beans, and if you could break them you were toward the westward of the Dogger Bank; if you could not, you were toward the eastward."

Fishing success often depends on knowledge of the kind of bottom frequented by particular fish and on the avoidance of rocky areas that can catch and tear nets. As a result governmental agencies routinely chart bottom topography and materials to aid the fishing industry, but the successful fisherman generally keeps much additional information to himself. Similarly, the production of oil and gas from the continental shelves during the past two decades has led governmental and international agencies to make broad geological surveys, which help to guide the oil industry to the areas of greatest economic promise. The oil companies make studies that are much more detailed and so expensive that the results are considered proprietary, at least until after exploitation rights are secured.

During World War II submarines took a large toll of the ships that crossed the continental shelves, mainly at the approaches of ports. The effectiveness of acoustical detection equipment on submarine hunting ships was much increased by a knowledge of bottom materials and their effects: long ranges over sand, short ones over mud, confusing echoes over rock or coral. Accordingly charts of bottom sediments were compiled by the American and German navies for many areas of the world. This problem had not risen earlier because both submarines and the search gear of surface ships were too primitive during World War I, and it may not be important in the future owing to the greatly increased sophistication of submarines and to the different role they may play in any future war.

The conflict between disseminating information and keeping it secret is about what one would expect in an environment that is both economically and militarily important. The recent political interest in the sovereignty of the ocean is also to be expected, considering the way the economic potential of the shelves has often been exaggerated in recent years. Thus it is not surprising that there have been a number of proposals to redefine the continental shelf so as to extend it seaward to whatever distance and to whatever depth are necessary to give a nation access to the resources presumably lying or hidden there. In 1953, before the world developed its present large appetite for seafood and minerals, an international commission defined the continental shelf, shelf edge and continental borderland as: "The zone around the continent extending from the low-water line to the depth at which there is a marked increase of slope to greater depth. Where this increase occurs the term shelf edge is appropriate. Conventionally the edge is taken at 100 fathoms (or 200 meters), but instances are known where the increase of slope occurs at more than 200 or less than 65 fathoms. When the zone below the low-water line is highly irregular and includes depths well in excess of those typical of continental shelves, the term continental borderland is appropriate."

Somewhat similar, but shorter, definitions are presented by most textbooks of geology. Where a depth limit is given it is 100 fathoms, an inheritance from the time when navigational charts had only three depth contours: 10, 100 and 1,000 fathoms. On a global basis the edge of the continental shelf ranges in depth from 20 to 550 meters, with an average of 133 meters; the shelf ranges in width from zero to 1,500 kilometers, with an average of 78 kilometers.

The continental shelves underlie only 7.5 percent of the total area of the oceans, but they are equal to 18 percent of the earth's total land area. A geological understanding of this huge region requires a knowledge of its topography, sediments, rocks and geologic structure. For nearly all shelves there is some information about topography; for perhaps a fourth of them something can be said about the surface sediments, but the rocks and geologic structure are known for less than 10 percent. Detailed knowledge is far less available. The best-known large areas are the ones off the U.S., eastern Canada, western Europe and Japan—in short, the shelves next to countries where scientific knowledge is well developed and freely disseminated. Smaller areas of knowledge are found

where oil companies have worked (such as parts of northern South America, parts of Australia and the Persian Gulf) and where oceanographic institutions have conducted repeated operations (northwestern Alaska, the Gulf of California, northwestern Africa, the shelf off Argentina, the Red Sea and the Yellow Sea). Recently some developing countries have effectively closed their shelves to foreign scientific studies; these areas are fated to remain unknown and unexploited for the foreseeable future.

The information that is most costly and most difficult to obtain concerns the underlying rocks and the structural geology of the continental shelves. This information is essential for understanding the origin and most of the history of the shelves. Data about the surface topography and sediments, which are readily accessible, tell only the late history.

Samples of bedrock have been dredged from the surface of many shelves, mainly from the top of small projecting hills and the sides and heads of submarine canyons that incise the shelves. Additional rock samples have come from the top of the adjacent continental slopes. Care must be taken in deciding whether the rock samples are from outcrops, whether they are loose pieces that were deposited by ancient streams or glaciers, or whether they were rafted to their present location by ice, kelp, marine animals or man. The decision is usually based on the size of the piece, on the presence or absence of fresh fractures, on the similarity of lithologic types within a given dredging area or between adjacent dredging areas, and on the amount of tension of the dredge cable. It is helpful to have submarine photographs, which may reveal rock outcrops in the dredging area. Rock also can be sampled by coring: by dropping or forcing a heavily weighted pipe into the bottom. This method can show the dip of the strata, and it can sample rock that is covered by sediments if the sediment is thin or if it is first removed by hydraulic jetting. A better but more expensive method of rock sampling is provided by well-drilling methods. Many holes have been drilled for geological information in shelf areas of structural interest; they provide good information on the sequence and depth of strata, the date of original deposition and geologic structure. In addition several thousand oil wells have been sunk into shelves, but most have been drilled in abnormal geologic structures such as salt domes and folds.

Geophysical methods provide excellent, although indirect, data from which geological cross sections can be constructed. These methods include seismic reflection and refraction, as well as measurements of geomagnetism and gravity. Each method has its advantages, but the most generally successful one is seismic reflection. In practice a ship traverses the shelf and produces a loud acoustical signal in the water at intervals of a few seconds. The chief source of sound energy a few years ago was a chemical explosive, usually dynamite; other sources are now preferred because they are cheaper, easier to trigger accurately and greatly reduce the danger both to the operators on the ship and to the fish in the sea. These newer energy sources include electric spark, compressed air and propane gas. Although part of the sound energy is reflected from the sea floor, much of it enters the bottom to be reflected upward and various layers of rock under the bottom. The reflected energy is received by hydrophones trailed behind the ship; the signal is amplified, filtered and recorded on continuously moving paper tapes. This method, termed continuous seismic-reflection profiling, is rapid and can yield information from depths of several kilometers under the sea floor, making it possible to construct geological cross sections. When the interpretations are supplemented by dredging or drilling, they provide the best information now available about the structure of continental shelves.

When existing geological and geophysical information is assembled on a worldwide basis, it shows that continental shelves can be classified into two main types by composition: those that are underlain by sedimentary strata and those underlain by igneous and metamorphic rocks. A large majority of the world's continental shelves mark the top surface of long, thick prisms of sedimentary strata. Many of the prisms are held in position against the continents by long, narrow fault blocks. Such is true of almost the entire perimeter of the Pacific Ocean, where tectonic activity has also produced deep trenches that are parallel to the base of the continental slope. In some areas, such as the West Coast of the U.S., a single geologic dam is known to have extended for thousands of kilometers along the coast. Locally part of the dam rises above sea level to form the granitic Farallon Islands that lie immediately off San Francisco. These rocks are some 100 million years old, but they were thrust up to form the dam

only about 25 million years ago. Elsewhere, as in the Yellow Sea of Asia, half a dozen such fault dams or fold dams have risen in the last 500 million years or so, each dam in turn causing the ponding of sediments from the land. There was a similar dam off the entire length of the East Coast of the U.S. between 270 and 60 million years ago; in time the trench on its landward side was filled with sediments that subsequently spilled over the former dam to build a continental slope that is held in place only by the angle of rest of the sediments. That this angle is unstable is shown by numerous landslides and erosion features recorded in seismic profiles across the continental slope and rise.

The continental shelf off the western part of the Gulf Coast of the U.S. is held in place by a diapir dam: a dam formed by the upward movement of salt from a bed that is buried several kilometers deep and is about 150 million years old. Seismic profiles and dredgings show the presence of still another kind of dam in the eastern Gulf of Mexico and off the southeastern coast of the U.S. This is an algal reef that dates from 130 million years ago and was succeeded by a coral reef off Florida at some time before 25 million years ago; even today the Florida keys are bordered by a living coral reef. Similar tectonic and biogenic dams elsewhere in the world have trapped huge quantities of sediments in the geological past.

Shelf areas underlain by igneous and metamorphic rocks are found on top of the tectonic dams. Off Maine, however, glacial erosion has removed the sedimentary rocks that once covered such a dam [see illustration on pages 112 and 113]. Other shelves underlain by igneous and metamorphic rocks are known, but most of them appear to be at high altitudes where glacial erosion has been effective. Nevertheless, even at high altitudes probably most of the shelves are underlain by sedimentary rock. In a sense we can consider the shelves whose shape is chiefly due to glacial or wave erosion as youthful ones (or rejuvenated ones); the shelves that are mainly depositional, with a thick prism of sediments on top of igneous and metamorphic rocks, can be regarded as mature ones. The sediments have built the shelves upward during the concurrent sinking of the edges of the continents. Perhaps more important from the viewpoint of real estate, these sediments have increased the size of the continents, widening them as much as 800 kilometers in areas where rivers have brought much sediment from the land and where tectonic or other dams effectively prevent the escape of the sediment to the ocean basins. This dammed sediment, as well as the sediment held only by its angle of rest, has an estimated average thickness of about two kilometers, yielding a total volume of sedimentary strata under continental shelves of about 50 million cubic kilometers.

Perhaps the most dramatic period in the history of the continental shelves was the million-year passage of the Pleistocene epoch when the sea level changed in response to the waxing and waning of the continental glaciers. At their maximum the glaciers appear to have been so extensive as to have stored in the form of ice enough water to lower the surface of the ocean nearly 150 meters below the present level. Four major lowerings of the sea level were produced by the four main glaciations, with minor lowerings caused by secondary fluctuations of climate and ice volume. Limited investigations with special seismic equipment off the East Coast of the U.S. show four or five somewhat irregular acoustical reflecting surfaces near the top of the shelf sediments. These reflecting surfaces probably can be explained by erosion and sand deposition at stages of low sea level. Cores from these beds probably would provide much interesting information about Pleistocene climates and Pleistocene chronology. For the present, however, our data for glacial effects on the continental shelf are restricted largely to surface sediments and topography.

About 50 years ago most textbooks of geology led the reader to believe that sediments became progressively finer in texture with distance from shore: gravel and sand at the shore, coarse sand grading to fine sand across the shelf, and finally silt and clay (the "mud line") at the shelf edge. Bottom-sediment charts compiled during World War II, however, showed that this simple pattern is very rare, and that the size of sediment grains is unrelated to the distance from shore. The examination of actual samples showed that most of the shelves are floored with coarse sands that commonly are stained by iron and contain the empty shells of mollusks that live only close to shore in shallow depths. Broken shells or shell sand are particularly abundant at the outer edge of the shelf and on small submerged hills that are relatively inaccessible to detrital sediments. Some of these same areas contain glauconite and phosphorite, minerals that are precipitated from seawater, but so slowly that they are obscured or diluted beyond recognition where detrital minerals are present. The only areas that exhibit a consistent seaward decrease of grain size are those between the shore and depths of 10 or 20

meters—in short, whatever areas are shallow enough to be ruled by the waves. At greater depths the sediments are too deep to be reached by new supplies of sand. These sections of the shelves are also bypassed by contemporary silts and clays that remain in suspension en route to deeper or quieter waters.

The sediments on about 70 percent of the world's continental-shelf area have been laid down in the past 15,000 years, since the last glacial lowering of the sea level. The rest of the shelf is floored by silts at the mouths of large rivers, in quiet waters behind barriers and in shelf basins, by recent shell debris, and by chemically deposited minerals. This means that when the sea level was low, the entire shelf was exposed and the rivers deposited sands on the then broader coastal plain and transported their silts and clays to the ocean. At that time ocean waves, with no shelf to reduce their height, were probably higher at the shore than they are today, with the result that shore sediments were probably coarser. The broad expanse of lowland favored the development of ponds and marshes, which were partly filled with debris from the forests and meadows that extended unbroken from the inland areas across what is now the sea floor. Freshwater peat now submerged in the ocean has been sampled at 10 sites off the eastern U.S. and at many other sites on the shore; similar peats have been found off Europe, Japan and elsewhere. Pollen analysis shows a succession from tundra to boreal spruce and pine some 12,000 years ago, followed by oak and other Temperate Zone deciduous trees about 8,500 years ago; the deciduous trees flourished until the site was submerged. Birds once flew among the trees in many areas where fish now swim.

The vegetation attracted many animals, but only their heavier bones are preserved or are readily detected by dredging. Nearly 50 teeth of mammoths and mastodons have been collected off the East Coast of the U.S., along with the bones of the musk ox, giant moose, horse, tapir and giant ground sloth. Similar finds have been reported off Europe and Japan.

Carbon-14 dates have been obtained for more than 500 samples of shallow-water material from the shelf off the East Coast of the U.S. The materials include salt-marsh peat, oölites (concentrically banded calcium carbonate pellets that typically form only in warm, shallow, agitated seawater) and the shells of oysters and other mollusks (which live in only a few meters of water but whose empty shells are found as deep as 130 meters). The dates and depths make it possible to draw a curve showing the changes of sea level in ancient times.

Apparently the sea was near its present level about 35,000 years ago and began to recede about 30,000 years ago. The level dropped by 130 meters or more 15,000 years ago; then it rose rather rapidly to within about five meters of the present level 5,000 years ago. The slow rise during the past 5,000 years has been documented by perhaps 100 carbon-14 dates for peat under existing salt marshes. Less complete sequences of dates for similar samples from elsewhere in the world show a sea-level curve resembling the one for the East Coast. Only the samples from the shelf in the western Gulf of Mexico provide a different curve, which suggests that this part of the gulf shelf was uplifted about 40 meters during the past 10,000 years.

Early men of the Clovis culture (characterized by fluted stone projectile points) appeared in North America some 12,000 years ago, when the sea level was still very low. What is more reasonable than to suppose such men ranged over the forested lowland that is now continental shelf? Game, fish and oysters were abundant. How were they to know or care that in a few thousand years the area was to be drowned by the advancing sea, any more than New Yorkers know or care that when the remaining glaciers melt, the ocean will rise to the 20th story of tall buildings? The search for traces of early man far out on the shelf began with the discovery of what may be the remains of an oyster dinner on a former beach off Chesapeake Bay, a site that is now 43 meters below sea level. This discovery was made from the Woods Hole Oceanographic Institution's research submarine *Alvin*; many similar discoveries will probably be made during the next decade.

Submerged barrier beaches are common on the continental shelf, but they are easily confused with the sand waves that are formed by strong currents. More spectacular and of certain origin are the submerged sea cliffs and terraces that mark the temporary stillstands of the sea level. Most of the shelves that have been studied have four to six such terraces, but the recognition of the terraces depends on their width and sharpness. On gently sloping shelves the terraces are almost imperceptible; on steep shelves they are narrow or absent; on shelves receiving a large supply of sediment they are buried. Variation in depth is to be expected in view of the large variation in depth of the most prominent terrace of all—the edge of the shelf. Passing through the terraces

are channels cut by streams that flowed across the shelf when the sea level was low. Most of these channels have been filled by sediment; they can be recognized only by seismic profiling and by drilling on the shore at the mouths of stream valleys. Probably hundreds of channels cross the continental shelves of the U.S., but only a dozen are known. One channel, the one cut by the Hudson River off New York, is so large it is not yet filled with sediment.

At the seaward end of the channels, near the edge of the shelf, the channels are replaced by the heads of submarine canyons that continue down the continental slope to depths of several kilometers. The continuation of the submarine canyons to depths far below the maximum probable lowering of the sea level means that the canyons must have been formed by some process that operates under the ocean surface. Although the matter is still the subject of debate, most of the evidence favors the view that the canyons were excavated by turbidity currents: currents that arise when sediment slips down a slope and becomes mixed with overlying water, thereby increasing its density so that it continues down the slope, often at high speed. Today the shelf off the East Coast of the U.S. is only slightly modified by submarine canyons; only the heads of the canyons indent the shelf edge. When the sea level was at its lowest, the canyons were probably important factors in sedimentation. The shelf off the West Coast of the U.S. is so narrow that the heads of many canyons reach almost to the shore. In those areas the canyons serve to trap and divert sand that is moved along in the shore zone under the influence of wind-driven waves and their associated currents. As a result the sand that is brought to the shore by streams and cliff erosion is only temporarily added to the beaches; eventually it moves seaward through the canyons in the form of slow sand glaciers or rapid turbidity currents.

The water above the continental shelves is complex in composition and movement because it is shallow and close to the land. Large rivers contribute so much fresh water that they dilute the ocean, but they also increase the local concentration of calcium, phosphate, silica and nitrate—precisely those elements and compounds that elsewhere in the ocean have been reduced to low concentration by incorporation into marine plants and animals. Continental-shelf waters that are distant from river mouths are sometimes saltier than the open sea because their rate of evaporation is high. Local variations in salinity (and therefore density) control the direction of currents on the shelf. For example, the low salinity at the mouth of a river means a higher sea level near the shore than farther out on the shelf, leading to a flow toward the right (when one is facing the ocean in the Northern Hemisphere).

Just at the shore, however, the long shore currents are mainly controlled by the angle at which waves intersect the beach, which in turn is a function of the wind direction. As a result the current in the wave zone may be northward, the current on the inner half of the shelf may be southward and the current on the outer shelf may be northward again (for example where an oceanic current such as the Gulf Stream runs along the edge of the shelf). Where rivers bring water to the ocean there must be a general current component toward the ocean at the surface; this induces a return flow toward the land at the bottom. Thus the sediment on the sea floor may be moved landward, often working its way into the mouths of estuaries. This means estuaries are truly ephemeral features, receiving sediments from both rivers and the open shelf.

Temperature zones on land are mainly a function of latitude, with secondary modifications resulting from winds whose direction may change seasonally or may be controlled by topography. Similarly, ocean water is cooled at high latitudes and heated at low ones. At the same time, however, the pattern of currents in the open ocean displaces the climatic zones in a clockwise direction in the Northern Hemisphere and counterclockwise in the Southern Hemisphere. The displacement causes the water above the shelf at middle latitudes to be warmer on the western side of an ocean than on the eastern side. At high latitudes the flow of arctic water makes the shelf colder on the western side than on the eastern one. As a result the correlation of animal species with shelf latitude shows a displacement on the opposite sides of oceans. Moreover, temperature zones are compressed on the western side and expanded on the eastern. The movements of currents, waves and tides above the shelves are so complex that they have received little study compared with those of the deep ocean. Much fieldwork is needed.

The present great interest in exploring the world's continental shelves flows from their potential economic exploitation. About 90 percent of the world's marine food resources, now extracted at the rate of \$8 billion per year, comes from the shelves and adjacent bays [see "The Food Resources of the Ocean," by

S. J. Holt, page 178]. Most of this is fish for human and animal consumption; the remainder is largely used for fertilizer.

Second in economic importance is petroleum and natural gas from the shelf; their present annual value is about \$4 billion, representing nearly a fifth of the total world production of these substances [see "The Physical Resources of the Ocean," by Edward Wenk, Jr., page 166]. Currently about \$1 billion worth of oil and gas a year is extracted from the shelves off the U.S., and much of the rest was developed by American companies with interests abroad. It is safe to predict that the future production from the world's continental shelves will increase at a greater rate than production from wells drilled on land.

The third marine resource in terms of present annual production and future potential is lowly sand and gravel. At present about \$200 million worth per year is mined for landfill and road construction in the U.S., for concrete aggregate in Britain and for both purposes elsewhere. As cities and megalopolises continue to grow and show a preference for the coastal regions, and as readily available stream deposits are exhausted or are overlain by houses, there is every prospect that the offshore production of sand and gravel will increase greatly.

We read much about the possibility of economic exploitation of valuable heavy minerals from the sea floor, namely ilmenite, rutile, zircon, tin, monazite, iron, gold and diamonds. The total production of these minerals from below the sea is now less than \$50 million per year. Production may increase, particularly in the case of tin, but it is decreasing for iron. Prospects for gold are not very hopeful, and diamonds have never been mined profitably from the sea floor. The basic problem is that economic placer deposits of tin and gold are found only within a few kilometers of the original igneous sources, and few continental shelves contain metalliferous igneous sources. Similarly, ilmenite, rutile, zircon and monazite require the high-energy wave environment of beaches to form deposits that are concentrated enough and large enough to be mined at a profit. When ancient beach deposits are submerged, even if they are not buried under worthless sediment or mixed with it, the cost of mining increases substantially. They will probably be mined in the future but not until they are economically competitive with shoreline deposits. This could come about either through a rise in prices, resulting from a diminution of known deposits on land, or when more efficient mining and separation methods are devised for the marine environment.

Phosphorite is present in large quantities on shelves off southern California, Peru, southeastern Africa, northeastern Africa and Florida. It can be mined off the U.S., but it has to compete with high-grade land deposits in Florida, Montana, Idaho and Wyoming (where there is about a 1,000-year supply at present rates of mining). Most investigators have concluded that the cost of mining at sea exceeds the cost of mining on land plus the costs of land transportation. Some deposits far from the U.S., however, may justify mining, particularly because some of them may be near places where there is a great need for fertilizer, such as India. Unfortunately the distribution of phosphorite in these areas is poorly known, and little or no effort is currently being expended on their investigation.

The would-be exploiter of the ocean will do well to remember the words of the old Newfoundland skipper, "We don't be *takin'* nothin' from the sea. We has to sneak up on what we wants and wiggle it away." Nevertheless, the continental shelves, when they are properly investigated, promise to greatly increase our knowledge of the earth's history and to become a steadily more important source of food and raw materials.

[From the Saturday Review, Oct. 11, 1969]

THE OCEANS—MAN'S LAST GREAT RESOURCE

(By Senator Claiborne Pell)¹

After millenniums of exploiting and often destroying the riches of the land, man is now hovering acquisitively over the wealth of the oceans that cover three-quarters of the Earth. In the no man's land of the seabed, a scramble for minerals and oil, for new underwater empires secured by advancing armies of technology, could well set a new and wider stage of world conflict.

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Even the most conservative estimates of resources in the seabed stagger the imagination of a world grown used to dire predictions of incipient famine and exhausted mineral resources. In the millions of miles of ocean that touch a hundred nations live four out of five living things on Earth. In the seabed, minerals and oil have been proved to exist in lavish supply. The oceans are a source of pure water and food protein; of drugs and building materials; even possibly a habitat for man himself and a key to survival for the doubling population on the land.

Man may yet learn to use a tiny fraction of this wealth. Unless international law soon determines how it shall be shared, that fraction alone could set off a new age of colonial war. Is the deep seabed, like the high seas, common to all, or is it, like the once wilderness areas on land, open to national claim by use and occupation by the first or the strongest pioneer? The question of what is to be done to regulate and control exploitation of the seabeds is no longer an exercise for academics and global thinkers. At stake is not just the prize of great wealth; pollution or geologic accident in the ocean depths is no respecter of national boundaries.

A few years ago, "practical" men dismissed speculations about wealth in the sea as economic foolishness. It would never, they said, be economically profitable to exploit the seabeds no matter how great the riches to be found there. They underestimated the lure of gold as the mother of invention. Yet, such pessimists may well be proved right in a fashion they did not anticipate. In these pioneer years of the ocean age, the damage done sometimes seems to exceed the benefit reaped. Beaches from England to Puerto Rico to California have been soaked in oily slime. Fish and wildlife have been destroyed. Insecticides, dispersed in the Rhine River, killed fish and revived fears of other lethal legacies that may emerge from our casual use of waterways as garbage dumps. The U.S. Army, until deterred recently by a few alert legislators, was disposing containers of chemical agents in the Atlantic despite some predictions that severe damage to the marine environment could not be ruled out, because of either deterioration of the containers or unforeseen underwater accidents. The future disposal of increasing amounts of atomic waste is an unresolved problem. Millions of acres of offshore seabed have been leased for drilling. Largely in ignorance, we are tinkering with our greatest source of life.

The incredible magnitude of the oceans' resources can be measured by just one isolated example: the metal content of manganese nodules, for years a curiosity with no realizable value. One study of reserves in the Pacific Ocean alone came up with an estimate that the nodules contained 358 billion tons of manganese, equivalent, at present rates of consumption, to reserves for 400,000 years, compared to known land reserves of only 100 years. The nodules contain equally staggering amounts of aluminum, nickel, cobalt, and other metals. Most of these resources exist at great depths of 5,000 to more than 15,000 feet, yet within five to ten years the technology will exist for commercial mining operations, a development that will open to exploitation virtually unlimited metal reserves. Closer to home, the University of Wisconsin discovered a deposit of manganese worth an estimated \$15 million in the shallow waters of Green Bay in Lake Michigan.

More familiar to most of us is the accelerated pace of offshore oil drilling that now extends more than fifty miles out to sea and accounts for 15 per cent of U.S. oil production. In the twelve years between 1955 and 1967, offshore production of crude oil increased from seven million to 222 million barrels. Estimates of known reserves of natural gas have more than tripled in the past fifteen years, and each advance of scientific exploration of the ocean beds brings to light new finds that would gladden the eye of the most hardend veteran of the California gold rush.

Perhaps the least developed resource, and one of critical importance to spiraling population figures, is the use of the seas for farming techniques or "aquaculture." Present methods of fishing can only be compared with primitive hunting with a bow and arrow; if fish were cultivated like livestock, the present world fish catch could easily be multiplied by five- or as much as tenfold. The production of protein concentrate and the distillation of fresh water are still experimental in an economic sense; there is no reason to believe that they too cannot become both useful and profitable. Aquaculture could also be applied to a variety of marine plant life.

Nor is the potential confined to what we can extract from the seas or the seabed. In crowded England, serious plans have been developed to build entire cities just off the coast. Offshore airports may solve the demand for large tracts of jet-age space near such large coastal cities as New York and Los Angeles. Some

Americans, quick to take advantage of the legal confusion that reigns beyond coastal waters, have planned to build independent islands atop seamounts and reefs outside the three-mile limit. Indeed, a romantic notion, but one with, it is suspected, the more prosaic aim of avoiding the constrictions of domestic law concerning gambling and taxes. One such venture has been restrained by the courts on the grounds that the reefs and seamounts attach to the seabed on the continental shelf, and are, therefore, under U.S. jurisdiction. In another case, a year or so ago, the United Nations was presented with an application for permission to extract minerals from the bed of the Red Sea in an area fifty miles from the coastal states. The Secretariat dodged this thorny question, citing lack of authority to act.

Such claims are no longer isolated or frivolous. Much of the wealth of the oceans is now both proved and exploitable beyond that part of the continental shelf once considered to mark the practical limit of exploitation and national claims. This Pandora's box is as full of political hazards as it is of manganese. Parts of the Gulf of Mexico became such a forest of drilling rigs that an agreement was necessary to clear shipping lanes. This spring, the Dominican Republic granted a single oil concession covering some three-quarters of a million acres of offshore seabed, and many other small coastal nations are looking for an economic bonanza in the leasing of drilling rights. Under what safety and pollution regulations will such developments take place? How far out may any nation grant such leases or undertake such exploitation?

In short, diplomats and politicians who five years ago looked backward to the slow evolution of mining the sea and found nothing to engage their immediate concern have been overtaken, as is frequently the case in this day, by the less stately pace of technological change. If the know-how of ocean exploitation has gathered momentum of its own, the same cannot be said for any reasoned approach to orderly development under a regime of law.

Two years ago, faced with the prospect of orbiting weapons in the legal void of space, nations did agree on a treaty to limit the uses of outer space. Similar concern has not been so evident in the realm of ocean space, perhaps because people are so used to taking marine environment for granted.

A less charitable view might suggest that one of the inhibiting factors is the prospect of making a good deal of money, an incentive not present at the moment in space, except for the manufacturers of hardware here on Earth.

Yet, the oceans offer no less a fearsome stage for escalation of the arms race. The seabed already abounds with a multiplicity of sounding devices and other defensive technology. High "mountain" ridges in the ocean bed offer tempting sites for the deployment of nuclear weapons, and there is no reason why the Soviet Union and the U.S. might not soon be planting ABMs eyeball to eyeball on the Atlantic ridge. Thanks in large part to initiatives in the United Nations, the question of arms control in the seabed is under discussion at the Conference of the Committee on Disarmament in Geneva. Last spring both the Soviet Union and the U.S. offered differing proposals to ban the emplacement of weapons of mass destruction on the seabed, proposals that hopefully could forestall this new escalation of the nuclear race.

If the prospect of a new arms race on the ocean floor precipitated efforts to focus world attention on the problem, there is no lack of other and equally explosive possibilities for conflict. How far may the claims and undertakings of coastal states extend seaward? By whose permission, if any is exploitation of the ocean depths undertaken? Who is entitled to the proceeds, and who is to establish and enforce rules governing the safety of such exploitation? There have not been, as yet, any murders or muggings on the ocean floor. If there were, what law would apply? No one knows. The laws of the high seas, which have evolved over so many centuries of our casual passage across their surface, are not wholly applicable by extension to the ocean floor.

In a study of the full range of our national interests in maritime resources, made public early this year, a special Presidential Commission on Marine Science, Engineering, and Resources noted, rather matter-of-factly, that the threat of "unbridled international competition for the seas' resources may provoke conflict," and recommended a series of international agreements that would create new legal political frameworks for the exploitation of mineral resources, underlying the deep seas. There is no lack of proposals for such a regime; their specifics are as various as the magnitude of the interests involved.

As could be expected, the differences among nations reflect political power and geographic accident. In a letter to the Spanish ambassador in 1580, the first Queen

Elizabeth of England wrote that "the use of the sea and air is common to all, neither can a title to the ocean belong to any people or private persons, forasmuch as neither nature nor public use and custom permit any possession thereof." The Queen may have had in mind the Treaty of Tordesillas, signed a little more than a century earlier by Spain and Portugal, dividing all the world's oceans between them. That treaty did not survive the emergence of a superior naval power, and the Queen's views of freedom of the seas prevailed.

Four centuries later, the same dispute has been revived beneath the seas. There are those who would carve up the shelf and the seabed among the major maritime powers, and there are others who would insure freedom of the ocean beds beyond a narrow claim of national jurisdiction equivalent to the customary three-mile or twelve-mile claim of jurisdiction over territorial waters on the surface.

The three-mile limit claimed by the U.S. is the measure of a cannon shot in the eighteenth century. It may be regrettable that nothing so simple as a cannon shot was used to determine an equivalent measure on the seabed, since efforts to date—with more sophisticated standards—have only compounded the confusion that began in 1945 when the U.S. largely at the behest of the oil industry, unilaterally extended its sovereignty to include the bed of the continental shelf (that portion of the submerged land mass that extends at relatively shallow depths seaward, in some places for more than a hundred miles). Other nations followed, and in 1958 an international Convention on the Continental Shelf declared that a nation's jurisdiction over the shelf extends to a depth of 200 meters (about 650 feet) or "beyond that limit to where the depth of the superjacent waters admits of the exploitation of the natural resources." For coastal nations with extensive shelves, it was the most painless territorial conquest in history. Few then suspected that effective exploitation of resources would soon take place far deeper than 200 meters, or that the exploitability" clause of the convention—as interpreted by the oil industry and others—would, in effect, grant a license to move in the ocean beds to the limits of a nation's power to defend its claims.

Strategic interests in what goes on in the seabeds off our shores further complicated efforts to decide whether our national interests would be best served by limited claims—as in the waters above—or by a more expansive goal. Yet the same rationale of maximum maneuverability, which is the basis of the jealously guarded right of freedom of the seas, argues equally strongly for a narrow claim of jurisdiction on the seabed. Beyond that narrow band, our own military, like their opposite numbers in the Kremlin, would prefer to trust to luck and muscle in making the best of all possibilities. The oil industry has no such dual interest; it wants to carry the flag as far as effective exploration permits.

And what of the small nations who believe, not unreasonably, that the riches of the seas should not be left up for grabs by the already rich and powerful?

It was this prospect, as well as the looming threat of a new weapons race, that two years ago brought forth two different proposals for an international regime for the seabed. In the United Nations, the government of Malta introduced a resolution that would place the riches of the sea under international administration to be used for the benefit of mankind. In the U.S. Senate, I introduced a treaty, based in part upon the Treaty on Outer Space, and one that would in my judgment, deal more realistically than does the Maltese proposal with the competing economic and political interests in ocean space.

Other detailed proposals have been made—by the National Petroleum Council at one end of the spectrum, and by the Commission to Study the Organization of Peace, the World Peace Through Law group, and the Center for the Study of Democratic Institutions in Santa Barbara at the other. Neither of these opposing views, whether favoring unilateral action by the U.S. or advocating extensive internationalization of the seabed, is entirely practicable.

The oil industry advises a clubby agreement among the major maritime powers extending their jurisdiction by their own actions to the limits of their technological capacity for exploitation at least to that point where the continental slope meets the abyssal ocean floor. Such a claim would encompass most of the known wealth and would, they argue, neatly delimit the lines of jurisdiction and so insure maximum stability. What might happen in the event of the emergence of a powerful nonmember of the club is not clear, but history provides some clues. In advocating such an approach, the National Petroleum Council piously noted that it "is in the best interest of the United States whether or not it is in the best interests of the American oil and gas industries." So pleased is the industry with this act of statesman ship that the publisher of the *Oil Daily* felt impelled to comment editorially that "we rather doubt there is a record of a more

high-minded, patriotic, and statesman-like position involving comparable interests in the whole range of the industrial economy."

Those proposals that advocate international administration of the resources of the sea, or of the profits from their exploitation, also suffer from practical defects, however useful their purpose may appear in theory. Only a few nations, most particularly the U.S., possess both the technology and the financial capability to proceed with the exploitation of the oceans. The financial risks and investments are enormous, and it is unlikely—and unreasonable—to expect that they would be assumed for altruistic purposes. It is clearly essential that any exploiting company be assured of security of tenure and the right to profits.

Adequate protection of economic incentive and investment security is not, however, irreconcilable with the thought that these resources should also provide some revenues for the common benefit of mankind. Ambassador Arvid Pardo of Malta once estimated that at the present rate of development, annual revenues could reach \$6 billion by 1975, if a regime such as he proposed were established by 1970. His figures assume that the fees paid would be the equivalent of those now paid to national governments for offshore drilling leases, and that they would cover all exploitation beyond the relatively narrow confines of a 200-meter depth or a lateral distance from the shore of twelve miles. Such a sweeping concept of internationalization is not likely to prove acceptable, but his estimate paints a tantalizing picture of the measure of funds that could be generated by licensing fees even on a much more limited scale.

Another practical defect in some of the proposals for international administration of the ocean beds, and one even closer to the bedrock of practicality in the present political climate of the world, is that it is simply not realistic to expect any great power to surrender to an international body control of a resource in which its national security interests are so substantially involved unless those interests are fully recognized and protected. Any international regime must be responsive to the realities of power or be doomed to failure.

Despite substantial and specific differences, most advocates of some international regime share a common purpose: to avoid an underseas land grab; to forestall a new nuclear arms race; to control marine pollution and, by extension, other actions that might upset the ecology of the oceans; and to insure some equitable distribution of the wealth for the common benefit of mankind. The same philosophy was stated earlier by President Johnson when he said, "Under no circumstances, we believe, must we ever allow the prospects of a rich harvest in mineral wealth to create a new form of colonial competition among the maritime nations. We must be careful to avoid a race to grab and to hold the lands under the high seas. We must ensure that the deep seas and the ocean bottoms are, and remain, the legacy of all human beings."

As a result of the initiative of Malta, the United Nations created a temporary, and now permanent, forty-two nation subcommittee of the General Assembly to deal with the seabed. Meetings of the subcommittee and its working groups have focused attention on the need to know more about our marine environment; gradually there has been a distillation of basic principles that seem essential to the orderly evolution of a body of law, however minimal. But it is evident that the sea that divides has yet to unite mankind, to paraphrase Longfellow. Except for occasional propaganda forays among the developing nations, the Soviet Union has taken the view that the least done, the better. Some Latin American states have made claims of jurisdiction extending out 200 miles on the seabed as they have also claimed a 200-mile territorial sea in the water above. Other small coastal nations, once in favor of internationalization, are now hoping to get richer quicker by leasing drilling rights off their coasts.

Technology, however, does not await the resolution of political differences, and we are fast approaching a point where the pace of exploitation may govern, rather than be governed by, sound political judgments. If there are, as seems likely, fewer risks in supporting at least a minimal international regime than in a wide-open scramble for control of the seas, it is necessary that we soon agree on some basic principles to serve as guidelines until a treaty can be negotiated.

First among these principles, and one that is embodied in the treaty I have proposed, is the recognition that the seas shall remain the heritage of mankind, open to all nations for peaceful purposes, and not subject to national appropriation by any.

To resolve the boundary problem, the treaty would set the limits of national jurisdiction at a depth of 550 meters or a lateral distance from the shoreline

of fifty miles, whichever is greater. The depth measure encompasses most of the geographic shelf. The lateral measure assures those nations with little or no shelf, the security of determining what goes on in the ocean depths within that distance of their shores.

The treaty further proposes that exploitation of the seabeds beyond this limit be licensed by an independent international body to be established by the United Nations. Such a body would be constituted to reflect the realities of power and interest of the major nations. The World Bank is one example of an international body not directly under the aegis of the U.N. and in which both political power and technical expertise are adequately represented so decisions may be both informed and enforceable in terms of practical support. Licenses would be granted for extensive periods to insure security of tenure; the fees paid for the licenses would be used for an agreed international purpose.

Provision is also made in this treaty for the settlement of disputes by a panel appointed by the International Court of Justice, and the treaty draft also envisions an international sea guard, the equivalent of our Coast Guard, to which nations might contribute or lend research and scientific vessels for exploration and to supervise the observance of established standards of safety and pollution controls. Finally, the treaty proposes international regulation of the disposal of atomic waste.

In sum, the treaty provides a sensible and practical means of regulating a resource that is no respecter of national boundaries any more than are the air waves; it ensures a limit on national territorial claims as we have already done in Antarctica; it limits the nature of activities in an area of common danger as we have done in outer space; and it should, someday, become an unremarkable as all the many international agreements that now govern air traffic, maritime lanes, radio frequencies, international mails, and all the incidents of everyday living now taken for granted.

Perhaps most important, it assures incentive for development by technologically advanced nations, while making available a source of funds to benefit poor nations. If there is any single critical issue on this planet, it is not nuclear bombs or ABMs; it is the vastly greater explosive force of billions of men living ever closer to the edge of famine.

It is inconceivable that this last great resource of our planet should not ease the grip of poverty and hunger on much of the Earth. And how tragic it will be if a few centuries hence, these vast oceans that nourish life should become the instrument of death, a not impossible end. Could those of our early settlers who first viewed the Great Lakes possibly imagine a day—a few short years in the sweep of history—when Lake Erie would become a lifeless testament to the unbridled depredations of men and machines? And, if they had foreseen such consequences, would they then have sought a rule of law to control the license of man? As we view the now abundant oceans around us, it is something to think about. The answers, one way or the other, may not be long in coming.

PROCLAMATIONS CONCERNING UNITED STATES JURISDICTION OVER NATURAL RESOURCES IN COASTAL AREAS AND THE HIGH SEAS

[Released to the press by the White House September 28, 1945]

The President issued two proclamations on September 28 asserting the jurisdiction of the United States over the natural resources of the continental shelf under the high seas contiguous to the coasts of the United States and its territories, and providing for the establishment of conservation zones for the protection of fisheries in certain areas of the high seas contiguous to the United States. The action of the President in regard to both the resources of the continental shelf and the conservation of high-seas fisheries in which the United States has an interest was taken on the recommendation of the Secretary of State and the Secretary of the Interior.

Two companion Executive orders were also issued by the President. One reserved and set aside the resources of the continental shelf under the high seas and placed them for administrative purposes, pending legislative action, under the jurisdiction and control of the Secretary of the Interior. The other provided for the establishment by Executive orders, on recommendation of the Secretary of State and the Secretary of the Interior, of fishery conservation zones in areas of the high seas contiguous to the coasts of the United States.

Until the present the only high-seas fisheries in the regulation of which the United States has participated, under treaties or conventions, or those for whales, Pacific halibut, and fur seals.

In areas where fisheries have been or shall hereafter be developed and maintained by nationals of the United States alone, explicitly bounded zones will be set up in which the United States may regulate and control all fishing activities.

In other areas where the nationals of other countries as well as our own have developed or shall hereafter legitimately develop fisheries, zones may be established by agreements between the United States and such other states, and joint regulations and control will be put into effect.

The United States will recognize the rights of other countries to establish conservation zones off their own coasts where the interests of national of the United States are recognized in the same manner that we recognize the interests of the nationals of the other countries.

The assertion of this policy has long been advocated by conservationists, including a substantial section of the fishing industry of the United States, since regulation of a fishery resource within territorial waters cannot control the misuse or prevent the depletion of that resource through uncontrolled fishery activities conducted outside of the commonly accepted limits of territorial jurisdiction.

As a result of the establishment of this new policy, the United States will be able to protect effectively, for instance, its most valuable fishery, that for the Alaska salmon. Through painstaking conservation efforts and scientific management the United States has made excellent progress in maintaining the salmon at high levels. However, since the salmon spends a considerable portion of its life in the open sea, uncontrolled fishery activities on the high seas, by nationals of either the United States or other countries, have constituted an ever-present menace to the salmon fishery.

The policy proclaimed by the President in regard to the jurisdiction over the continental shelf does not touch upon the question of Federal versus State control. It is concerned solely with establishing the jurisdiction of the United States from an international standpoint. It will, however, make possible the orderly development of an underwater area 750,000 square miles in extent. Generally, submerged land which is contiguous to the continent and which is covered by no more than 100 fathoms (600 feet) of water is considered as the continental shelf.

Petroleum geologists believe that portions of the continental shelf beyond the three-mile limit contain valuable oil deposits. The study of subsurface structures associated with oil deposits which have been discovered along the Gulf coast of Texas, for instance, indicates that corresponding deposits may underlie the offshore or submerged land. The trend of oil-productive salt domes extends directly into the Gulf of Mexico off the Texas coast. Oil is also being taken at present from wells within the three-mile limit off the coast of California. It is quite possible, geologists say, that the oil deposits extend beyond this traditional limit of national jurisdiction.

Valuable deposits of minerals other than oil may also be expected to be found in these submerged areas. Ore mines now extend under the sea from the coasts of England, Chile, and other countries.

While asserting jurisdiction and control of the United States over the mineral resources of the continental shelf, the proclamation in no wise abridges the right of free and unimpeded navigation of waters of the character of high seas above the shelf, nor does it extend the present limits of the territorial waters of the United States.

The advance of technology prior to the present war had already made possible the exploitation of a limited amount of minerals from submerged lands within the three-mile limit. The rapid development of technical knowledge and equipment occasioned by the war now makes possible the determination of the resources of the submerged lands outside of the three-mile limit. With the need for the discovery of additional resources of petroleum and other minerals, it became advisable for the United States to make possible orderly development of these resources. The proclamation of the President is designed to serve this purpose.

POLICY OF THE UNITED STATES WITH RESPECT TO THE NATURAL RESOURCES OF THE
SUBSOIL AND SEA BED OF THE CONTINENTAL SHELF¹

(By the President of the United States of America)

A PROCLAMATION

Whereas the Government of the United States of America, aware of the long range world-wide need for new sources of petroleum and other minerals, holds the view that efforts to discover and make available new supplies of these resources should be encouraged; and

Whereas its competent experts are of the opinion that such resources underlie many parts of the continental shelf off the coasts of the United States of America, and that with modern technological progress their utilization is already practicable or will become so at an early date; and

Whereas recognized jurisdiction over these resources is required in the interest of their conservation and prudent utilization when and as development is undertaken; and

Whereas it is the view of the Government of the United States that the exercise of jurisdiction over the natural resources of the subsoil and sea bed of the continental shelf by the contiguous nation is reasonable and just, since the effectiveness of measures to utilize or conserve these resources would be contingent upon cooperation and protection from the shore, since the continental shelf may be regarded as an extension of the land-mass of the coastal nation and thus naturally appurtenant to it, since these resources frequently form a seaward extension of a pool or deposit lying within the territory, and since self-protection compels the coastal nation to keep close watch over activities off its shores which are of the nature necessary for utilization of these resources:

Now, therefore, I, Harry S. Truman, President of the United States of America, do hereby proclaim the following policy of the United States of America with respect to the natural resources of the subsoil and sea bed of the continental shelf.

Having concern for the urgency of conserving and prudently utilizing its natural resources, the Government of the United States regards the natural resources of the subsoil and sea bed of the continental shelf beneath the high seas but contiguous to the coasts of the United States as appertaining to the United States, subject to its jurisdiction and control. In cases where the continental shelf extends to the shores of another State, or is shared with an adjacent State, the boundary shall be determined by the United States and the State concerned in accordance with equitable principles. The character as high seas of the waters above the continental shelf and the right to their free and unimpeded navigation are in no way thus affected.

In witness whereof, I have hereunto set my hand and caused the seal of the United States of America to be affixed.

Done at the City of Washington this 28th day of September, in the year of our Lord nineteen hundred and forty-five, and of the Independence of the United States of America the one hundred and seventieth.

HARRY S. TRUMAN.

By the President:

DEAN ACHESON,

Acting Secretary of State.

Senator PELL. Moreover, I should point out that, during Congress' consideration of both the Submerged Lands Act and the Outer Continental Shelf Lands Act, some years ago, the same basic definition as noted above, was used repeatedly. For example, and with respect to the latter legislation, Senate report 411 of your own Committee on Interior and Insular Affairs stated:

The Continental Shelf is defined as the extension of the land mass of the continents out under the waters of the ocean to the point where the slope leading to the true ocean bottom begins. This point is generally regarded as a depth of approximately 100 fathoms, or 600 feet, or more or less.

¹ 10 *Federal Register* 12303.

Mr. Chairman, I make reference to these examples simply to try to point out that even the most cursory reading of the history of the Continental Shelf doctrine stresses the importance of the 200-meter criterion as delimiting the seaward boundary of that offshore zone over which the coastal State may exercise exclusive jurisdiction in terms of exploiting the natural resource within the zone.

Now, in coming to grips with the so-called "exploitability test" of the Geneva Convention on the Continental Shelf, I think that the following factors must be kept in mind:

1. This test was incorporated in the convention primarily, if not exclusively, to satisfy those nations not endowed with an acceptable expanse of shelf area; namely, the west coast nations of South America:

2. In 1958, offshore recovery of oil and gas was not possible in more than 30 meters of water, indicating that at the time the convention was signed, the 200-meter criterion was certainly the more significant in terms of defining the seaward limit of coastal state authority over seabed resources; and

3. During the Geneva Conference on the Law of the Sea, the conferees rejected the repeated attempts of the Latin American nations to substitute more expansive terms, such as "Continental Terrace" for the more restricted concept inherent in the term "Continental Shelf."

And here, Mr. Chairman, I must emphasize the shell game in which, I believe, the oil industry has been engaged in the past few years: when you and I went to school, continental shelf meant that portion of the submerged continental land mass that is in relatively shallow water and terminates at the beginning of the continental slope. The oil industry has thrown up a smoke screen by trying to equate the continental shelf with the continental terrace concept, which includes the slope.

Senator METCALF. Well, I am afraid, Senator Pell, that when I went to school I took very little interest in whether it was the Continental Terrace or Continental Shelf, or what it was. And I think most of the people of America weren't very much concerned in those days.

Senator PELL. Perhaps, but I think everyone who took a basic course in geology before World War II and was asked what is the Continental Shelf, would have said the shelf is that relatively shallow area that goes out until the continental slope begins.

Now, the oil industry has done a marvelous job in throwing up a smoke screen aimed at equating the Continental Shelf with the Continental Terrace. And this I think is part of the problem, trying to get people to recognize and appreciate the difference between the two. As a result of the oil industry's barrage of words, many people have come to view the Continental Shelf as the Continental Terrace, and they have a tendency to read Continental Terrace when the shelf is referred to in agreements of 10 years ago. But as I said earlier, the shelf is distinct from the terrace, which includes not only the Continental Shelf but the Continental Slope as well.

In view of these considerations, it is clear to me that the exploitability test was never intended to permit the extension of coastal State jurisdiction over seabed resources beyond the Continental Shelf. My proposal recognizes such intent and simply substitutes the maximum depth of the Continental Shelf for its conventional average depth. While this and similar proposals were rejected during the 1958

Geneva Conference, the record of the conference indicates that there was considerable support for these proposals, and in view of our advancing marine technology, I strongly believe that the 550-meter formulation is deserving of another try.

In addressing the boundary issue, I would also like to point out that my proposals deal effectively with the so-called island problem, by stipulating that in no case shall a Continental Shelf zone be allowed to encompass an area greater than the area, exclusive of the territorial sea, of the state or island to which it is adjacent. With this provision, I have tried to get around the impossible situation in which there are small islands like St. Pierre and Miquelon which might be able to claim a Continental Shelf area many times their own size.

I think this is a practical proposal and one that should be considered thoroughly during any international discussion of the Continental Shelf boundary question.

Another practical consideration is that relating to the location of the Shelf boundary in terms of the total area that would be brought under coastal state authority, as versus being brought under the administrative control of a single international licensing authority. For example, the Library of Congress reports that the difference between drawing the boundary at the bottom of the continental slope—that is where the oil industry would like it—as versus drawing it at the 200-meter isobath would be to have an additional 20 percent of the total ocean floor brought under coastal state jurisdiction. The point I want to make is that, it seems to me that our business interests, for the most part, would prefer to have the maximum area possible under the administrative control of one authority as opposed to have to continue to deal with 10-odd coastal states each prescribing its own rules and regulations.

In this connection, it might be well to point out that the United States has but 6.1 percent of the world's Continental Shelf, and we have but 6.5 percent of the combined shelf and slope areas worldwide. Thus the larger the offshore zone we contemplate bringing under our national jurisdiction means that on balance we are closing off a much larger zone worldwide, assuming as we must that other states would be entitled to claim a similar area. In view of our leadership position in ocean-related industrial activities, I should hope that this consideration would be weighed very carefully by the members of this subcommittee.

Now, Mr. Chairman, if you will bear with me. I would like to give you my views on the boundary controversy as it continues to exist within the executive branch. Having watched this controversy develop in intensity, particularly within the last year, I must say that I have learned to thoroughly respect the political muscle which the petroleum industry—working through the National Petroleum Council—is capable of exerting on this administration. In view of the NPC's quasi-official status with respect to reporting to the Secretary of the Interior, the petroleum industry has been able to block any administration decision on the boundary issue which is not in accord with that position which the industry has put forward—namely, an up-dated "Truman proclamation" asserting unilaterally U.S. jurisdiction over the adjacent seabed out to the deep ocean floor.

While the administration has not taken an official position on the NPC's recommendation, the lack of a decision on the boundary question clearly works to the advantage of the petroleum industry—given the rapid strides being made in technology and the eagerness of the developing countries, in particular, to lay claim to potential offshore “gold mines.”

While the National Petroleum Council ascribes its recommendation exclusively to serving the national interest—I hope, Mr. Chairman, that this subcommittee will consider the fact that the NPC's recommendation also serves to maintain the petroleum industry's favorable status vis-a-vis the advantages derived from the oil import quota program and the benefits received through foreign tax credits.

In both instances, the location of the Continental Shelf boundary is crucial to the maintenance of the industry's privileges on both of these issues: In the case of our import quota program, the closer the boundary is drawn to shore, the greater the amount of offshore oil which will then become subject to the quota. Thus the logical recommendation for the industry to make is to have the boundary located as far from shore as possible in order to have a greater amount of oil labeled as American oil, and I am sure that I need not remind the members of the subcommittee of the artificially high prices awarded American oil, as a result of the protection derived from the import quota program.

And in this connection I must cite another example of what I would call the oil industry's verbal shell game, because in the oil import program national security is often cited by the oil industry as being a reason for its preservation, but the Defense Department's view of national security—and after all they are probably the best able to interpret security requirements from a technical viewpoint—strongly oppose the wide Continental Shelf and states that from a defense standpoint, importance to the United States to have a narrow shelf. But this is lost sight of by the National Petroleum Council.

With respect to the foreign tax-credit issue, here, too, the industry's interests are best served, in their view, by a wide coastal zone, from the standpoint that in order to receive foreign tax credits and other benefits, such as writeoffs on intangible drilling costs, the U.S. petroleum industry must be doing business with a foreign government. In view of the apparent movement toward some form of international authority to license exploitation beyond the limits of national jurisdiction, the question arises, “Would the petroleum industry continue to receive its tax credit and expense writeoff benefits if its activities were being conducted under the administration of an international licensing authority?” Not wishing to face the risk of an unfavorable answer to this question and believing that even a favorable response would not secure any greater benefits than the industry already enjoys, the petroleum industry understandably wants to restrict, as much as possible, the size of the area over which any international authority would be granted administrative control.

Thus the greater the expense of the coastal State zone worldwide, the smaller the international zone—and the happier the petroleum industry.

Mr. Chairman, with these kinds of stakes at issue—stakes amounting to many millions of dollars annually for the petroleum industry—I think all of us can understand why the industry has mounted such a campaign to forestall any unfavorable decision on the Continental Shelf boundary issue. In view of the administration's unwillingness to say "no" to the petroleum industry, I think it is incumbent upon us in the Congress to force this kind of issue, and this is precisely what I have sought to do through the introduction of Senate Resolutions 33 and 92.

In offering these resolutions, one of which is in the form of a draft treaty, I realize that I have taken a rather unprecedented course of action, since usually we wait for treaties to come to us for ratification, but I think it important to make clear that I have taken this course of action, not with a view to breaking precedent, but rather with a view to prodding the executive branch into meeting its constitutional authority.

In this connection, let me assure you all that I have no delusions about my draft treaty in terms of providing the basis for future negotiations, but by the same token, I would hope that those charged with the treaty-making responsibility would give full consideration to the concepts contained in my proposal—many of which, I feel, have received exceptionally broad-based support throughout the U.N.'s continuing debate on the so-called seabed issue.

An example of what can happen if we don't move is the Canadian action to extend its jurisdiction 100 miles offshore for the purpose of pollution control. This is only one form of unilateral claims of jurisdiction and unless we reach agreement on a boundary and on international rules to govern such things as pollution beyond that boundary, others will follow Canada's move. The oil people were the first to object at the Canadian action, yet should their views on extending seabed jurisdiction to the continental margin be followed, it would confer on other States, as well as our own, in many cases more extensive rights than those now claimed by Canada in surface waters. Either we have an international agreement, or we have a multiplicity of conflicting unilateral claims.

Now, it has often been said that consistency is the mark of a small mind, but one requires a certain consistency in most respects. And if the oil industry cites national security in one instance, it can't ignore it in another. If the oil industry objects to Canada going out 100 miles for one purpose, it ought to object to similar action for other purposes. These are the problems that face us.

What I have sought to do as an individual—and I wish to acknowledge the courtesy and kindness of Mr. Bellmon in setting up the meeting with the National Petroleum Council and Mr. Abernathy, whom I like very much—is to try to convince the petroleum industry that they are better off with a narrow shelf. The important thing is for American industry and technology to have as wide a world in which to act and move. And when I talk to the people at the top levels in the oil industry, I always notice a more sympathetic hearing and a recognition of the long-term view than those who are in middle management positions and who are hired to block consideration of the narrow shelf concept.

This concludes my statement. I would be delighted to answer any questions that you may have.

Senator METCALF. Well, thank you very much, Senator Pell. You have been an outstanding leader in creating a discussion on this whole matter.

I certainly agree with you that the very lack of activity on the part of our administration has caused a proliferation of plans and programs and created such a situation as resulted in Canada extending its control over pollution to 100 miles.

It seems to me that if your committee and Senator Hollings' committee and this committee can accomplish anything it would be at least to get some sort of an administration policy upon which we can work and operate.

I have some questions, but I think that I would like to defer to my colleague, Senator Bellmon.

Senator PELL. Speaking of policy to be decided—

Senator METCALF. Yes, go ahead.

Senator PELL (continuing). I am reminded here of what happened during the Johnson administration—this has got nothing to do with partisan politics—the same situation arose in the previous administration with regard to the seabed disarmament issue. At that time there was a lengthy controversy in the administration and the arguments couldn't be solved at the NSC level. It finally went all the way to the President for decision. The present argument, it seems to me, is much the same: the Interior and Defense Departments are at loggerheads, the State Department continues to remain on the sidelines and for that reason it has to go to the President for decision.

Senator METCALF. That is right. This has to be determined at the presidential level.

Senator PELL. As I understand it, there are other matters under consideration there, but it can only be decided by him.

Senator METCALF. Senator Bellmon.

Senator BELLMON. Thank you, Mr. Chairman. I am sorry. Some constituents from Oklahoma came in at the last minute and I missed the beginning of your statement.

Senator PELL. You have heard it before.

Senator BELLMON. OK. I will be able to get it from the record when it is written. But, I might say that in checking at the White House this matter has already gone to the President. He has it on his desk but he unfortunately has not had much help really, I mean from his own staff in reaching a conclusion. They have just given him all the arguments and he is going to have to make a decision.

Senator PELL. That is what I mean, that he has got several pieces of paper in his hands, and only he can make this decision.

Senator BELLMON. Perhaps it can't be otherwise, but it is unfortunate that it has to happen.

Senator METCALF. Well, I want to concur. The Senator from Oklahoma knows, that this committee isn't concerned with a partisan program. What we are concerned with is having a definitive administration policy that we can support.

Senator BELLMON. And I think it is interesting, Mr. Chairman, that there seems to be agreement between Senator Pell and the leaders of

the oil industry that I have talked with, and that is they would like to see a policy worked out that makes it possible for those who wish to develop the resources of the Outer Continental Shelf to do so. Their concern is that if we are not careful we will wind up with some kind of an arrangement that will close off larger areas to technology that has been developed largely in this country. But the disagreement comes as to what system is best.

I don't agree with what I gathered from some of your statements that the industry's position is one that is necessarily selfish. Perhaps they do want to have the right to use the technology they develop, but the difference is which kind of a system will give them this opportunity best over the long run?

Senator PELL. Forgive me. There is nothing wrong with an industry having a selfish position. I think that is to be expected. I know my textile industry at home would have and any other industry has a selfish position. What I get upset about is when a particular industry occupies too strong a role in calling the punches in a particular Government department.

Senator BELLMON. Well, that was another point I was going to get to. As I heard your statement, I took it you were almost alleging that the National Petroleum Council had a great deal of influence in the administration.

Senator PELL. In my viewpoint the Interior Department is acting really as the lawyer for the industry in this particular issue.

Senator BELLMON. Well, I am not——

Senator PELL. I realize——

Senator BELLMON. Do you have any evidence that this is happening——

Senator PELL. I find no evidence to the contrary that any position that the oil industry wants, the National Petroleum Council wants, and when it comes to this international boundary issue, the industry's position is automatically backed up by the Department of Interior. In my own work for 2 or 3 years on this issue, I find the opposition is always from a combination of the oil industry and the Interior Department. They work together. They come into hearings together. It seems they have made a marriage. This is—it my subjective view. I can't say that they have signed a contract of matrimony, but I see no evidence to deter me from this view, and I would be delighted if you could put in the record any evidence to the contrary.

Senator BELLMON. Has this relationship existed under both administrations?

Senator PELL. Absolutely. No difference at all. Nothing to do with partisan politics here. It was just as close under President Johnson, maybe closer. I don't know.

Senator BELLMON. Well, of course, I wasn't around here then but I am a little surprised——

Senator PELL. I said the same thing then, too.

Senator BELLMON. I undersand. Of course, you know my close association with Mr. Abernathy who is head of the NPC, and I really think these people are men of the highest possible motive.

Senator PELL. I completely agree with you. I think you were there during our conversation, and I think you could see how we were com-

municating, but my point is that the fellows whom we need not name, but you recall the gentleman who came with them to lay out a smoke-screen—actually, I forgot his name—Olmstead, that was his name, I think. But when you communicate with the industry leaders, you can see that they realize that their interests are served by having the largest seabed area, as you said earlier, open to American ingenuity and technology. And I think that their views are not always reflected by their subordinates.

Senator BELLMON. Mr. Chairman, I am not sure what your plans are for future hearings, but it might be worthwhile to get some of the top management from these companies and from the organizations in to see what their opinions are.

Senator PELL. I think you ought to get people like Mr. Abernathy and Mr. Jamison, but not the fellows next down the line.

Senator METCALF. Well, Senator Bellmon, you and I have worked together in trying to make this an informative and exploratory hearing rather than just find out something on the passage of one bill or one resolution. So, as we can fit it in with the full committee schedule I will be delighted to have the people of the oil industry up here. I think they will make a significant contribution. We had some of their representatives, of course, when we had the two lawyers from the American Bar Association. But I think that your suggestion is good and Senator Pell's suggestion is good as to Mr. Abernathy.

Senator STEVENS. I, of course, find myself diametrically opposed to my good friend from Rhode Island. You know, I spent about 4 years down there at the Interior Department and worked with the NPC, and I think you should see some of the fights from the other side sometime. But I am amazed really at your conclusion because as I understand it the American Bar Association takes the same point of view as the NPC, and the International Court of Justice reached the same conclusion in effect that there was an extension of national jurisdiction as far as the land mass is concerned, and yet you assume that because the Interior Department and the NPC agree with the American Bar Association and International Court of Justice that there is some collusion. I would say that maybe someone is out of step but it is not them.

Senator PELL. There is no collusion. It is just merger of interests. But I think the ABA position—and I am not a lawyer here so I am getting in deeper water than I should probably—but my recollection—

Senator METCALF. You are off the slope and into the depths, and into the deep water.

Senator PELL. Is that the ABA attorneys who presented the view in that particular committee, are connected with the petroleum industry in their private practices. Now, there is nothing wrong with that but it is an interesting fact. And I think if you will check—I will submit for the record the list of the committee and the attorneys. I don't have it with me. I probably should have. Could that be inserted in the record.

Senator METCALF. Yes.

(The material referred to is in the committee files.)

Senator PELL. And it will either show I am right or Mr. Stevens is right.

Senator STEVENS. That is an interesting thing. I have represented members of the oil industry in Anchorage in drawing title opinions on oil and gas leases. Does that mean that I represent the oil industry here?

Senator PELL. Well, I think quite honestly there is nothing wrong with it. I have a very strong bias toward the textile industry. I really do. And I think you have a perfectly natural bias toward the oil industry.

Senator STEVENS. I think you assume this.

Senator PELL. I have one in the textile industry. I admit it.

Senator STEVENS. Well, you know I don't think that—that is the unfortunate part of this—the extension of your views is the assumption that the oil industry has so many votes Senator Pell?

Well, we can explore that later.

Tell me, did you know that when we bought Alaska from Russia that the conveyance, the treaty included the land under the water out to the line which is the median point between the two continents coming through the Bering Sea? Are we to give that back to Russia or give it to the U.N.?

Senator PELL. First, we have to establish whether Russia had it to sell, and presumably it did. I think you will find that if the depth—and I think I am right in this—is less than 550 meters out to that median point; it wouldn't be affected by my treaty in the slightest.

Senator STEVENS. Well, back in the old whaling days, we seized, the United States seized, several sailing ships and whalers out there, and on the basis of our purchase condemned the ships and took them. As I recall they took the case to the International Court of Justice and the International Court of Justice at the time believed that it was an extension of the national jurisdiction, and as a result held that we were wrong, and our country at that time, our Nation at that time said we weren't going to abide by the decision of the International Court of Justice.

Senator PELL. They were talking about the high seas which is something quite different.

Senator STEVENS. It still was based on the fact of sovereignty at the time.

You criticized the Canadian action which incidentally Alaskans applaud. I applaud it. I think we have sat around too long and watched South American countries claim 200 miles and have everyone seem to be in a mad rush to give away rights that we have fought over in the past. I would say that without the jurisdiction that the Canadians have to control pollution, there would be no pollution control in the Arctic.

Senator PELL. But I think what you are doing is confusing the seabed with the high seas. The point you mentioned earlier when we seized several vessels in the high seas is very different from who has jurisdiction over the seabed itself. On the seabed, which is what we are talking about here, not the high seas—and again you are from Alaska, I am not, but my recollection is that the Continental Shelf there does not get deeper than 550 meters. So if my treaty were adopted, or this proposal or one of the proposals before President Nixon right now, it wouldn't affect your area in the slightest. Is that correct or not, sir?

Senator STEVENS. Not in the Bering Sea. It would off the Gulf of Alaska. Certainly it would affect some very serious claims as I understand it in terms of the Gulf of Alaska where we presently wish to have exploration. But you cite the Department of Defense and their position on this matter concerning the margin, and yet their position, as I understood their witnesses, is based upon the fact that if we claim the subsurface rights we will lose control over the surface as far as the right of free passage is concerned.

Senator PELL. We must be specific if we are going to debate this issue. First, on the Continental Shelf—and the record should show this—maybe one of us could submit for the record what portion of the shelf off Alaska at a depth of 550 meters.

Senator STEVENS. I will be glad to do that.

Senator PELL. Thank you. Now, second, the real argument of the Defense Department is because of SOSUS and other weapons, or defense systems that we have—

Senator STEVENS. But that is for the surface.

Senator PELL. No, forgive me. This is on the seabed.

Senator STEVENS. Seabed.

Senator PELL. Exactly. And if you listen to DOD, what they are most concerned about is—I don't want to go further here because we are getting into a classified area—but they want a narrow shelf so as to have access to as much seabed of the world as possible.

In this connection, DOD cites the problem of creeping jurisdiction which is what you were just talking about. And their point is that very often you find where you have sovereignty over the seabed it can creep up and include the water column above it. An excellent example of this problem may be seen in the airspace issue. Before 1900, before the Wrights invented their little machine, the airspace was considered beyond national jurisdiction, but as soon as airspace was considered of value, where you just didn't go unless you went in an airplane, then under creeping jurisdiction countries proclaimed sovereignty over the air column above them.

Senator STEVENS. Well, tell me who owns that property under your theory that is beyond national jurisdiction?

Senator PELL. As of now? Nobody owns it. There is no sovereignty. And this is why a crime committed on the seabed further out beyond the Continental Shelf of a nation, beyond the territorial waters—and sometimes the territorial waters can go farther than the Continental Shelf if it's a sharp one—no law applies.

Senator STEVENS. I hate to disagree, but that law applies as the law of the vessel—

Senator PELL. If there is a vessel involved I couldn't agree with you more. But in the seabed you don't have a vessel. You are talking about high seas.

Senator STEVENS. Well, if you are there, you must have got there by some means.

Senator PELL. Well, do you remember the Texas tower off of Great Britain where a murder was committed beyond the territorial waters? They knew who the murderer was but he could not be brought to trial because he pleaded that it was beyond the territorial limits of Great Britain. This happened just a few years ago. And this is one of the gaps that must be filled.

Senator STEVENS. You would, I take it, believe that that U.N. ought to have control over it, though, don't you?

Senator PELL. Not the U.N. itself. I think some agency in which we would be able to exert a strong role, like the International Bank. It would be an agency nearest akin really to the IBRD, in which we do play a significant role.

Senator STEVENS. We could go on for hours. I just can't understand your position and I can't understand your tax concepts.

Senator PELL. If you say you can't understand, I wish you would ask me to clear the record, because I want the record to be clear. I thought the statement was clear. What is it you don't understand?

Senator STEVENS. I don't understand—if you believe that there is no title today to this land that is out beyond national jurisdiction, there is no method of acquiring title, I don't understand why you oppose what the Canadians have done. I mean—

Senator PELL. Excuse me. I didn't necessarily oppose it. I commented on it. And I recognize in the frozen areas there is a greater pollution hazard. I am pointing out that "we" opposed, the American Government lodged a strong protest against what the Canadians did, and I am saying that from the viewpoint of our Truman proclamation and the doctrine that has been espoused along this line, there is nothing wrong with what the Canadians did. This is my view.

Senator STEVENS. Well, I agree with that. I think under the Truman doctrine it is entirely consistent, what the Canadians did. But on the one hand, you criticize the administration because they have no policy. On the other hand, you criticize them because they criticized the Canadians for doing something contrary to what the policy is.

Senator PELL. No; I am saying that what the Canadians did and has been strongly criticized by our Government I think should not be done. I think it should have been done under U.N. auspices in general, but it is no worse than what we have done ourselves—the actions we have taken as a government.

Senator STEVENS. Maybe "don't understand" is a bad phrase, Senator. I would say that I disagree with you so violently I can't understand your position. Maybe that is the best way to put it.

Senator PELL. Now, the other point, and I just want the record to be clear on is this. You said you didn't understand my tax points. What didn't you understand?

Senator STEVENS. I didn't understand in terms of your feeling as to the motivations of the oil industry to oppose the position you are taking of a tax disadvantage that you seem to believe that they would have under the present system as opposed to a tax advantage under your system.

Senator PELL. Right.

Senator STEVENS. I don't think that you can assume—since we have no U.N. body that has any taxing authority in this area, I don't think you can assume that the U.N. would not reach the same conclusion that the other States have in terms of taxing policy. It seems to be the one that is the most workable.

Senator PELL. I must not have explained this clearly. Let me give you an example of what I am driving at. When it comes to taxes paid abroad—let's use Saudia Arabia as a good example—there is a certain amount that is paid as rent or royalty. I think it is 12, 15 percent,

somewhere in that order. I don't recall the exact figure. And that is properly deducted as a cost of doing business. No criticism. In addition to that, what really is to all intents and purposes a "super royalty" is labeled a tax of around 50 percent is paid by, the American oil companies, and then passed on to U.S. taxpayers because the oil industry takes it as a full credit, and this is an advantage in the tax code that is there perfectly legally. I am not asking the oil companies to invoke charity on the United States and give it up. It is perfectly proper.

Now, I think we could find very likely that under a U.N. system you would have a full credit taken, but also under a U.N. system we could establish a maximum rent or royalty of 10 percent, 15 percent, no more; and this to my mind is fair. What I want to do is not only make sure more oil is available to the industry, but make sure the industry pays lower rents and royalties. The problem is they are not as interested in the second feature because they don't pay the 50-percent tax credit. That is paid for by us poor taxpayers.

So this is not a very good argument with them, but from a national interest viewpoint it is a darned good argument because it means we are not going to get raped by all these little countries as they get greedier and greedier and get us in there with our expensive equipment, which is exactly what is happening now.

Senator STEVENS. Well, maybe I—again, we apparently come from such diverse backgrounds. But as to a tax credit, in the first place, you have to have profit for it to mean anything.

Senator PELL. Right.

Senator STEVENS. In the second place—and that means you have to be making money. To an oil company that is losing money, a tax credit does nothing good.

But as a practical matter one of the things that makes the Mideast oil so cheap is the arrangement in terms of this type of operation as opposed to dealing with our own oil production where we have a different system of taxation and a different calculation. Yet, you would favor, I am sure, bringing in more of this oil as its pricing structure is affected by the very thing you criticize as opposed to what we call the expensive oil from our country, my State of Alaska, which is priced because of the circumstances that you are criticizing.

In addition to that, the U.N.—just a minute ago you said we could establish a 10- to 15-percent limit.

Senator PELL. Right.

Senator STEVENS. Well, if "we" means the United States, we have been highly unsuccessful in the U.N. as to establishing anything in the last few years. I don't understand how you can say "we."

Senator PELL. Because in establishing the definition of the regime, we will exert a strong role in the early days of it. We don't have to go ahead with it unless it is reasonably favorable. And I think we could get general agreement somewhat like we have in the Constitution. We have certain basic protection for the minorities. We believe in one man, one vote except in the Senate, and these things are built-in. And on that basis we could build in some top limit of rent or royalty never more than 10 or 15 percent, and I think this would be a terrific boon to technologically advanced countries like ours with strong oil industries.

Senator BELLMON. Would you yield?

Senator STEVENS. Surely. I am finished.

Senator BELLMON. This idea you have of this country setting up an upper limit on how much tax credit we would allow a company to take for production from the Outer Continental Shelf—

Senator PELL. No, no; I misexpressed myself. I was not setting forth any sort of thing. I am not suggesting that we should change the law in the slightest. I am just saying under the U.N. agency, the license granting authority, whatever you want to call it, there would be a top limit before we signed any agreement as to what the maximum percentage or rent or royalty to a U.N. agency would be.

Senator BELLMON. Would you feel under the tax laws there should be an upper limit on what we would allow the Saudia Arabians, for example, to charge as far as giving American companies a tax credit is concerned?

I am in agreement with the thing you are saying here. It seems to me totally unfair to have a company operating in another country where we perhaps pay the landowners a 12-percent royalty and yet we pay the Saudia Arabian Government, we will say, a 6-percent royalty, and we charge 50 percent of that as a direct tax credit. This to me is not equitable.

Senator PELL. I just am not—

Senator BELLMON. I am not either.

Senator PELL (continuing). Grounded in on the general tax laws to comment intelligently on that.

Senator METCALF. If you will yield—

Senator PELL. Yes.

Senator METCALF (continuing). Your proposal does not interfere with the tax laws of the specific States. You are talking about this international agency that you wish to create.

Senator PELL. Exactly. I think I misexpressed myself. I am not touching on any internal tax law now.

Senator METCALF. And the point you are making is that if there is a broad shelf then the internal tax laws would apply to a broad shelf, and if there is a narrow shelf there will be a greater area for the international agency to have its lower royalty payments available.

(Subsequent to the hearing the following clarifying letter was received:)

THE GENERAL COUNSEL OF THE TREASURY,
Washington, D.C., August 17, 1970.

HON. LEE METCALF,
Chairman, Special Subcommittee on the Outer Continental Shelf, U.S. Senate,
Washington, D.C.

DEAR MR. CHAIRMAN: In Deputy Assistant Secretary John S. Nolan's letter to you of January 22, 1970, he stated that, pursuant to your request, an explanation of the current tax and customs status of the outer Continental Shelf would be forthcoming at a later date. This letter is intended to fulfill that commitment.

TAX STATUS

It was brought to the attention of the Treasury Department over a period of time that a number of taxpayers were experiencing some difficulty in determining the U. S. tax consequences arising from continental shelf operations. On September 4, 1969, the Treasury Department, responding to that situation, recommended to the Senate Finance Committee that the tax status of continental areas be clarified.

In large part the problem was caused by an ambiguity in the relationship between the Internal Revenue Code of 1954 and the Outer Continental Shelf Lands

Act of 1953. The latter statute has been interpreted by some as a blanket extension of Federal laws to the outer Continental Shelf as though such submarine areas were within the external boundaries of the United States. On the other hand, the Internal Revenue Code, as enacted the following year and later amended, defines the term "United States" when used in a geographical sense to include "only the States and the District of Columbia". State boundaries do not extend beyond the territorial sea, except for domestic purposes in the case of Texas and the West Coast of Florida.

Because the United States taxes its citizens and corporations on their worldwide income, the definitional problem affects only those U. S. nationals and corporations with foreign source income, and non-resident aliens and foreign businesses engaged in continental shelf activities off the United States coast. The differences in their tax treatment can be substantial, depending on whether or not the U. S. shelf is considered to be within the United States for tax purposes, or whether or not a foreign continental shelf is considered to be within the adjacent coastal nation (or U. S. possession, which for many purposes in the Code is treated as a foreign country).

Treasury's recommendation contemplated an amendment to section 7701(a)(9) of the Code which would have enlarged the geographical definition of the term "United States" to include continental shelf areas for all federal tax purposes. The provision which was finally enacted—section 638 of the Code—is limited in application to income taxes (including withholding of tax on wages or salaries received for personal services performed on a mine, or oil or gas well located or being developed on the U.S. continental shelf) and, therefore, has a narrower scope. Nevertheless, most of Treasury's objectives in making its continental shelf recommendation were achieved, as follows:

(1) *Certainty.* Business needs a reasonably clear and predictable legal framework within which to make investment decisions. Where ocean mining is concerned, the risks of operating in a hostile ocean environment are considerable; additional uncertainties—about the tax consequences of such ventures, for examples—could cause the abandonment of projects of this kind that may be in the national economic interest. We believe that section 638 fulfills the responsibility of Government to lay down clear rules and, thereby, to permit better forward planning for offshore enterprises.

(2) *Equity.* Because of the uncertain state of the law prior to the enactment of section 638, it appears that a number of enterprises took whatever position on the tax status of the outer continental shelf was most advantageous to them. There is some indication, for example, that certain foreign contract drillers (some of them subsidiaries of U.S. companies) may have considered their earnings from U.S. continental shelf operations as beyond United States tax jurisdiction as exercised in the Code. Generally, where a U.S. contract driller is concerned, it makes no difference whether the shelf is considered within or without the United States for tax purposes, inasmuch as the United States taxes its nationals and corporations on their worldwide income. Consequently, a foreign driller incorporated in a country which taxes on a territorial, rather than global basis, would have had a clear competitive advantage over the American driller as long as he had not paid U.S. income tax on U.S. continental shelf income.

Similarly, section 911 of the Internal Revenue Code provides that a U.S. citizen who is present in a foreign country or countries for a period of 17 out of 18 consecutive months may exclude up to \$20,000 of his foreign earnings from U.S. taxable income. In the case of offshore employment, however, it was not previously clear that an individual's presence on a continental shelf rig off the coast of a foreign country could be counted for purposes of meeting the time requirement. The possibility existed, therefore, that a U.S. citizen working on a foreign mainland was entitled to better tax treatment than a U.S. citizen working on a foreign continental shelf.

Section 638 cures these kinds of problems by providing equality of tax treatment in similar circumstances regardless of the nationality of the taxpayer where U.S. shelf operations are concerned, and regardless of artificial distinctions between onshore and offshore operations abroad where U.S. citizens or corporations are concerned.

(3) *Exclusion of Fishing for Sedentary Species.* Sedentary species (such as sponge, clams, and abalone) constitute natural resources of the continental shelf under Article 2:4 of the Continental Shelf Convention and are, therefore, subject to the jurisdiction of the coastal nation. Under Public Law 88-308, foreign vessels are prohibited from fishing for sedentary species of the U.S. continental shelf,

except where specifically authorized by Executive Agreement or by the Secretary of the Treasury pursuant to a determination that granting permission to fish is in the national interest and that the State, Commonwealth or U.S. possession directly affected concurs. Executive Agreements were entered into with Japan and the Soviet Union in 1964 and 1965 respectively, permitting vessels of those countries to fish for king crab on the U.S. continental shelf.

Apparently, neither Public Law 88-308, nor the Executive Agreements negotiated under it, took into account U.S. income tax consequences. It was brought to our attention that imposing income taxes on Japanese and Soviet continental shelf fishing operations might cause certain problems in our foreign relations with those countries. In addition, the prevailing international practice is for fishing operations to be taxed on a flag basis. It was, therefore, concluded that foreign vessels, fishing for sedentary species on the U.S. continental shelf, should be exempt. Section 638 accomplishes this objective by limiting the statutory coverage to income and activities related to "mines, oil and gas wells, and other natural deposits." The term "natural deposits" does not include sedentary species.

(4) *Consistency with International Law.* In exercising tax jurisdiction under the new Code provision, we naturally did not want to exceed our rights and obligations under international law. Because there are a number of unanswered questions as to the seaward boundary of the continental shelf and the precise nature and scope of the coastal state's rights over continental shelf areas, it was decided that it would be appropriate to include a limitation in the statute to insure that the administration of the tax laws in this connection would be in accordance with international law. In practice, where there may be difficult international law questions, including the question of the seaward boundary of the "legal" continental shelf, the Treasury Department will consult with the State Department and other Government agencies having a direct interest in the issues presented.

CUSTOMS STATUS

Products taken from the seabed of the Outer Continental Shelf and brought into the United States are treated as not imported into the United States and, accordingly, not dutiable. Foreign goods transported onto installations built to exploit the natural resources of the Shelf are treated as imported into the United States and are dutiable. Consistent with these positions, fixed installations built to exploit natural resources on the Shelf are considered to be points in the United States for purposes of the application of the cabotage laws.

This position is based on two provisions of law. Section 4 (a) (1) of the Outer Continental Shelf Lands Act of 1953 extends the application of the jurisdiction and laws of the United States to the subsoil and seabed of the Shelf and to artificial structures built thereon for the purpose of exploiting the resources of the Shelf. Article 2, section 1, of the 1958 Geneva Convention on the Continental Shelf grants sovereign rights over the Shelf to the coastal states for the purposes of exploiting its natural resources.

Very sincerely yours,

SAMUEL R. PIERCE Jr.,
General Counsel.

Senator PELL. That is exactly what I am saying. And from—let's say Saudi Arabia—my recollection is it is a rather deep shelf that plunges into the Indian Ocean there. Yes, it is. But let's say it has a narrow shelf instead. Under my proposal—the 10 percent would be the top limit or whatever percentage we fix that would be paid to an international agency, and we would benefit by it. If it was a wide shelf, the Saudi Arabians would benefit by it.

Senator STEVENS. May I interrupt there?

Senator PELL. Certainly.

Senator STEVENS. I still don't understand how you can believe that an international organization which has a great impact on it from the noncoastal states is going to establish a tax policy or a royalty policy for the offshore areas which would be more beneficial to American industry today than the coastal states have been willing to establish for their own areas.

Secondly, I really don't understand how you can assume that it would be a tax benefit. How would the industry itself benefit from our permitting noncoastal States to have anything to do with offshore development? The history of the United States shows that. Look at the fight over the tidelands, the total fight over the tidelands.

Senator PELL. First with regard to the agreement, I think because of the position that we have—and we are the Nation most advanced as of now. That is not saying a hundred or two hundred years from now there may not be a more technologically advanced nation—and because of my own experience, drawing from my own experience—I think you can check this with anybody who has been at seabed meetings—the idea of the top limit of rent or royalty of 10 or 15 percent is one that would meet with general approval provided all the other pieces fell into place and it could be cemented into any agreement into which we entered.

Now, your second point about why should nonlittoral countries have anything to do with the seabed, it is the same thing with the development of outer space. When you get into the deep sea maybe a country like Austria would have some special expertise. I think as a general rule you are going to find that countries like Switzerland or Austria are not going to be very active in this field. It is going to be really the littoral countries like the United States, France, or the Soviet Union that are on the sea and are interested in its development.

Senator STEVENS. Well, our interests are there and I think that is one of the great reasons why we would oppose so violently giving those interests away.

Senator PELL. Not giving them away. I think we have to think in term of history, in the long term. And where we differ diametrically is I am saying the American oil industry, American interests and American security interests would be all better served by moving in the direction I advocate, and you say it would be worse served. This is a subjective opinion and the President is having to make this decision.

Senator STEVENS. Thank you.

Senator PELL. Fine.

Senator METCALF. Senator Hatfield?

Senator HATFIELD. Mr. Chairman, I am sorry that I was late and did not get to hear the first part of the Senator's comments. Claiborne, as I understand the 500 meters or 50 miles——

Senator PELL. 550.

Senator HATFIELD. 550—is based primarily on this matter of oil exploration and other minerals?

Senator PELL. No. My definition—the reason for 550 is that that it is the lowest depth at which the outer edge of the Continental Shelf occurs; the average depth is 200 meters.

Senator HATFIELD. We have been talking primarily about oil.

Senator PELL. Yes.

Senator HATFIELD. Perhaps other minerals. Do you feel that that line or that demarcation is totally unrelated to other resources such as fisheries, middle waters resources?

Senator PELL. Then we come to this point that was raised by Senator Stevens, the danger of what the Navy calls creeping jurisdiction. I think under my 550 you can't say it won't ever occur, but under my 550

there would not be the potential risk of closing off vast portions of the sea. I think we as a nation should fight creeping jurisdiction in every way that we can and keep the high seas as free as they can be.

Senator HATFIELD. But you have here then basically a line that you have established in your treaty of 550.

Senator PELL. Right.

Senator HATFIELD. The Defense Department doesn't want that.

Senator PELL. Forgive me.

Senator HATFIELD. Does it?

Senator PELL. The Defense Department infinitely prefers 200.

Senator HATFIELD. Yes.

Senator PELL. I think—put it this way. You better ask the Defense Department that question, but I am sure it prefers 500 to 3,000.

Senator HATFIELD. Yes. It would prefer the 200.

Senator PELL. It would prefer the 200.

Senator HATFIELD. To the 550?

Senator PELL. Absolutely. And what I have sought is a compromise here.

Senator HATFIELD. And, of course, it would prefer the 550 if the choices were 550 and 3,000.

Senator PELL. Yes.

Senator HATFIELD. But still its first preference is 200.

Senator PELL. Right.

Senator HATFIELD. Now, why don't you prefer 200?

Senator PELL. Frankly, in my heart, I guess I would. I am trying to do what is conceivable and practical, and I believe the 550 figure provides the basis for compromise.

Senator HATFIELD. But what is included in the 550 as, say, the difference between 200 and 550? What are you accommodating in that 550, say, in preference to 200?

Senator PELL. Well, under the 550 meter isobath you would have more shelf area under coastal State control. So that is one point where it does not quite fit in.

Secondly, I guess, I was trying to in this way reach a compromise to produce a figure with which the Department of Defense could live.

Senator HATFIELD. Compromise with who?

Senator PELL. With the oil industry.

Senator HATFIELD. With the oil industry. We are back to oil then, are we not, really?

Senator PELL. Right. They consider me as sort of bogey man, but, I think 550 would be more acceptable to them than 200.

Senator HATFIELD. We are still concerned here about the beds, the seabeds and oil primarily. It is an argument of oil.

Senator PELL. At this point it is oil but it also will be hard minerals before we are through.

Senator HATFIELD. Yes, eventually other minerals.

Senator PELL. At this point, oil.

Senator METCALF. I think that should be, the record of this committee has demonstrated that there are potentialities for recovery of hard minerals.

Senator HATFIELD. Yes, I understand, but at the moment we are most concerned as far as interest here and pressures and what have you, we are really focusing upon the oil industry.

Senator PELL. Oil and defense.

Senator HATFIELD. Oil and defense. Now, do you in your own mind—unrelated to the Defense Department, do you see a certain logic that would follow that if we are going to be concerned about one resource, say, at the seabed, namely oil in this case, that it would follow that we must, or that we could become concerned about other resources in the middle waters, namely the fish resources?

Senator PELL. Yes, the water column above.

Senator HATFIELD. Yes, the water column above, that that has a natural relationship, and therefore, if we can establish the validity of the argument that it should be at 550 for the sake of oil exploration, I who am more interested in fishery resources, should have the same then, should have the same ability to relate that to the fishery resources at the same level as we face the reality today of decimation of fishery resources by particularly the Russian fishing off the Oregon coast, the Washington coast and now the Korean—

Senator PELL. And now the Rhode Island coast.

Senator HATFIELD. And Rhode Island, and Alaska, and now the Korean, and now the Korean fishing interests? In my opinion we can not just arbitrarily divorce these two, the seabed resources and the middle-water resources or the column above that seabed. And I just want to make that point in the record, that I am concerned about oil in terms of our national need, and so forth, but I am also not just provincially concerned about the fishery resources, but I see the fishery resource here as a source of protein which is so fundamental to our whole national health and international health. And I think it is far more than just whether it is an economic interest on the west coast or in Rhode Island. I think it has truly an international significance at this particular time.

And I would like to just have the record show there is a relationship I think here between these resources.

Senator PELL. I would agree with you, and the particular danger of this here is the question of creeping jurisdiction.

Senator HATFIELD. Creeping jurisdiction?

Senator PELL. Yes.

Senator HATFIELD. Isn't that again a semantic, isn't that typical of many Defense Department semantics, that we are hearing about protective retaliation and some others but it still comes right down to the hard fact that if we want to claim jurisdiction at a certain line at the seabed level that it cannot be disassociated completely and made irrelevant to the column above it and the surface waters, middle waters, and what have you?

Senator PELL. Sure.

Senator HATFIELD. And the resources involved in those, and jurisdiction particularly? And we have moved from 3 miles out to 12 miles basically against the Defense Department's judgments and recommendations to establish jurisdiction on fisheries. That is why we moved to 12 miles. And we had eloquent evidence to do so, because here again there was just a decimation taking place of the fishery resources that was vital not only to our own country but to the world.

Senator PELL. I must say that we have found the Russians have been pretty conscientious when they make an agreement. The two violations that occurred off our coast, one was Canadian and one was, I think it was Spanish. I am not sure.

Senator HATFIELD. Well, after that conference that took place here in Washington to hammer out the zones that were set up and the agreements with the Russians, you are right, I think they have been very conscientious in observing these on the whole. But we haven't been able to reach on the basis of international agreement and treaty all of these countries that are dealing in the fishery resource.

Senator PELL. Just to carry your thought one step further this is why I am so sold on the sea grant college concept, because what we must do is treat the seas as just one more dimension of the land, treat fish as we treat cattle or fowl or food to be grown.

Senator HATFIELD. That is right. And I think in line with that—and I certainly commend your leadership in that sea grant college program in which Oregon State University has become one of the major centers—I would also add as an addendum to your comment that we can't be overcome by the vastness of the ocean in its per square footage or cubic footage without also recognizing there are deserts in the ocean. There are deserts in the ocean as it relates to fishery and other such life. We have come to assume the whole ocean is just jam packed full of life and resources. Like on the land surface of the globe there are deserts in the ocean.

Senator PELL. But the record should show that there are desert areas occurring more in the deep ocean than they are on the shelf and the slope.

Senator HATFIELD. That is right. And that is what makes our fishery resources to be conserved and looked upon as a conservation object rather than just an unlimited resource that so many people have thought it to be.

Senator PELL. And here is where the semantics enter—the semantic war that has occurred with respect to what we think of as shelf, the oil industry has gradually started supplementing with the continental terrace which goes all the way down to the bottom of the ocean floor.

Senator HATFIELD. Yes.

Senator PELL. And this is why the public as a whole is confused. And I think we ought to keep to the original definitions of shelf, slope, and terrace and then we know what we are talking about.

Senator HATFIELD. Although I think we have to get a better clarification of the criteria or the base upon which we are going to determine these, or at least in which we are going to give leadership, and that it has to be a broader base than for one particular mineral or one particular industry. And right now it appears that we are making adjustments to accommodate the oil industry, which in itself might be a good base, but I think it is too narrow. I think we have to consider many other resources that are involved in the same area which we are talking about, not try to make the seabed one jurisdiction and the middle waters another jurisdiction and the surface waters still another jurisdiction. It may be how we will try to end up, but I don't think it makes good sense.

Senator BELLMON. Mr. Chairman, could I ask one additional question?

Senator METCALF. Surely.

Senator BELLMON. I don't want to try to anticipate what Mr. Abernathy might say when he comes, but based on the conversations that we had, Senator Pell, one of his concerns is that if an international body is created to take jurisdiction over most of the Continental Shelf and other subterranean areas—

Senator PELL. Excuse me. It wouldn't be most of the shelf.

Senator BELLMON. But his concern is that if we get one international body having this jurisdiction, and for any reason this body would have an anti-American bias, which is entirely conceivable at this time, that this might prevent the use of American-developed technology throughout the entire zone that the international body controlled. And the feeling I think that you will hear from him is that as long as we have separate governments controlling these areas some of those governments will be progressive and wish to see development take place, and that those who have this technology will be able to work out satisfactory arrangements with those governments. Do you have a comment about that?

Senator PELL. This would depend on how tough the negotiating position we adopt is when we move into the creation of the agency that is involved, and I would think we would have to cement into it, or frankly not accept it, certain safeguards. And one of these would be as I suggested earlier a top limit on the rent or royalty. Another safeguard would be free access for the technology of any nation, not just our own, to be used anywhere in the area under control.

Senator BELLMON. How do you anticipate that such an international body might select which of the various interested parties would have access to a given area in case there was petition?

Senator PELL. What I have done is establish a first-come first-served rule, with a 10-year license being given for exploration, and you lose it if after that time you don't want to exert your right, like a homestead. And a 50-year or a 100-year lease. I haven't made up my own mind which is best, for exploitation open to renewal if all the policies have been followed. On the other hand, if two countries claim the same area at the same time, this is when you have to have some adjudicatory body that would decide which should really get it.

Senator BELLMON. And this would be the international—

Senator PELL. This would be the appellate board that we would have set up within the agency. Japan, and we might want the same thing, or two other countries might settle on the same thing, and I think there has to be some means of settling these disputes, but this would depend on the agreement that we make.

Senator BELLMON. That is all.

Senator METCALF. Senator Pell, Senator Hansen who was here and has taken an interest in attending most of the hearings and participated in the discussions had to go over to the floor when the Senate went back into session. I think the record should show that he was here and is interested and concerned in this matter.

Senator PELL. Very interested. We have had discussions on the Senate floor, and I agree with you. His interest is just about as strong as my own.

Senator METCALF. Senator Pell, in your remarks on the Senate floor of April 16, you stated that "the term 'continental margin' is not

synonymous with the term "Continental Shelf" and that the 1958 Geneva Shelf Convention "confers rights to no one in regard to the entire continental margin." Further, you said, "There are no such national rights."

The 1969 decision of the International Court of Justice regarding the North Sea dispute—which did not involve the seaward limits of the shelf—nevertheless was declaratory of the "inherent rights" of coastal nations to the natural resources of the seabed and subsoil which constitutes a "natural prolongation" of their land territory.

And a report of the American Bar Association, called to our attention—and you were present—by previous witnesses, spoke to the shelf-limits issue by stating that the legal Continental Shelf included "the submerged continental land mass."

Now, how do you square the opinion of the International Court of Justice and the American Bar Association report with your view that no nation has the right to explore and exploit the entire continental margin?

Senator PELL. I want to be sure that—I hope I am expressing myself correctly. My view is that any nation can exploit whatever it wishes on its own shelf. But there is disagreement on the term "shelf."

Senator METCALF. But you said there are no national rights.

Senator PELL. There are no national rights to the entire continental margin; national rights extend no further than the outer edge of the Continental Shelf.

Could you requote to me what I said on the floor?

Senator METCALF. You said on April 16 that the 1958 Geneva Convention "confers rights to no one in regard to the entire Continental Shelf." And then you said further, "There are no such national rights."

Now, don't you agree that, even under the 1958 convention and the decision in the North Sea case, there has been created national rights to this adjacent Continental Shelf?

Senator PELL. I think you are misquoting from my floor statement. But let me make it clear that there is no doubt in my mind that we have exclusive rights to the resources of the Continental Shelf; our rights, however, do not extend to the whole margin.

Senator BELLMON. Or so far as technology—

Senator PELL. This is the \$64 question because, under the median-line approach, you could go to the open sea, middle of the open sea, and what I am seeking to do is to stop this at 550 meters. If we wait, I think we will find that these limits will go right out to the midocean floor.

Senator METCALF. But there are national rights as of the present time, and what you are trying to do is circumscribe the national rights at 550 meters.

Senator PELL. This is what I am seeking to do. That is right. I think the Defense Department would do it at 200, and as of now the petroleum industry would want out to 2,500 to 5,000 meters depth.

Senator BELLMON. Mr. Chairman, may I ask one question?

Senator METCALF. Surely.

Senator BELLMON. I should know this, but have there been developments beyond the 550—

Senator PELL (interrupting). Yes.

Senator BELLMON (continuing). Did you go farther than 400 feet below the crust of the seabed?

Senator METCALF. I believe we had testimony on that.

Senator PELL. So the technology is already with us beyond 550 meters.

Senator STEVENS. That is the technology of the drill.

Senator PELL. It is not economical. It is what you call exploratory—

Senator METCALF. It was not economically feasible, but they did show the technology of the drill.

Senator PELL. I think the deepest operating well now—I don't know.

Senator BELLMON. 550 meters?

Senator PELL. I don't know. I should know the answer to this. I don't know.

Senator METCALF. Approximately 300 feet.

Senator PELL. I thought they had gone down further. I would think with our technology we soon would.

Senator METCALF. The practical technology is 320 feet. It is still within the 200 meter line?

Senator PELL, assuming your resolution as drafted, or your resolutions, were introduced into the General Assembly this fall and passed by a majority vote and the United States and the other technologically advanced nations voted against it, would the United States and the other nations which voted against it be bound by its terms, including those which provide for cutting off our shelf rights at 550 miles?

Senator PELL. No; and neither would they have the protections afforded by my treaty proposal.

Senator METCALF. Your treaty which sets up an international board would take it out of the jurisdiction of the United Nations General Assembly and create a special agency which in drafting you feel that we would have more authority. I thought you used a very good example for Rhode Island and Montana. We managed in the Constitution to preserve the fact that you can never change the Senate.

You would have a board where you could never change, without the consent of the United States, some of these rental agreements or some of these other things subject to which we are involved in the United Nations General Assembly with many of the nations over-riding our national interests?

Senator PELL. We would lock in the rent or royalty and certainly the basic rule so we could never be run over roughshod. I don't think you could lock in a permanent lease on a particular part of the seabed for a thousand years. But I think there would be certain safeguards and it would have to be supplied by many nations.

Senator METCALF. We would have to have Alaskan concurrence.

Senator PELL. And Alaskan concurrence, too.

Senator METCALF. They have more shoreline than almost the rest of the United States.

Senator STEVENS. We do; yes.

Senator METCALF. Now, the General Assembly did pass a resolution declaring a moratorium pending the establishment of an international regime.

Senator PELL. Which we either did not vote for or abstained from. I forget which.

Senator METCALF. Do you think that we should abide by this resolution and let our technology remain in abeyance until we have an international regime?

Senator PELL. No; I do not.

Senator METCALF. You didn't support the resolution?

Senator PELL. No.

Senator METCALF. I understand.

Senator PELL. I did not support the idea that technology should be halted, not developed, because you can never do that before we work out an agreement. I think bases should be granted, but we should also get an agreement as soon as possible.

Senator METCALF. But doesn't the fact that this resolution was voted, and the fact that this is a matter that you would support, partially point up the need for a definite administration discussion at the earliest possible date?

Senator PELL. For instance, Korea, you ought to see the map around Korea.

Senator BELLMON. Would you mind. Which Korea, North or South?

Senator PELL. South Korea.

Senator BELLMON. South Korea.

Senator PELL. South Korea has just divided up its whole offshore area, and you can look at the map—I will submit it for the record—if you like.

Senator METCALF. Please do.

(The information referred to follows:)

[From the New York Times, Mar. 16, 1970]

FOUR MAJOR OIL COMPANIES PLAN SOUTH KOREAN OFFSHORE SEARCH

SEOUL, South Korea, March 15.—One European and three American oil companies have entered a race for finding petroleum resources in offshore seas of South Korea where not a single drop of oil is now produced.

The companies are the Gulf Oil Corporation, Texaco, Inc., Chevron (Standard Oil of California), and Royal Dutch Petroleum.

They have won rights from the Seoul Government to explore and produce oil in the continental shelf off South Korea.

Texaco and Chevron, the joint owners of the Caltex group companies, were the last to obtain the right in an agreement signed here on Feb. 27.

Operating as partners in a joint venture with the Lucky Chemical Company of Korea, which will own only 20 per cent interests, they plan to begin the exploration in May in two designated offshore blocks, totaling about 80,000 square kilometers.

EARLIER AGREEMENT SIGNED

Gulf Oil made a head start as it signed its agreement with the Korean Government in April, last year. It completed the first reconnaissance seismic survey last November in the two blocks assigned to it.

The combined size of the Gulf blocks is about the same as that of the Caltex group. It plans to conduct a detailed survey this year.



The New York Times March 16, 1970
**Shading is offshore area
 where companies will drill.**

Royal Dutch was granted its exploration permit in January, this year. It is now making preparations to start a seismic survey in May in the remaining two blocks, totaling 71,000 square kilometers.

The oil companies are given eight years to find oil and may produce oil for 30 years after they have discovered petroleum deposits under the sea.

The exploration period may be extended by two extra years and the production period by 10 years.

They paid to the Korean Government a signature bonus ranging from \$400,000 to \$1 million as a price for the rights.

In addition, each company is obligated to provide scholarship and education grants amounting to \$50,000 each year during the exploration period.

In all three cases, the accords call for a 20 per cent equity participation by Korean interests, including the Government.

Royalty on oil produced is set at 12.5 per cent, and a 50 per cent tax is to be levied on company profits.

South Korean officials are hopeful that, with four of the world's leading oil companies participating in the search for offshore petroleum resources this country may become an oil producing state within a few years.

South Korea has been spending an average \$100-million a year recently to import crude oil from the Middle East and requirement for petroleum products are rising steadily.

SURVEY CONDUCTED

The country began to show interest in developing offshore oil resources in 1963, when the Geological Survey of Korea started a series of geological researches.

The nation's hopes were heightened when the survey, a Government agency, reported in November, 1968, that tertiary formations, presumed rich in oil and gas resources, had been found at two locations off Korea's west and southern coasts.

This was supported in a report by a group of scientists from the United States, Japan, Nationalist China and South Korea, who jointly conducted a geophysical survey in the Yellow Sea and the East China Sea for about seven weeks in October and November, 1968.

The survey was sponsored by the United Nations Commission for Asia and the Far East with the support of the United States Naval Oceanographic Office.

The paper, commonly known as the Emery Report, named after Dr. K. O. Emery of the Woods Hole Oceanographic Institution, at Woods Hole, Mass.,

who headed the survey team, said that the continental shelf in the Yellow Sea and the East China Sea may have one of richest oil reserves known to man. It recommended detailed seismic studies to be followed by drilling tests.

Since it required highly sophisticated techniques and substantial funds to explore and produce oil under the sea the Korean Government decided to rely on experienced foreign companies to do it.

About 10 companies expressed interest, and among them four were chosen.

Senator PELL. It is quite interesting. And this is what is happening—Indonesia is doing the same thing. All around the world these leases are being granted, sold by nations.

Senator METCALF. Now, in your Senate Resolution 33 you pointed to "threat of legal confrontation between nations of the world over ownership and jurisdiction of the bed of the deep sea and the superjacent waters, and the resources therein." As evidenced by the debate in the United Nations General Assembly and its Seabeds Committee, there is some disagreement about who has what rights in the deep seabed. But from reading Senate Resolution 33 I was unable to determine who in your view should own—that is your word, own.

Senator PELL. The seabed?

Senator METCALF. The deep seabed.

Senator PELL. Here what I am saying is that it is—I guess you lawyers know the difference between *res nova* and *res nullius* better than I do. I look on the deep seabed as being *res nullius*, owned by all and has to be somehow allocated, has to be somehow administered by some authority we all accept.

Senator METCALF. That would be an international authority.

Senator PELL. This would be an agency, not the United Nations, but a specific agency set up for the purpose under the U.N. umbrella.

Senator METCALF. Now, would this international authority acquire title to this deep seabed?

Senator PELL. If you are a trustee——

Senator METCALF. If you are a trustee you acquire title.

Senator PELL. If you are a trustee you have title to the property that you administer for the fiduciary.

Senator METCALF. It would be analogous to the title held by a trustee.

Senator PELL. Yes.

Senator METCALF. And after acquiring the title as a trustee then this international authority would have jurisdiction to issue licenses and charge reasonable fees, and so forth.

Senator PELL. Right. I am a little bit concerned about this idea of someone having title because——

Senator METCALF. Somebody has to have title somewhere along the line.

Senator PELL. You have to have title to administer something. I am just trying to think that one through.

Does anybody have title to outer space? Does anybody have title to Antarctica? I cannot give you answers myself.

Senator METCALF. We have an agreement on Antarctica.

Senator PELL. Sort of a pie agreement.

Senator METCALF. Yes. And I don't know—I think this question of title is going to arise and it arises for your own resolution when you talk about ownership, and it arises in your own statements when you

talk about legal rights. So somewhere we extend title out into the sea——

Senator PELL. What I am saying is that residual ownership of the deep seabed, to my mind, rests with all men, with mankind. The agency couldn't sell its title. The agency doesn't own it. It is administering it—I don't want it to sound like a utopia, but for mankind—for the benefit of man.

Senator METCALF. Yes. You say in your resolution "province of mankind."

Senator PELL. Right.

Senator METCALF. But you are saying now that mankind cannot assert its common heritage or assume jurisdiction over this province without some international agreement and an international complication.

Senator PELL. Right.

Senator METCALF. Now, when they have title or just authority to administer it is perhaps just an academic or a legalistic question.

Senator PELL. Right. You have to have an agency otherwise you would have anarchy, I would think.

Senator METCALF. Under subsection 4 of section 3 of your resolution you would provide for "the payment to the licensing authority of such fee or royalty as may be specified in the lease." Does this mean that a nation or one of its corporations will not be able to acquire the right to exploit the deep seabed unless it is willing to pay the royalty rate which the international licensing authority demands?

Senator PELL. Yes. And that would be a top limit of 10 or 5 percent.

Senator METCALF. If it is negotiated figure, it might be greater than 10 percent.

Senator PELL. I would like to see it built in and cemented. My own recommendation, if I were on the negotiating team, would be to have a top limit of a relatively small amount, because I think otherwise our industry would get raped.

Senator METCALF. But an American industry that was reluctant to pay that wouldn't get a license?

Senator PELL. Exactly.

Senator METCALF. Nor would a Japanese or a Russian industry?

Senator PELL. Exactly. And my idea of a fair rent or royalty which I said in the record several times would be in the neighborhood of 10 percent.

Senator METCALF. Now, under section 7 of your resolution you call for the establishment of a sea guard which would consist of men and ships donated by the nations of the world. This would be a U.N. navy.

Senator PELL. U.N. Coast Guard, U.N. sea guard. It is not a warmaking agency, it's a life-saving agency, a law-enforcement agency.

Senator METCALF. How many nations do you envisage would contribute to such a sea guard and willing to donate ships and men?

Senator PELL. I visualize it in the beginning, the first 10, 15, 20 years as being built probably around our own Coast Guard; maybe with the Japanese Maritime Agency; maybe with some Soviet contributions in it. After awhile I see it as being truly a U.N. sea guard with the agency itself, out of its revenues, buying the vessels and manning the ships.

Senator METCALF. Now, is this a U.N. sea guard or is it a sea guard subject to this corporation or special organization?

Senator PELL. This is left fuzzy in my treaty.

Senator METCALF. It certainly is.

Senator PELL. It would develop into eventually a U.N. sea guard but it would start out as an agency sea guard. But I have left that open ended.

Senator METCALF. It is a private navy for this international organization?

Senator PELL. Right. I would hope it would become—please don't use the word navy. It would be a private coast guard for this organization and would develop into a seagoing presence for the United Nations. Here I must say this is an idea of 25 years I have had since before the San Francisco Conference where I served, and at the San Francisco Conference I was assistant secretary of the Committee on Enforcement, articles 3, 4, and 5. We developed the military staff committee concept which had not been invoked because of the Russian intransigence, and this is—also in the back of my mind was the thought that perhaps this way we could get some kind of U.N. presence, that is, a true U.N. presence.

Senator METCALF. What would happen in the event of a confrontation between the U.S. Coast Guard and this international sea guard composed initially largely of American men and American ships?

Senator PELL. I would hope that would not occur, but you would have exactly the same situation as would happen now in a confrontation in the Middle East, say, Swedish troops working under the U.N. flag and a Swedish expeditionary force suddenly siding with either Israel or Egypt as they chose. It would be the same question.

Senator METCALF. My question is more in the realm of the possible than the confrontation in Israel or the Middle East with Swedish forces.

Senator PELL. I am evading the question. I think what would happen is, human nature being what it is, American citizens, although they have taken the ocean blue U.N. flag, would probably find their own national loyalty to prevail. This is what usually happens. I am not saying it should, but it is what usually does.

Senator METCALF. Well, I think we have had a very helpful and informative discussion today. And I think as one of the real leaders in this you have made a significant contribution both in your attendance and participation in your committee hearings and in your presentation of your point of view today. I congratulate you on your leadership and thank you for coming here today.

Senator PELL. I thank you. And I really thank you for the fairness and objectivity, which really bespeaks well of a formed judge with which you have run these hearings.

Senator METCALF. Thank you very much.

Senator Cook, as I understand, is unable to be here. He had anticipated being here, and he has a statement that we have all had an opportunity to look over. Unless there is objection, Senator Cook's statement will appear in the record at this point. And any questions about the statement will be submitted at another hearing.

(The statement follows:)

STATEMENT OF HON. MARLOW W. COOK, A U.S. SENATOR FROM
THE STATE OF KENTUCKY

Mr. Chairman: I am delighted to be able to appear before the Subcommittee on the Outer Continental Shelf to testify on the question of the seaward limits of our continental shelf.

Although I am not an expert on questions of international law and am not as familiar with the issue of the limits of the continental shelf as are the members of this distinguished subcommittee, I do have an interest in the matter. This interest stems from my membership on the Subcommittee on Oceanography of the Commerce Committee. The Subcommittee on Oceanography shares the interest of his subcommittee on America's stake in the oceans and the sea floor. Thus, I am delighted to be with you this morning to discuss with you the issue of the limit of our continental shelf.

As I understand it, the question before the subcommittee is: What is, or should be, the seaward extent of United States sovereign rights to explore and exploit the natural resources of the seabed and subsoil of our legal continental shelf?

As the 1953 Outer Continental Shelf Lands Act was silent on the question of the seaward limits of our continental shelf, we must turn—for our legal authority—to the 1958 Geneva Convention on the Continental Shelf. Article one of that convention specifies that the term "continental shelf" refers to "the seabed 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 of the said areas."

As I read this language, in order for a part of the seabed and subsoil to be recognized as part of the seabed and subsoil to be recognized as part of any coastal nation's legal continental shelf, it must be both exploitable and adjacent to its coast.

Further elaboration of these concepts was amply stated in a 1969 American Bar Association report which declared:

"We reaffirm our opinion that the concept of adjacency contained in the present Shelf Convention should properly be interpreted to include the submerged continental land mass. In the view widely held among our members, all of the submerged continental land mass is subject to national jurisdiction over its natural resources. In the view of a significant number of our members any part of this land mass will come within national jurisdiction as soon as it becomes accessible to exploitation."

These views are consistent with the opinion of the International Court of Justice which held, in its 1969 North Sea Decision, that the 1958 Convention on the Continental Shelf was declaratory of "inherent rights" of Coastal States to the natural resources of the seabed which constitutes a "natural prolongation" of their land territory.

In geological terms, the submerged natural prolongation of the continental land territory encompasses the continental margin which consists of the shelf, slope and rise.

This then is the area over which the United States enjoys the present or potential exclusive right to explore and exploit insofar as its natural resources are concerned. The United States should not forfeit these rights.

Looking at the shelf limits problem from the point of view of the value of the natural resources it contains, based on 1969 values, the estimated recoverable petroleum and natural gas in place between the 200 meter depth limit and the seaward edge of the continental rise is worth about \$745 billion. The living resources of the same area which constitute sedimentary species such as some species of crabs and lobsters are worth several million dollars. But these resources, unlike petroleum and natural gas, multiply each year and therefore may be harvested indefinitely. Thus, their value is not depletable—as is that of minerals—unless such species are over-fished.

The rationale behind preserving our exclusive rights to these resources is self-evident, as has already been made clear in the public record by members of this subcommittee. Accordingly, the United States should attempt to maximum the quantity of continental shelf natural resources to which it is exclusively entitled in light of the need to insure undisputed access to the natural resources necessary to sustain our national economic security.

If the natural resources of continental margin beyond the 200 meter depth limit were given away to the United Nations or some other international body

as some have proposed, the United States would not only lose its *exclusive* rights to explore and exploit the natural resources but might lose *all* rights to these resources. The United States, in order to gain access to the resources of its continental margin under such a scheme, could conceivably be forced to pay astronomical royalties to an international organization which could have the power to dictate when, where, and how—if at all—the United States would be permitted to recover the vitally needed resources of its continental margin.

Additionally, as members of this subcommittee have stated, the United States in exercising its rights under the Geneva Shelf Convention, should not take any action which would give rise to any valid accusation that the United States was interfering with the freedom of the seas.

Clearly, however, the freedom of the seas doctrine is separate and distinct from the doctrine of the continental shelf. As the Geneva High Seas Convention recognizes, the freedom of the seas doctrine applies to the rights of all nations to navigate and fish *on* the high seas, lay submarine cables and pipelines under the high seas, and fly *over* the high seas. The shelf doctrine, on the other hand, applies only to the rights of coastal nations to explore and exploit the natural resources of the continental margin adjacent to their coasts.

Finally, as some members of this subcommittee have stated, the question of deciding the seaward limits of the legal continental shelf should not be influenced by the excessive demands of some nations that the area of the deep seabed, subject to future agreed upon international rules for exploration and exploitation of deep seabed minerals, should also encompass the slope and rise of coastal nations' continental margins.

The question of developing such a deep seabed regime is another matter which I will not address at this time other than to suggest that such a regime should be developed in a manner which will be attractive to United States industry. The deep sea technology of the United States is the best in the world and its development should be encouraged.

In summary, Mr. Chairman, I strongly feel that the United States should not forfeit any of its rights—present or potential—to the natural resources of our continental margin.

Thank you for the opportunity to present my views to this distinguished subcommittee.

Senator METCALF. Now, I had anticipated that we have one further meeting at which the administration after long delay was going to come up with some sort of a position. We have twice postponed hearing administration witnesses at their request because as has been pointed out the State Department and Defense and Interior and others have all sent material—Commerce, all sent material to the President and apparently its on his desk and he is the one who has to make the decision. He has other matters on his mind right now and certainly I understand his position.

However, I am going to ask the staff to work with you, Senator Bellmon, and perhaps we can get Mr. Abernathy of the oil industry here, I will concur in Senator Pell's request that we don't have people from the middle management group; that we have somebody who can speak with prestige and authoritatively for the industry. So in between now and the time we hear the Government witnesses or don't hear them again for the third time, let us try to set up some day in which we can hear some of the oil industry people.

Senator STEVENS. Is the American Mining Congress going to be heard also?

Senator METCALF. They have been heard. The American Mining Congress has been heard, and the National Petroleum Council. Now, the administration has given its commitment that they would have their mystery witness here a week from today on the 27th.

Senator METCALF. We won't hold the hearings until we have an opportunity for Mr. Abernathy or one of your witnesses, Senator Bellmon, to appear.

Senator BELLMON. I am of the opinion that the administration won't be ready within a week, but perhaps they will.

I have very great doubt that Mr. BeLieu can commit the President.

Senator METCALF. I am not going to risk very much on my wager that the administration will be here on that date. However, the 27th will be kept open for them to appear if possible. Time is growing short. If we are going to have legislation we have to sit down and talk about it and discuss it and get it on its way through both Houses of Congress, perhaps the committee will have to go through and report without hearing a definitive position as far as the administration is concerned.

I feel that if that is the case we will report some legislation, ask for a departmental report within a short time which will bring it to another issue, but I know there are some people representing the various administration offices here, and I want the record to show that we urge some sort of a position to be presented to this committee because it is the desire of every member of this committee—and we have different ideas I know on it—but it is the desire of every member of this committee to work with the administration once they have a position.

Senator BELLMON. Mr. Chairman, may I inquire if it turns out that the administration is not likely to be ready by next Wednesday, could we at that time hear from Mr. Abernathy if he is available?

Senator METCALF. Surely. I would be delighted. We have the room reserved and the committee would be ready. Is that satisfactory, Senator?

Senator STEVENS. Yes.

Senator BELLMON. I don't know whether his plans will permit him to come, but I will advise him.

Senator METCALF. And you and I and our staffs will work that out.

Senator BELLMON. Yes.

(Letters asking for views and comments on OCS follow:)

APRIL 16, 1970.

HON. CLAIBORNE PELL,
*Chairman, Subcommittee on Ocean Space,
Senate Foreign Relations Committee, Washington, D.C.*

DEAR SENATOR PELL: The Special Subcommittee on the Outer Continental Shelf, Senate Committee on Interior and Insular Affairs, plans to recess its hearings on the Outer Continental Shelf boundary question in mid-May.

Before doing so, however, I feel that those who share our interest and jurisdiction in this matter should have an opportunity to present their views for the record. Therefore, I extend this invitation to you, and to Senator Hollings, Congressmen Bennett, Garmatz and Lennon.

If you, or someone authorized to speak for you, wish to testify before the Subcommittee, or would like to join the others in a panel discussion of OCS boundary issues, please let me know. Although, we are tentatively planning on 20 May for this hearing, this date can be changed to accommodate the schedule of those who wish to attend.

If you prefer to submit a statement for the record, we will appreciate having it.

Very truly yours,

LEE METCALF.

APRIL 16, 1970.

Prof. LEWIS M. ALEXANDER,
*Executive Director, Law of the Sea Institute,
 University of Rhode Island, Kingston, R.I.*

DEAR PROFESSOR ALEXANDER: As indicated earlier by telephone, I will appreciate your view regarding those Outer Continental Shelf Boundary issues which have been of interest to my Subcommittee.

In this regard, there is enclosed the published record of the first three hearings on this subject and the statements of the economists who testified at the 1 April hearings. Also enclosed is a copy of my 13 April speech on the Senate floor which will provide an assessment of the present status of the issue regarding the Administration position on this subject. As soon as this information is available, it will be provided to you.

Your comments may either be expressed in writing or presented in person before my Subcommittee. If you prefer the latter, the hearing scheduled for 13 May may be most appropriate if there are no conflicts with your schedule. In any event, please let me know your decision.

Very truly yours,

LEE METCALF.

Similar letters to:

Hon. Ernest F. Hollings, Chairman, Subcommittee on Oceanography, Senate Commerce Committee, Washington, D.C.

Hon. Charles E. Bennett, Chairman, Special Subcommittee on Sea Power, House Armed Services Committee, Washington, D.C.

Hon. Edward A. Garmatz, Chairman, House Committee on Merchant Marine and Fisheries, Washington, D.C.

Hon. Alton Lennon, Chairman, Subcommittee on Oceanography, House Committee on Merchant Marine and Fisheries, Washington, D.C.

CONGRESS OF THE UNITED STATES,
 HOUSE OF REPRESENTATIVES,
 Washington, D.C. April 22, 1970.

HON. LEE METCALF,
 U.S. Senate,
 Committee on Interior and Insular Affairs,
 Washington, D.C.

DEAR LEE: Thank you for your April 16 letter. I do share your interest in solving the problem of the Territorial Shelf and the Outer Continental Shelf boundary question. However, the Subcommittee which I have been heading in the House Armed Services Committee on Sea Power has also been holding hearings on this subject and I do not feel that it would be appropriate for me to act as Chairman of that Subcommittee and at the same time give testimony in another committee. The hearings in that committee which I chair have not yet been concluded. I hope you understand.

With warmest and kindest personal regards, I am

Sincerely,

Charlie
 CHARLES E. BENNETT.

A letter from Jack H. Abernathy, representing the National Petroleum Council, to Senator Metcalf, is on p. 472.

Senator METCALF. Thank you. The committee will be in recess until May 27.

(The committee recessed at 11:40 a.m., to reconvene subject to the call of the Chair.)

OUTER CONTINENTAL SHELF

WEDNESDAY, MAY 27, 1970

U.S. SENATE,
SPECIAL SUBCOMMITTEE ON OUTER CONTINENTAL SHELF,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The special subcommittee met at 10 a.m., pursuant to notice, in room 3110, New Senate Office Building, Senator Lee Metcalf, presiding.

Present: Senators Metcalf, Gravel, Stevens, and Bellmon.

Also present: Senator Claiborne Pell of Rhode Island.

Staff members present: Jerry T. Verkler, staff director; Stewart French, chief counsel; and Charles Cook, minority counsel.

Senator METCALF. The subcommittee will come to order. At previous hearings the special subcommittee on the Outer Continental Shelf has heard witnesses representing as many different views as available on the issue of our national policy on the seaward limit of our legal Continental Shelf.

Throughout the hearings, the subcommittee has attempted to bring forth all relevant facts and issues for consideration in an unbiased manner.

The conduct of today's hearings will continue to reflect this objective quest for facts. We are indeed pleased to receive today the long-awaited policy statement from the administration.

It would be appropriate that the record show both our concern and understanding of the difficulty in developing a national policy in this regard.

On April 13, 1970, I called attention to the fact that the yet unresolved issue of our national policy on the seaward limits of our legal Continental Shelf is at long last receiving the high level attention of the administration it so rightfully deserves.

That statement will be included in the record at the close of my remarks. It includes the fact that, at the request of a member of the President's staff, I postponed the scheduled hearings for the executive agencies for 2 weeks to give the administration time to develop a unified position.

(The document referred to follows:)

[From the Congressional Record, Apr. 13, 1970]

THE SEAWARD LIMITS OF OUR LEGAL CONTINENTAL SHELF

Mr. METCALF. Mr. President, the yet unresolved issue of our national policy on the seaward limits of our legal Continental Shelf is at long last receiving the high level attention of the administration it so rightfully deserves.

My Special Subcommittee on the Outer Continental Shelf has been holding hearings on this and related issues since late last fall. As our record will indicate

by both its volume and breadth of coverage, we have heard witnesses representing as many different points of view as available.

We were about to hear testimony from the interested agencies of the executive department and we had asked the Departments of the Interior and Defense to lead off on this past Wednesday, April 8. They were to be followed on April 22 by spokesmen for the Departments of Transportation and Commerce and the scientific community and on the 29th by Treasury and State.

On Tuesday, April 7, I was personally called upon by a member of the President's staff. I was asked to postpone our hearings until April 22 to give the administration time to develop a unified position. Upon being assured that there would be an administration position by that date, I agreed to the postponement.

Mr. President, I want to make it clear to the administration that the Special Subcommittee on the Outer Continental Shelf does not lightly consider the matter of the limits of the legal rights of the United States to explore and exploit the natural resources of our Continental Shelf. We expect the administration position to reflect the same careful and extended attention given this matter by members of the Special Subcommittee on the Outer Continental Shelf.

We of the subcommittee have yet to reach final agreement on all aspects of this complex issue. There are several major premises upon which I feel the U.S. position should be based. Among these are:

First. The United States should not forfeit any of the legal rights, present or potential, to the natural resources of the continental margin it enjoys by virtue of the 1958 Geneva Convention on the Continental Shelf.

Second. The United States should attempt to maximize the quantity of Continental Shelf natural resources to which it is exclusively entitled in light of the need to insure undisputed access to the mineral and petroleum resources necessary to sustain our national economic security.

Third. The United States, in exercising its sovereign rights to explore and exploit the natural resources of its Continental Shelf, should limit the character of its claims to the shelf in such a way as to avoid the valid accusation that we are asserting unilaterally any claim which would fly in the face of the customary freedom of the seas doctrine.

Fourth. The U.S. decision on the seaward limits of its legal Continental Shelf should not be couched in terms prejudicial to development by U.S. nationals of the mineral resources of the deep seabed beyond the continental margin.

Fifth. The decision of the United States regarding its legal continental Shelf boundary should not be influenced by excessive and unrealistic demands being voiced in some segments of the international community.

Mr. President, in summary, I feel that the Special Subcommittee on the Outer Continental Shelf has complied with the request from the White House that we postpone for 2 weeks our hearing of administration witnesses, with the understanding that by April 22 there will be a unified administration position. The special subcommittee will give that position every consideration under the criteria which represent what we believe to be in the national interest.

Senator METCALF. Apparently the administration underestimated the complexity of the issues involved, for once again on April 17, I was requested to delay the scheduled hearings. Although I am generally a patient man, I share the feeling of many of my colleagues that we have waited for this decision far too long already.

However, I would not like to be accused of forcing the administration to take an inadequately considered position that would be untenable in the future.

The administration was then granted one last delay and the hearing rescheduled for today. The administration's commitment to meet with the subcommittee on this date of their choice is contained in a letter of April 28.

This letter will also be inserted in the record.

(The letter referred to follows:)

THE WHITE HOUSE,
Washington, April 28, 1970.

HON. LEE METCALF,
U.S. Senate,
Washington, D.C.

DEAR SENATOR METCALF: I want to express our appreciation for your understanding acquiescence to our request that you reschedule the date for the appearance of an Administration witness before your Subcommittee on the subject of Continental Shelf legislation.

In accordance with our conversation, we shall be prepared to present the Administration's position before your Subcommittee on May 27, 1970.

With highest regards, I remain,
Most sincerely,

KENNETH E. BELIEU,
Deputy Assistant to the President.

Senator METCALF. We are privileged to have with us this morning Mr. Elliot Richardson, acting secretary, and Mr. John Stevenson, legal adviser to the Secretary, Department of State. We look forward to discussing with you the proposed administration position on the Outer Continental Shelf boundary issue.

Mr. Secretary and your counsel, we are delighted to have you present your statement and your testimony. As you heard the Senate is in session. Other committees are in session. I expect some of the other members of my committee, and we have invited Senator Pell, who is appearing at the present time before the Appropriations Committee, to appear with us and, later on, we hope to have other members of the committee.

STATEMENT OF HON. ELLIOT L. RICHARDSON, UNDER SECRETARY
OF STATE; ACCOMPANIED BY JOHN R. STEVENSON, LEGAL
ADVISER OF THE DEPARTMENT OF STATE

Mr. RICHARDSON. Thank you, Mr. Chairman.

I am pleased to have this opportunity to appear before the Special Subcommittee on the Outer Continental Shelf. Accompanying me is John R. Stevenson, legal adviser of the Department of State.

With the permission of the committee, I would like to have him sit with me at this table, since there will undoubtedly be questions that he will be better able to answer than I.

Senator METCALF. We are delighted to have you both here, and we have had Mr. Stevenson present at meetings of the committee, and know that he was preparing for just this hearing.

Mr. RICHARDSON. Thank you, Mr. Chairman.

I appreciate the patience you and the members of your subcommittee have shown in rescheduling your hearings while the administration was considering and arriving at a position on this difficult problem.

Last Saturday, the President announced an initiative which offers a modern and imaginative basis for settling the uncertainties regarding the exploitation of the seabeds.

It provides, for the first time in man's history, for an independent, substantial source of revenue for international community purposes, particularly economic assistance to developing countries.

The President made his proposal during the year in which the United Nations is celebrating its 25th anniversary. If we are successful in implementing the President's proposal I am confident that future generations will regard it as a significant example of leadership and farsightedness.

With your permission I would like to insert in the record at this point the President's statement in its entirety.

Senator METCALF. Then without objection, the President's statement will be incorporated at this point.

Mr. RICHARDSON. Thank you, Mr. Chairman.

(The statement referred to follows:)

STATEMENT BY THE PRESIDENT ON U.S. OCEANS POLICY, THE WHITE HOUSE, MAY 23, 1970

The nations of the world are now facing decisions of momentous importance to man's use of the oceans for decades ahead. At issue is whether the oceans will be used rationally and equitably and for the benefit of mankind or whether they will become an arena of unrestrained exploitation and conflicting jurisdictional claims in which even the most advantaged states will be losers.

The issue arises now—and with urgency—because nations have grown increasingly conscious of the wealth to be exploited from the seabeds and throughout the waters above, and because they are also becoming apprehensive about ecological hazards of unregulated use of the oceans and seabeds. The stark fact is that the law of the sea is inadequate to meet the needs of modern technology and the concerns of the international community. If it is not modernized multilaterally, unilateral action and international conflict are inevitable.

This is the time, then for all nations to set about resolving the basic issues of the future regime for the oceans—and to resolve it in a way that redounds to the general benefit in the area of intensive exploitation that lies ahead. The United States as a major maritime power and a leader in ocean technology to unlock the riches of the ocean has a special responsibility to move this effort forward.

Therefore, I am today proposing that all nations adopt as soon as possible a treaty under which they would renounce all national claims over the natural resources of the seabed beyond the point where the high seas reach a depth of 200 meters (218.8 yards) and would agree to regard these resources as the common heritage of mankind.

The treaty should establish an international regime for the exploitation of seabed resources beyond this limit. The regime should provide for the collection of substantial mineral royalties to be used for international community purposes, particularly economic assistance to developing countries. It should also establish general rules to prevent unreasonable interference with other users of the ocean, to protect the ocean from pollution, to assure the integrity of the investment necessary for such exploitation, and to provide for peaceful and compulsory settlement of disputes.

I propose two types of machinery for authorizing exploitation of seabed resources beyond a depth of 200 meters.

First, I propose that coastal nations act as trustees for the international community in an international trusteeship zone comprised of the continental margins beyond a depth of 200 meters off their coasts. In return, each coastal state would receive a share of the international revenues from the zone in which it acts as trustee and could impose additional taxes if these were deemed desirable.

As a second step, agreed international machinery would authorize and regulate exploration and use of seabed resources beyond the continental margins.

The United States will introduce specific proposals at the next meeting of the United Nations Seabeds Committee to carry out these objectives.

Although I hope agreement on such steps can be reached quickly, the negotiation of such a complex treaty may take some time. I do not, however, believe it is either necessary or desirable to try to halt exploration and exploitation of the seabeds beyond a depth of 200 meters during the negotiating process.

Accordingly, I call on other nations to join the United States in an interim policy. I suggest that all permits for exploration and exploitation of the seabeds beyond 200 meters be issued subject to the international regime to be agreed

upon. The regime should accordingly include due protection for the integrity of investments made in the interim period. A substantial portion of the revenues derived by a state from exploitation beyond 200 meters during this interim period should be turned over to an appropriate international development agency for assistance to developing countries. I would plan to seek appropriate Congressional action to make such funds available as soon as a sufficient number of other states also indicate their willingness to join this interim policy.

I will propose necessary changes in the domestic import and tax laws and regulations of the United States to assure that our own laws and regulations do not discriminate against U.S. nationals operating in the trusteeship zone off our coast or under the authority of the international machinery to be established.

It is equally important to assure unfettered and harmonious use of the oceans as an avenue of commerce and transportation, and as a source of food. For this reason the United States is currently engaged with other states in an effort to obtain a new law of the sea treaty. This treaty would establish a 12-mile limit for territorial seas and provide for free transit through international straits. It would also accommodate the problems of developing countries and other nations regarding the conservation and use of the living resources of the high seas.

I believe that these proposals are essential to the interests of all nations, rich and poor, coastal and landlocked, regardless of their political systems. If they result in international agreements, we can save over two-thirds of the earth's surface from national conflict and rivalry, protect it from pollution, and put it to use for the benefit of all. This would be a fitting achievement for this 25th anniversary year of the United Nations.

Mr. RICHARDSON. The President arrived at his decision only after lengthy and careful consideration of these difficult and important issues. The review of the problem actually began soon after Ambassador Pardo of Malta first introduced the seabed item into the U.N. General Assembly in the fall of 1967.

Extensive discussions were held among all of the interested department and agencies of the U.S. Government. The members of the executive branch benefited from the hearings held by this subcommittee, and by other committees and subcommittees of the Senate and House of Representatives, as well as from many private discussions with Members of the Congress.

We also had the benefit of numerous discussions with leaders of industry and representatives of various public groups. We found that the report of the Commission on Marine Science, Engineering, and Resources, established by the Congress, and reports prepared by the Secretary General of the United Nations were very helpful.

Also, as a participant in the U.N. Seabeds Committee and its predecessor, the Ad Hoc Seabeds Committee, we gained much from hearing the views of other countries.

I would like today to describe for you some of the details of the President's proposal, but before I do, I would like to say a word or two about the context and background of the proposal.

You will recall that in his report to the Congress of February 18, U.S. Foreign Policy for the 1970's, the President stated that "as man's uses of the oceans grow, international law must keep pace."

He said that the most pressing issue regarding the law of the sea is to achieve agreement on the breadth of the territorial sea to head off the threat of escalating national claims, and that it was also important to make progress toward establishing an internationally agreed boundary between the Continental Shelf and the deep seabeds and on a regime for exploitation of deep seabed resources.

He said further that we are working with others to channel the products of technological progress for the benefit of mankind, and the

President's proposal of May 23 is aimed at giving effect to these general considerations.

As the members of this committee are aware, the United States is already seeking a new Law of the Sea Treaty which would fix the limit of territorial sea at 12 miles with free transit through and over international straits, and would also give limited preferential fishing rights to coastal states on the high seas.

The President's new proposal regarding the seabeds beyond the territorial sea is an effort to close the gap in another part of the international law of the sea.

The proposal combines narrow limits of national sovereign rights over seabed resources with a pragmatic division of royalties and administration of the resources of the continental margin, and assures orderly development in the exploration and use of seabed resources beyond the continental margins.

The concept of an international trusteeship for coastal States is a new one. It is designed to insure the best possible use and sharing of the benefits derived from exploitation of the world's continental margins.

For the United States to propose a concept of broad extension of national jurisdiction would have indirect, but serious, national security implications and would impede the freedom of scientific research and other uses of the high seas.

On the other hand, it is improbable that coastal States would be prepared to agree to a 200-meter limit if no international trusteeship zone with a division of royalties and administration were included.

In discussing the President's proposal with you, I ask that you bear in mind that we are still working on many details. In developing scientific proposals on the international regime, we hope to work closely in consultation with interested Members of Congress and the public.

I would like to emphasize the underlying importance to the United States and the rest of the world of providing arrangements which will assure that activities on the seabeds in years to come can be conducted under a clear system of law respected by the members of the international community.

This in itself requires an evaluation of the interests and needs of a wide variety of nations, coastal and landlocked, and developed and developing.

The system accordingly cannot be designed to reflect the interests of any one nation or group of nations: The maritime and technologically advanced nations will doubtless supply the technology needed for seabed exploitation for some time to come; the nations with long and exposed coastlines, or the landlocked nations and others with relatively short or unexposed coastlines.

The President's proposal is based on a 200-meter limit for coastal state sovereign rights over the Continental Shelf beyond the territorial sea. This figure represents the point out of which coastal state sovereign rights over the natural resources of the seabed are undisputed.

It is the only figure mentioned in the Convention on the Continental Shelf. Its use maximized the area of the seabed which would be subject to a new international regime.

Its choice was also dictated by the difficulties involved in interpreting the adjacency and exploitability criteria of the Continental Shelf Convention.

The resolution of an issue of such overriding importance should not, in our view, be reduced to a series of legal arguments regarding the meaning of terms which have been interpreted differently.

Accordingly we are proposing that new and certain decisions be made.

Moreover, we have taken into account the changes in the international community which have occurred since President Truman issued his Continental Shelf proclamation in 1945.

The mechanisms available for international cooperation and international solutions to problems have vastly expanded since that time. The number of independent nations has greatly increased.

This is not only a quantitative but a qualitative change. The problem of promoting the economic development of these nations is one of the important items on the long-term agenda of the international community.

The treaty establishing the international regime would contain the general legal rules regarding exploitation of seabed resources beyond the 200-meter limit, including rules relating to matters such as preventing unreasonable interference with other uses of the ocean, protecting the ocean from pollution, assuring the integrity of the investment necessary for such exploitation, and providing for peaceful and compulsory settlement of disputes.

These rules would reflect the common interests of all nations.

Substantial mineral exploitation of this entire area would be used for international community purposes, particularly economic assistance to developing countries.

These revenues will be significant, of course, only if the formulas and rules used do not discourage investment and exploitation.

The proposal for establishing two types of machinery for authorizing exploitation of seabed resources, pursuant to the international regime is designed to provide a basis for avoiding problems of dual administration of single resource deposits within the continental margins and is intended to accommodate the interests of nations with long and exposed coastlines.

Coastal nations would be authorized then by the international regime to act as trustees for the international community in an international trusteeship zone comprised of the continental margins beyond the depth of 200 meters off their coasts.

This would include the continental slope and the continental rise, as well as the areas of the Continental Shelf which extend deeper than 200 meters. The coastal state would act pursuant to authority delegated to it under the treaty establishing the international regime and would be responsible for assuring adherence to general rules established by the treaty.

Within this framework it would as trustee for the international community, authorize and regulate exploration and exploitation of seabed resources within the trusteeship zone pursuant to its own laws and regulations. It would decide on who would be granted leases and of how long.

The conditions on which such leases would be granted subsequent to ratification would be consistent with and in addition to the general rules specified in the regime treaty. The treaty would make it the responsibility for the coastal state, as trustee, to prevent and punish violations of the general provisions of the treaty regarding exploration and exploitation of natural resources.

The agreed international machinery would perform many of the same functions with respect to the exploration and exploitation of natural resources beyond the continental margins. From a technical point of view, one would have to assume that certain functions would be performed under the international regime by individual states with respect to their nationals operating under authorizations from the international machinery.

An example of this would be criminal penalties.

The proposal for the interim period pending negotiation of the treaty is designed to assure two objectives. First, that exploration and exploitation of the continental margins and deep ocean floor continue.

Second, that mineral revenues from this area will be generated for international community purposes without waiting for agreement on an international regime.

The President has suggested that leases and permits beyond 200 meters be issued subject to the international regime to be agreed upon. The regime should accordingly include due protection for the integrity of investments made during the interim period.

What we have in mind are grandfather arrangements similar to those which were made with respect to areas in the Gulf of Mexico at a time when it was unclear whether particular States and areas were under the jurisdiction of the States or the Federal Government.

As the President stated, with respect to revenues, we would seek appropriate congressional action to make funds available under the interim proposal as soon as the sufficient number of other States indicate their willingness to join us.

Finally, we recognize that adjustments in U.S. import and tax laws and regulations will be necessary to avoid discrimination against U.S. nationals operating in the trusteeship zone off our coast or under the authority of the international machinery to be established.

These changes would be based on the approach used in our existing laws and regulations regarding Continental Shelf resources and high seas fisheries.

This, Mr. Chairman, and members of the committee, concludes my summary of the President's proposal. As you can see it is calculated to meet a number of competing interests, and does reflect very considerable and careful deliberations within the administration.

That concludes my prepared testimony. Mr. Stevenson and I would be glad to respond to questions of the committee.

Senator METCALF. Of course, Mr. Secretary, in the course of your deliberations you have discovered that there are many questions, and this is a matter of extreme complexity. I am going to start by asking for clarification of some of the President's remarks that are included in the Presidential announcement.

I have before me, and you very courteously provided it, a draft of the announcement. I have not compared the draft paragraph by paragraph and sentence by sentence with the final statement that you put in the record, but if I misquote, I hope you will correct me.

You say, or President Nixon said, that the stark fact is that the law of the sea is inadequate to meet the needs of modern technology and the concerns of the international community, and you referred in your statement to the President's foreign policy statement, that as uses of the ocean grow, international law must keep pace.

Now what are the inadequacies we are talking about?

Mr. RICHARDSON. I think twofold, principally, Mr. Chairman. First, there is no agreed international regime or set of rules for the exploitation of what is concededly the deep bed, and secondly, that there is suitable disagreement with respect to the area between 200 meters and the beginning of the deep seabed or the continental margins, and, of course, this latter uncertainty in turn can create problems with respect to the use of the waters above the continental margin.

Taking these things together, we have a situation which, in our view, makes it important that there be established an agreed international principle governing these areas.

Senator METCALF. Perhaps later on in your statement where you said the principle of exploitability and adequacy was not an adequate principle because it is subject to a lot of legalisms and debate, and we should take a whole new look at it?

Mr. RICHARDSON. Yes, Mr. Chairman, this is essentially what I had in mind in referring to the uncertainties attaching to the situation of the continental margin.

Senator METCALF. We have only talked about a depth of 200 meters. You mentioned that in your previous answer. Senator Pell and others, have suggested a combined depth-distance criteria. Why was that rejected?

Mr. RICHARDSON. Well, Mr. Chairman, the approach reflected in Senator Pell's suggestion would in effect draw the single line between the area of coastal state jurisdiction on the one side and the jurisdiction of the international regime on the other, and I take it, therefore, that it was the judgment that if the single line were to be drawn, it ought to be drawn along an isobath deeper than 200 meters in order to meet the claims of the coastal states, at least in part.

The proposal which I have just outlined and which has been made by the President deals with the claims of interest of coastal states in a different way, but I propose to create an intermediate zone, referred to as the trusteeship zone, and here the coastal state would have certain rights and responsibilities under the international regime.

So since the coastal states' interests are safeguarded in this latter way, it seemed reasonable to draw the margin of exclusive sovereignty of the coastal state more narrowly than the Pell proposal.

Senator METCALF. You bring up a question that I was going to ask. Most of the treaties governing territorial seas speak in terms of jurisdiction. In proposing an international zone off our coast, President Nixon has brought in the concept of trusteeship.

That is a concept that, at least in domestic law, and under Anglo-Saxon law has a basis of legal ownership as far as the trustee is concerned.

Why did you change from the term of jurisdiction to the term of trusteeship?

Mr. RICHARDSON. Well, Mr. Chairman, I think it is important to distinguish and sentence by sentence with the final statement that you put tinguish at the outset—I am sure it is clear to you and to the members

of the committee—between the international legal provisions applicable to territorial seas and on the one side and those applicable to the exploitation and exploration of the seabeds on the other, in the case of the seabeds, we were searching for a way of recognizing a broad and international interest on the one side and the opportunity to dedicate resources to all mankind, while on the other recognizing that there are very real and very legitimate interests on the part of the coastal states in the waters off their shores.

The concept of trusteeship is intended to reflect a sense of responsibility of the coastal states toward the nations of the rest of the world, and pursuant to the rules and regulations of an international regime, while recognizing on the other hand a scope for their own legitimate exercise of responsibility.

While as you point out, a trustee under Anglo-American law is the holder of title, here we are dealing, not with the evolution of a concept through the case-by-case elaboration of the common law, but rather with rights and responsibilities allocated by treaties as between the international regime and the coastal states.

Senator METCALF. Is the term "trusteeship" different in our evaluation and analysis of treaties than it is in our analysis of domestic law?

Mr. RICHARDSON. Well, take the trusteeship council of the United Nations in the role of a trustee exercising responsibilities to the trusteeship council. I don't think here we would expect to find a great deal of light on the relative roles and responsibilities of the trustee under the United Nations with reference to Anglo-American jurisprudence. The term "trusteeship" implies a responsibility entrusted, and here the coastal state would be entrusted by the rest of the world through the international regime with responsibilities, and so, therefore, we thought it was a descriptive word in the sense that it carried connotations of a responsibility, exercised for the benefit of all mankind.

Would you like to supplement this? Mr. Stevenson is a better international lawyer than I am, Mr. Chairman.

Mr. STEVENSON. I would like to reinforce what you said, that the concept here is that the treaty itself, which will be very carefully negotiated to reflect the responsibilities of the coastal state and the duties of the coastal state as well as the activities which the coastal state will regulate the treaty itself will be the guiding legal document here, and the terms of the coastal state's duties will either be set out or delegated in the treaty itself.

Senator BELLMON. Mr. Chairman, would you yield for one question?

Senator METCALF. Yes.

Senator BELLMON. It looks like we are renouncing all our claims and then we turn around and say we maintain the power of trustee and to some extent power of taxation. Are we not simply saying that we are willing to grant the international regime a portion of the revenues?

Is that not what we are accomplishing?

Mr. RICHARDSON. I would say it is more than that, Senator. The revenues would be divided between the international regime and the coastal states, and it depends on how you view the legal claims of the coastal states under existing international law, whether you consider that the coastal state is yielding revenue to the international regime or the other way around.

In any event, there would be a division of revenue. There would also be a division of regulatory responsibility, in the sense that the

international regime would establish broad rules for the Government's exploitation and exploration of the continental margin. The coastal State, within these broad rules, would apply and administer its own regulations, including the application of its tax and criminal laws.

So we would have in effect a division of rights and responsibilities somewhat analogous to the divisions of the rights and responsibilities as between the Federal Government of the United States and the States.

The international rules would be broader—the national ones would be more specific—and presumably the latter could not be in conflict with the rules of the international regime, but they could in any case go beyond them and supplement them and fill in the gaps.

Senator METCALF. Mr. Richardson, and Mr. Stevenson, when we go to the floor of the Congress, and begin to discuss legislation on this matter, most of us are going to interpret "trusteeship" in the way we have ordinarily interpreted it and analyzed it in our practice of law or our experience in business. You have already told us that there are vague words in previous treaties, "exploitation," "exploitability," and "adjacency," and so forth.

It seems to me that using a word of the art and a word that would have new connotations in domestic law, we are even getting ourselves into difficulty; we are changing the meaning of that word as far as international relations are concerned.

Mr. RICHARDSON. Well, Mr. Chairman, I can only say that what we are trying to convey by the word "trustee," what is generally understood by it, without necessarily carrying with it thereby all the specific applications that attach to them under Anglo-American common law.

As Mr. Stevenson has said, the specific issues are presumably issues that will be worked out in the legislative process of the Congress of the United States and in the international process of negotiating a treaty, as well as pursuant to the regulations that would be adopted pursuant to any treaty when it comes into force.

So that there would then be developed by that time a body of law which would certainly, in the first instance, be the body of law to which one would refer in answering questions.

Conceivably it could be true at that stage that one would also want to look beyond the rules and regulations for concepts one might find in Anglo-American jurisprudence, but that would be a secondary source.

I would emphasize finally that what we are really trying to do at this stage is to present an approach to dealing with the exploitation of the continental margin, which we think accommodates the broad range of interests referred to in my testimony, but we don't present it as a final, full blown, engraved in letters of gold approach, nor subject to a great deal of development.

Senator METCALF. What authority would the coastal state exercise in administering this trusteeship?

Would it be merely an act of the international authority designated by the international regime?

Mr. RICHARDSON. Well, it would be more than an act, in the sense that its powers would derive by treaty, and it would be safeguarded by treaty and not subject to revocation by the international regime.

The most important of its powers, perhaps, would be that of deter-

mining who, and under what conditions, should be allowed to exploit the continental margin. It seems to us fairly self-evident that a coastal state would wish to exercise the power of decision as to whether or not a license should be granted to a particular applicant, having in view the national antecedents of the applicant; having in view the relations between the coastal state and the nation; and we have felt, therefore, that to have proposed unilateral international control of such a decision as that would go too far in overriding clear interests of the coastal states.

Beyond this, the coastal state might well have stricter standards with respect to pollution, or with respect to the protection of the other natural resources, including fisheries, than the international regime might demand, and the coastal state under this approach would have the power to establish these stricter standards.

It would, in addition, have the power to collect royalties above the level established by the international regime, recognizing that if it chose to impose such additional royalties it might thereby impair its own competitive position as among other coastal states, but it would have the option whether or not to do this.

Mr. STEVENSON. I just want to supplement your statement at one point. This international regime would not deal with fisheries, except sedentary fisheries like king crab, and there would be, even with respect to those, there would be no royalty provision.

Those sedentary species, of course, are now dealt with under the Continental Shelf Convention.

Mr. RICHARDSON. What I meant in referring to fisheries was to suggest that a state, for the protection of its fisheries, might wish to establish stricter pollution standards applying to mineral resources exploitation than the international regime had seen fit to apply under its own broad regulations.

Senator STEVENS. My ears pricked up, Mr. Stevenson, and I am sure that Senator Pell would likewise have questions concerning that.

Am I to understand that you are saying that you are prepared now to let us assert a claim to king crab to the 200-meter line on the basis of national jurisdiction?

Mr. RICHARDSON. That would be the corollary of the adoption of this proposal.

Senator STEVENS. In other words, the administration is now prepared to extend the 12-mile limit to the 200-meter line?

Is that correct?

Mr. RICHARDSON. Mr. Stevenson, would you answer that?

Mr. STEVENSON. No, this is not correct. The Continental Shelf Convention deals only with so-called sedentary fish species, and we are simply applying then in this area the same principle that you have in the present Continental Shelf Convention.

Senator STEVENS. What are you trying to do? You are trying to bring together the Truman proclamation together with the Continental Shelf Declaration, so that the distance from our shore is the same as far as national jurisdiction over sedentary fisheries. Is that what you are saying?

Mr. STEVENSON. Sir, at the present time, the sedentary fisheries are governed out to 200 meters under the Outer Continental Shelf Convention. We are only dealing with the situation beyond there, and these would be the only species regulated by this.

Other fish would not be. This is applying the same principal in the international trusteeship zone that presently applies under the Continental Shelf Convention, sir.

Senator STEVENS. I want to make sure we understand each other. I had this map put up here. You see the blue area around our Aleutian chain. That is the 200- to 500-meter area, and that is where the king crab is. Are you saying that the administration is now going to say that with regard to the king crab we are going to limit your jurisdiction to the 200 meters, and beyond the 200 meters we are prepared to turn this over to an international regime?

Mr. STEVENSON. Beyond 200 meters, that would be covered by the international trusteeship, and under which the coastal State would be the trustee, and would have the authority to control—there is no provision in here for any sort of royalty on king crab as opposed to mineral resources.

The living resources would be dealt with in the same way as they are landward of 200 meters. The only point is that this regime would also put that species under the trusteeship of the coastal State.

Senator STEVENS. I interrupted here, Mr. Chairman, and—

Mr. RICHARDSON. That would depend on how you construe the existing convention.

Senator STEVENS. I would like to know how you construe it with respect to the action of 1969 of the U.N. General Assembly, which I understand the United States opposed, and it said that States and persons are to refrain from actions in the seabed, and so forth.

Now you are saying that we are trustees of the area beyond the national jurisdiction and we can go ahead and develop it; we don't owe anyone any royalty; but we are a trustee.

I am surprised to see that you are going to extend it to items such as our king crab. I don't think anyone else has king crab. You are really talking about Alaska in terms of this proposition right here, and I will have some substantial questions.

Mr. RICHARDSON. As long as we got into this, let me try to answer this by reciting some—restating this.

One, under clearly recognized principles of international law, we have jurisdiction with respect to sedentary marine life, at least out to 200 meters. The proposal under discussion here today made by President Nixon would extend coastal jurisdiction as far as the limit of the continental margin—in other words, the bottom of the rise—and to that extent it would enlarge jurisdiction subject to the trusteeship.

It would not—the only distinction between the king crab situation or petroleum is with respect to the imposition of a royalty.

The moratorium which you referred to earlier which we opposed in the United States bears on this only in the sense that we have felt that pending the establishment of an international regime, and the trusteeship proposal proposed here, or some other international trusteeship or treaty, that there should not be a complete moratorium on all exploitation beyond conceded national jurisdiction.

Senator METCALF. Would the Senator yield?

Mr. RICHARDSON. The consequence would be then either to completely stop such development or alternatively, stimulate the progression of wider, unilateral national claims.

Senator METCALF. There are areas on the Continental Shelf of the United States where the 200-meter line would come within 2 or 3 miles.

We have asserted our jurisdiction out to 12 miles. Does that mean we are going to abandon the 12-mile jurisdiction, and come in to 2, 3, or even less mileage than that.

Mr. RICHARDSON. No, Mr. Chairman. What I have said is all subject to the overriding determination of territorial jurisdiction out to 12 miles, so that the—

Senator METCALF. So we have a dual concept. We have 200 meters or 12 miles, whichever is the greater?

Mr. RICHARDSON. We have a dual approach from the outset in terms of jurisdiction or sovereignty over territorial waters and the regulation of rights and responsibilities in the seabed, and what we have proposed is the establishment by treaty of a limited territorial sea extended 12 miles.

This would carry with it sovereignty with respect to the land surface under the territorial seas as well.

So with respect to that part of the Continental Shelf lying within the 12-mile limit, the international treaty we are talking about here would not apply.

Its application begins in any case no nearer to the coast than the 12-mile limit.

Senator STEVENS. Would it be possible, Mr. Chairman, to use my State as a good example, and have the Department prepare a little map as to what happens to the national jurisdiction off Alaska, since we are talking about king crab and a few other things up there, to the 12-mile limit, and the 200-mile meter line, and particularly how you are going to apply it to the offshore islands?

For example what about Middleton Island? We have a proposal to lease the offshore lands now under the Outer Continental Shelf Act, and if you notice, the green portion that exists in the Gulf of Alaska, I am really not sure what you have done with Middleton Island under this proposal.

Mr. RICHARDSON. Senator Stevens, we would be very glad to provide a map appropriate with descriptive annotations for the benefit of the committee, and the State of Alaska.

We would, I think, be assisted by the understanding of the committee that the provision of such a map for Alaska would also serve the purposes of the rest of the committee. We at least would need to have some order of priority in the provision of maps if all the coastal States in the United States would request them.

We would be glad to do whatever the committee asks in this respect.

Senator STEVENS. I think the application of this doctrine is going to be most unique in the application of our State, as I understand it. I think it is going to be a challenge even to apply it to our State.

If you can apply it to our State, you probably could apply it anywhere in the world, but I don't believe you can apply it to our State.

Mr. RICHARDSON. We will be glad to accept that challenge, Senator Stevens, and Mr. Chairman, if that is the wish of the committee.

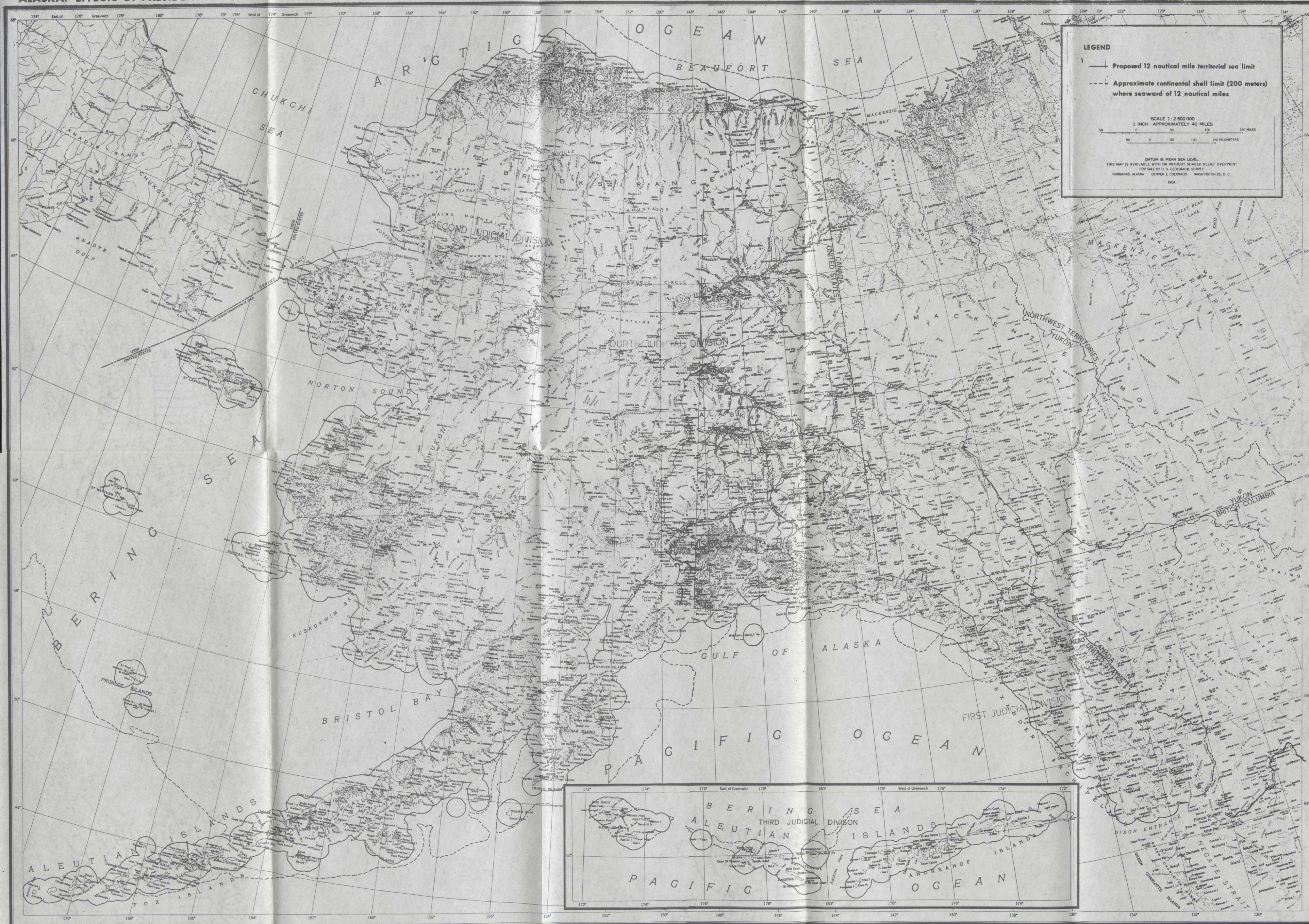
Senator METCALF. I did not get into your discussion but the question of trusteeship did arise, and I appreciate the contribution of the Senator from Alaska, which raises some serious questions.

I suppose Alaska has as much coastline as Montana. [Laughter.]

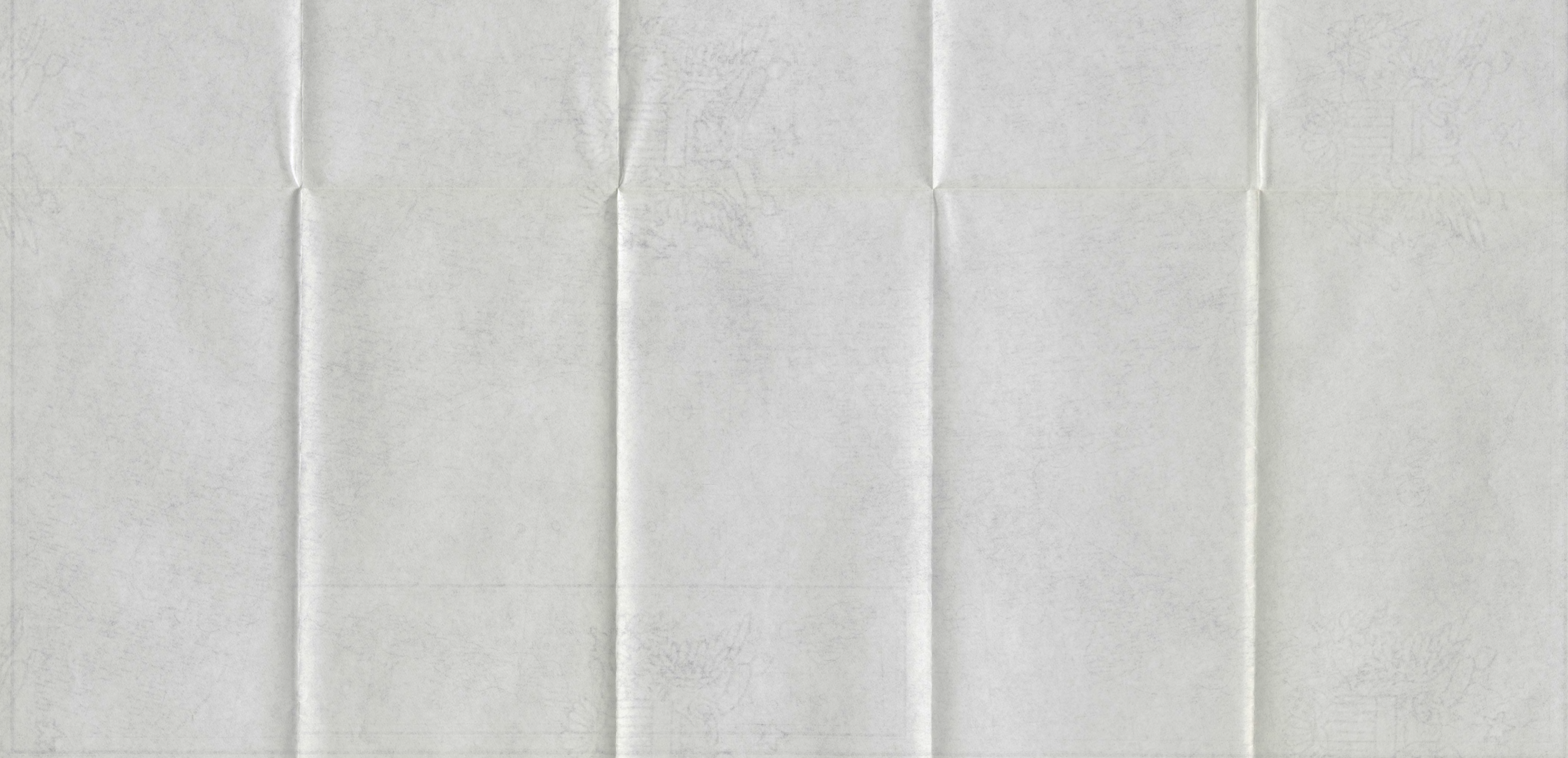
Senator STEVENS. What I have asked for is to see if they can apply this doctrine to our State in the form of a map.

Senator METCALF. I hope it will be submitted. If it can't be reproduced in the record, it will be incorporated in the files.

ALASKA: EFFECTS OF PRESIDENT NIXON'S PROPOSALS ON THE SEA AND THE CONTINENTAL SHELF



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Mr. RICHARDSON. Yes, sir.

Senator METCALF. I am informed that in view of the interest of the Canadians in this matter, we have Mr. John Freecan, Canadian Minister of Northern Development for Indian Affairs in the audience, accompanied by Mr. Robinson, Mr. Ray, and Mr. Abrahams of his staff. We are delighted to have some of our Canadian neighbors here to audit this discussion.

Mr. RICHARDSON. I am very glad to have the opportunity to have them present to hear this colloquy, Mr. Chairman. Perhaps we can have the opportunity to discuss the subject with them further.

Senator METCALF. Perhaps they will have an opportunity when they are discussing these matters with the administration that they will understand some of the questions that we are raising here in the Congress.

Mr. RICHARDSON. We hope, Mr. Chairman, that the Government of Canada will regard President Nixon's proposal as one helpful to their concerns with respect to control of pollution and in other respects.

Senator METCALF. I am sure that the whole international community is grateful to the Government of Canada for at least calling attention to the needs for additional pollution control in international activity.

Senator GRAVEL. Mr. Chairman, could I inject something there?

Senator METCALF. Yes.

Senator GRAVEL. Just in that regard, Mr. Secretary, how would the Canadian position with respect to the 100-mile pollution zone, which passed quite resoundingly in their own Parliament, what would be your comments on that, first; and second, how would that interrelate with the President's proposal that you have just enunciated?

Mr. RICHARDSON. Well, it would not relate directly, Senator, because the Canadian 100-mile pollution zone, in the first instance is the exercise of regulatory authority over waters along the northern Canadian coast without reference directly to a system of regulation of the exploitation of the seabed.

There would be a relationship between that claim of regulatory jurisdiction and the proposal which this administration has made since, within the area of national trusteeship of the coastal State, there would be vested in the coastal State the power to administer regulations directed against pollution. In fact the trusteeship area subject to the jurisdiction of Canada under this proposal would cover a very large part of the same area of coastal waters over which Canada claims regulatory jurisdiction under this new doctrine.

Exactly what the areas of overlap are, I don't have with me now, but since the edge of the continental margin along the Canadian coast is at least 100 miles offshore in most of the area, that area would thus be included in the area of proposed trusteeship.

Is this substantially correct, Mr. Stevenson?

Senator GRAVEL. With the amount of control they have, I would imagine that pollution control would have an effect on any type of economic development, since any type of economic development would have possible polluting effects. Would you envision that this is part of the trustee arrangement that you are proposing, and that really the Canadian movement would be in concert with what is proposed here?

Mr. RICHARDSON. It would be. The only difference basically is that where they are claiming a right of regulation to prevent pollution in

an area measured by 100 miles from whatever the boundary of their territorial sea is, we would measure it, rather by the 200-meter measure than by the limit of the continental margin.

Senator STEVENS. Could I ask one question there?

Senator METCALF. Certainly.

Senator STEVENS. In terms of enforcement, take the king crab, for instance; under this doctrine, how are we going to prove that a foreign vessel which is operating on the surface to take king crab was or was not invading the 200-meter limit?

We can do that on a mileage basis. Even that, you know, has serious problems about where you measure it from, but, again look at the map.

How are we going to tell that a Korean or Japanese or Russian ship that is taking king crab within the 200-meter limit is really within that limit, as opposed to a radar fix or something on a mileage basis from the shore?

Mr. RICHARDSON. Well, the depth sounding devices which all fishing vessels have could determine this by reference to the conditions which they otherwise determine on the surface and the depth which their sound reflection devices tell them is the depth at that point.

Senator STEVENS. In Alaska, since they slipped their gear and ran outside the 12-mile limit, we are having a terrific time proving they were within the 12-mile limit.

I think you are adding to the problems of law enforcement, particularly in relation to seabed resources, that I hope you will reconsider the whole doctrine.

Mr. RICHARDSON. I don't think, Senator, that this is a significant problem in itself. You can draw around any area what the continental margin is, just as you can draw the 200-meter isobath, and this line is as easily determined as the 12-mile limit is.

You simply have to have a chart that shows what it is.

Senator METCALF. Mr. Secretary, as I understand it, the coastal State is to have the power to tax. Is that correct?

Mr. RICHARDSON. Yes, sir.

Senator METCALF. It is going to have the power to regulate pollution, crime, and regulate leasing.

Mr. RICHARDSON. Yes.

Senator METCALF. It is going to have the power to collect royalties, both on behalf of the international community, and, if assessed above the international royalties, for the coastal state.

Mr. RICHARDSON. Yes.

Senator METCALF. And it is going to exercise most of the international jurisdictions over that area.

Mr. RICHARDSON. Yes; it will carry out for the international regime.

Senator METCALF. For the international regime?

Mr. RICHARDSON. Yes, sir.

Senator METCALF. Did you have a comment, Mr. Stevenson?

Mr. STEVENSON. No, sir. On the point that the Secretary just made, this would be by delegation from the international regime, and the details of just what that allocation will be still have to be worked out.

Senator METCALF. Would foreign nationals have the same status in the international territory that the nationals have of the coastal state would have in obtaining leases or submitting to the jurisdiction of the coastal state?

Mr. RICHARDSON. I recognize this is something which is presumably subject to—like all these things—subject to negotiation internationally, but our concept is that, with respect to the granting of licenses, the coastal state would have complete jurisdiction and could, therefore, if they saw fit to do so, discriminate in favor of its own nationals.

Senator METCALF. It could exclude certain foreign nationals?

Mr. RICHARDSON. Yes, that is, indeed, part of the reason for vesting the licensing authority in the coastal states.

Senator METCALF. So in the case of oil off the coast of Indonesia American companies could be excluded.

Mr. RICHARDSON. They could be, of course, they can be now, depending upon what the limits of coastal jurisdiction are. Similarly, of course, this—under this proposal, the oil exploration and oil exploration company owned by the regime of North Vietnam could be excluded, whereas under some interpretations of the existing convention, this would not be true.

Mr. STEVENSON. There is one other point, Mr. Chairman, that U.S. companies operating in those areas would enjoy the protection of compulsory dispute settlement under this proposal because that would be embodied in the international treaty.

That would not be the case if these states had complete sovereignty in that area, so that once investments were made they would be better protected.

Senator METCALF. We could conceive a situation where the emerging states in Africa, for example, could exclude American exploration and discovery, and at the same time would be the greatest beneficiaries of international funds.

Mr. RICHARDSON. This is, of course, possible, Mr. Chairman. I think it is important to back up a little bit and to consider the situation that is likely to evolve in the absence of the kind of international regime that is contemplated here.

If we have no treaty governing the right of exploration and exploitation of the continental margin, we can anticipate a situation in which coastal states progressively, over time, a certain unilaterally wider and wider areas of exclusive control not subject to any international regulation or limitation.

What we are proposing in effect is to stabilize the situations on a basis that recognizes legitimate coastal-state interest with respect to licensing and otherwise at the end of the continental margin, but which at the same time also safeguards international interests, including international interests in the use of part of the proceeds, as well as international interest in other uses such as, for example, a scientific research.

So we would say that it is much better to have a division of interests, rights, and responsibilities along the lines that we propose than the anarchical and chaotic situation that would even develop if, over time, coastal states one by one unilaterally asserted broader and broader areas of jurisdiction.

Senator STEVENS. I have serious questions about this. In the first place, with relation to the U.S. action as I understand it, the President—he is suggesting that we go to the treaty route and by treaty between coastal nations; is that correct?

Establish the international regime as opposed to U.S. action? Am I correct in that?

Mr. RICHARDSON. Not entirely, Senator. The United Nations action was merely a resolution to the effect that until there had been created some kind of international agreement, presumably by treaty, there would be discouraged, exploration or exploitation beyond areas of conceded national jurisdiction.

That was all that it did. What we have—the United Nations in its proposed moratorium pending a treaty. What we are now saying is, “Here is an approach to a treaty which we think should commend itself not only to coastal states but to the landlocked states of the world as well.”

Senator STEVENS. But it will be a treaty?

As I understand it, the President in his statement says that he’s proposing that all nations adopt as soon as possible a treaty under which they would renounce national claims to the seabed.

I assume that all noncoastal nations would be willing to enter that. How much indication do you have that coastal nations would be willing to sign a treaty renouncing their claims to the seabed?

Mr. RICHARDSON. Not renouncing their claims completely, but we feel there will be an interest on the part of coastal States in an approach such as this, which does not involve a complete renunciation of claims, and rather a division of rights and responsibilities, including the proceeds of exploitation with an international regime.

Senator STEVENS. But the President again said that he is proposing that all nations adopt as soon as possible a treaty under which they would renounce all claims to the seabed beyond the 200 meters, and he would regard these resources as the common heritage of mankind.

I understood you to say they would not be renouncing their national claim. Again though, what indication does our Government have that any coastal nation is willing to renounce their claims beyond the 200 meters?

South American countries, for instance, are some of those I have in mind.

Mr. RICHARDSON. Let me back up a minute, Senator.

As the President said, they would even renounce claims in the sense that they would recognize the international regime as having jurisdiction over—for the benefit of all mankind of resources in the continental margin. My point was that they would still, however, as trustees, exercise substantial rights and retain substantial interests, and that coastal States interest in a proposal like this is greater than their interest in proposals such as some that have been made that would exclude any rights on the part of the coastal State even to regulate or to share in royalties.

Now we—

Senator STEVENS. We are still trying—getting away from the point. What differences, then, is there in the proposition made by our Government in a situation here where a South American country claims jurisdiction out to 200 miles, and we are saying, “We want you to renounce all your national rights and claims beyond 200 meters, but you can still discriminate, you can still exclude the U.S. citizens, you can tax, and you can have exclusive jurisdictions as far out as you

want yourself. All we want you to do, though, is act as a trustee for some international regime."

Isn't that right?

Mr. RICHARDSON. We are not talking about 200 miles.

Senator STEVENS. That is where they claim today, out to 200 miles. What happens in a specific instance where they claim the 200 miles today?

What is the difference between your proposal and what they now claim?

Mr. RICHARDSON. Senator, I will have to back up a little bit here, because, No. 1, the United States does not recognize these claims. We think that they are—if over time, comparable unilateral claims are added by other countries—we will have the very kind of chaotic situations which the United States through 1, a proposal for a treaty on territorial seas; 2, a proposal for a treaty relating the Continental Shelf and continental margin, is trying to prevent.

It is not clear, too, in each instance exactly what form of unilateral jurisdiction a Latin American country is asserting.

It may, in some instances, appear to be limited to assertion of jurisdiction with respect particularly to fisheries, without necessarily carrying with it a comparably clear assertion of unilateral right to exploit the mineral resources beneath the sea.

In any case, our hope is that the countries that have asserted unilateral rights to exploit the seabed out to, say, 200 miles, would be willing to, in the overall international interest we are seeking to recognize and to protect, to modify those claims.

Senator STEVENS. What is your estimate as to the years required to negotiate the treaty, keeping in mind that it took 10 years to prepare the 1958 Geneva Convention?

How many signatures will it take, how long will it take, and what are you going to do to enforce the treaty on those who refuse to sign it?

Mr. RICHARDSON. This sounds like a good question for Mr. Stevenson. [Laughter.]

Mr. STEVENSON. Senator, in the first place, the four conventions adopted in 1958 dealt with the whole area of the law of the sea. They were monumental conventions, but they did deal with the greater part of the problems. What they left unsettled were the width of the territorial sea and the question of boundary of the seabed.

These are the principal questions which are being dealt with now, as far as the territorial sea and free passage through States and a provision reflecting the interests of coastal States and a provision—and fisheries beyond the territorial sea, those proposals could be dealt with fairly simply.

The United States, in fact, has been talking in terms of three articles now; the seabed regime is a newer and more complicated idea, but nonetheless, compared to what had to be done in 1958, we do not have as difficult a job, and we will be building on the foundation of the 1958.

I think for the reason that the Secretary pointed out, because you do have a large number of unilateral claims being made around the world, it is terribly important that we move as quickly as we can to reach international agreement while there is still time to do so.

I think many other countries share the desire to reach some kind of an agreement, and so that as the President has announced, we will

be working with other countries and in the U.S. seabeds committee, and next year at the general assembly, discussing the ways of moving this ahead, whether within the General Assembly or by a special conference.

Is that something that still has to be decided, but hopefully this is something that action will be taken on in an initial way next fall, as far as the setting up of a definite timetable?

Senator STEVENS. Again I appreciate your comments, and I think your statement indicates that despite the 10 years that lead into the 1958 convention, all of these matters were pushed aside because they could not be settled in that period of time.

Again, though, my question is how many signatories will be required before a treaty would be acceptable to the United States, and what are you going to do to enforce the treaty on those who will not sign it?

Is there some contemplation of an international police force or something that is going to come along and say that you have got to recognize this concept because all of the noncoastal nations, I am certain, will go along with it.

But what about the coastal nations that will not go along with it? I am particularly interested in how many coastal nations must agree before we feel it would be a workable procedure.

Mr. STEVENSON. I am sorry. I forgot to answer that question.

Senator, we already have a comparable situation in the case of the 1958 conventions. Not all states have signed those four conventions, but when you have a certain number of the important states of the world signing those conventions, this tends to create a general disposition to go along with the provisions set forth in those conventions, and important coastal states participate in this arrangement, and we therefore feel that it is important in the international bargaining to take in account their interests, but like any other problem in the international area where we don't have an international legislature, we can't, by majority vote, decide that this is going to be it.

We have to proceed by the negotiation route, trying to convince the significant coastal states of the world that come along with this, and therefore whatever proposals you must make must reflect a fair balance of the various interests involved.

We feel that the package that we are talking about, both in the law of the sea area and in this area, does represent a very good starting point toward getting the type for international agreement that we require.

We do agree with you that, for this to be successful, we should have large coastal states supporting them at the time the convention is opened for ratification.

Senator STEVENS. It seems to me we have been supporting the United Nations for many years, and what you are really saying is that Congress ought to agree that we divert additional funds to the United Nations or at least to an international regime from resources developed by our industry off our own shores, and I don't see what benefit we are going to gain from it, unless you can guarantee that the other coastal nations are going to recognize this.

I would assume that you adopted the treaty route because of the constitutional problems of dealing with these resources in regard to

the Congress, but again I still don't understand that we have had any answer saying, "Assuming that 90 percent of the coastal nations and 100 percent of the noncoastal nations follow this, what happens to a U.S. company trying to operate off one of the coastal nations among the 10 percent that will not agree? What occurs? Who has rights, and how do they enforce them?"

Mr. STEVENSON. Senator, I think in the first place there will be a very definite incentive for countries to come into this arrangement. It will be a way of guaranteeing that they can give valid licenses and they will be able to offer foreign companies, or their own companies that want to exploit this area now an established legal regime within which to do so.

They will avoid the uncertainty that they presently have, so that there will be that incentive.

The other incentive will be that in the case of less developed countries, they will be participating not only in the revenues generating off their own shores as trustee, participating in the trustee arrangement, but also will be recipients of some of the funds turned over to the international community.

So you have another incentive.

In terms of the more developed countries, you have the incentive that most of them are quite concerned now with the absence of any effective law in this area; the fact that we have conflicts all over the world because there are no established rules of the game in this area, and they also, in many cases prefer—they are not so concerned about the rules as with having a stable regime within which they can operate.

So I think there are many attractions in this proposal.

Senator STEVENS. Mr. Chairman, I have a series of questions. I will submit them, if I may, to the witness, and see if we can put them in the record. I have belabored the issue, I am sure.

Senator METCALF. I don't feel that the Senator from Alaska has belabored the issue. The issue is new, is complex, and a matter that this chairman, and I think this committee, wants to explore in depth and support the administration if we possibly can.

(The questions and the answers referred to above are on p. 463.)

Senator METCALF. Off the record.

(Discussion off the record.)

Senator METCALF. Back on the record.

Senator GRAVEL?

Senator GRAVEL. I want to make one observation, Mr. Chairman. I don't want to give the impression, and I don't frequently compliment the administration, but I think the initiative shown is certainly laudable. As an exercise of leadership here is being taken in the international community that should be noted.

The only concern I would have, of course, is in the developing process of the treaty that we truly consult with the large neighbors, our large neighbors, in the process of developing a treaty.

I think this will underlie its acceptability over a period of time. That is one concern I have. The other is in financing the present international community. We have done it very directly through appropriations, and we have been far more generous than some of the other

member nations of the world who could have contributed more, and has there been any research made—take, an example, the Soviet Union, and certainly we have been more generous to international agreements than they have.

What would be the impact if they were signatories to such a convention? Would this increase their contribution to the international community, or is this a blind side to this whole proposal that we don't know anything about?

Mr. RICHARDSON. First, Senator, I think your point on consultation with the countries principally concerned with the treaty is very well taken, and we would certainly want to do this.

It is not realistic to hope for an international agreement in the absence of very intensive and—

Senator GRAVEL. I want to underscore one point and that is, if you arrive at a draft and present it to them and say, "let's discuss our draft," or you can go to the table and say, "Let's create a draft," I think the chances are better if you sit down to create a draft rather than having one to discuss at the start.

Mr. RICHARDSON. I think this is true, Senator, and I think it applies then in our approach to this. We would, I think, not propose for a considerable period to try to write treaty language going beyond the general approach set forth in the President's statement and in our testimony here, but rather than seek to develop as far as possible a general understanding and consensus before trying to transmit it into treaty language.

On the question of Soviet contributions, of course, this depends really on what turns out to be the mineral resources along the arctic coast of the Soviet Union. This is a very long coast, and if there are mineral resources in the Canadian and Alaskan parts of the northern coast, there may well be over the Siberian and Russian coasts also.

At any rate, whatever part they played in contributions to the aggregate royalties of the international regime would depend upon what resources may be in those coastal waters, since they don't have much else in the way of coastal waters.

Would you like to add to that?

Mr. STEVENSON. We of course do not have very precise figures as to what is to be anticipated as between the United States and the rest of the world. This is something that is now being investigated, but in terms of the area that we are talking about, the area between 200 meters and the continental rise, the U.S. area within this depth is about 1,400,000 square miles whereas the world as a whole has about 18,500,000 square miles.

So you see, we only have the figures of around 8 or 9 percent of the total, so that assuming that the amount of oil and gas is roughly proportionate throughout the world, there would certainly not be a share that is out of proportion if the rest of the world were contributing 91 or 92 percent.

This would be—

Senator GRAVEL. Which would be a far cry from our present percentage of contributions to the international community?

Is this the point you are making?

Mr. RICHARDSON. That is true.

Senator GRAVEL. I think it is a good point.

Senator METCALF. The point, however, is that this perhaps is a contribution as far as we are concerned to foreign aid that is beyond the budgetary control of Congress.

Isn't that correct?

Mr. RICHARDSON. That is certainly true. Of course, we would have a voice, presumably, in the international bodies that allocated this. In general, however, I think this administration in accordance with the views, also, of the Peterson task force, appointed to advise the President on the foreign aid, that we should be moving progressively over time in the direction of greater reliance on multilateral bodies in the field of economic development and assistance.

Senator METCALF. Go ahead.

Senator STEVENS. Before the treaty is agreed to, are you indicating that in the interim the United States contemplates acting as a trustee for the international community for any income beyond this 200-meter line?

Mr. RICHARDSON. I don't think we have proposed that the income would be put in escrow in effect; no. What we are—what we have said in substance is that we would hope that leases were negotiated on a basis that contemplated the eventual establishment of an international regime, and that the treaty itself would contain provisions for respecting the previously negotiated agreements. Because we won't want whatever may be the interval that goes by between now and the negotiation of the treaty to prevent exploration and exploitation in the meanwhile.

We have not suggested, have we, the proceeds during that interval be held in escrow?

Mr. STEVENSON. What you say is absolutely correct. I think the Senator was also raising the question about the policy statement with respect to having some income allocation from this area during the interval to the international community.

There are two points about that. One, it is quite clear that that could only be done with congressional approval, and, of course, we would wish to consult with Congress about how that might be done.

Second, we would only propose to do that if what the President considered was a satisfactory number of other countries would agree to do the same thing.

This of course is unilateral action pending the establishment of the international regime by a treaty, and it is designed to take into account the fact that then it may be some time before a treaty is negotiated.

But it is dependent on these two points, one, that we have the congressional approval; and second, that a number of the other countries are willing to go along with that.

Senator METCALF. Would the Senator yield?

Senator STEVENS. Yes.

Senator METCALF. Specifically however, in the principal testimony that the Secretary gave, you drew an analogy between the coastal States and the Federal Government, and we finally had a determination on that. I don't think that is a completely apt analogy because it is easier for us to settle our disputes within our domestic area, because we are all part of the same federal system.

But there was an escrow concept there, and if you have any analogy at all, there must be an escrow concept in this interim period.

Mr. STEVENSON. There could be, Senator. This is not specific. But I think the thought was rather that those funds could be given currently to some organization concerned with international development, such as the World Bank, for example, and—

Senator METCALF. Then would each coastal State make a contribution to some international organization, or would we have to reach an agreement that we would make it to the same international organization?

Mr. STEVENSON. Again this is a detail. It may be that some would prefer the International Bank, and others would prefer the United Nations Development Fund, or there might be other organizations.

But the point is, this would be a much more informal type of arrangement that would simply be something that a number of countries that are interested in working toward this final goal would be willing to do in the interval.

Senator METCALF. But in the interim the proposed payment to the International Fund would come out of revenues that were paid directly to the coastal States?

Mr. STEVENSON. That is correct, during that period, because the State would be administering this area itself.

Senator METCALF. And so as far as our Government is concerned, that would be revenues paid into our Treasury and paid out without appropriations.

Mr. STEVENSON. Therefore we would clearly have to have congressional action on this proposal. There is no question about it.

Senator METCALF. That would be a bill perhaps presented by the Treasury Department and sent up here to the Ways and Means and Finance Committees?

Mr. STEVENSON. That certainly would be one procedure.

Senator STEVENS. Again, I would like to get back to the U.S. proposals. There action stated that no claims to any part of that area or its resources shall be recognized and now we have a suggestion that leases and permits beyond 200 meters be issued subject to the international regime to be agreed upon.

Aren't we in effect saying that we lost that vote in the United Nations and so we are going to go ahead with this and say what we were going to do anyway? At least as far as this country is concerned, we are prepared to issue leases and permits beyond 200 meters and we will act as trustee for an international regime if it is ever agreed to.

Isn't that what we are agreeing to?

Mr. STEVENSON. I think there are two points there, Senator. The U.S. resolution talked about not doing anything beyond national jurisdiction. One of our objections to the proposal is that there is no clarity as to where national jurisdiction now extends, and we are afraid the resolution might promote further claims of national jurisdiction.

But I think, as the Secretary pointed out, that resolution is simply recommended. It has no binding effect whatsoever, and insofar as suggesting a policy, we feel that our policy is consistent with it, because we would be doing this, subject to an international regime to be agreed upon.

I think this was part of the feeling of those who voted in favor of the resolution, that they did not want to prejudice any future international regime by the activity that was presently being carried on.

So we think to that extent, it is consistent with the policy, although we don't think we are bound by it.

Senator STEVENS. Again I would like to be specific. I have to go vote, but I would like to get specific.

That is in the green area, the area between up to 200 meters right now, is the State Department prepared to support legislation to authorize us to issue leases and permits for the recovery of gold and minerals off the shore of Alaska under this doctrine before there is in fact an international treaty?

If you are, I think that some of us might well see fit to support you, while we otherwise might oppose the idea of the maintaining of the position you have maintained to date, for taking no action at all until there is an international treaty.

Is this a change in policy of the State Department, that you are now willing to support U.S. action out to the 200-meter limit when it is beyond national jurisdiction?

Mr. STEVENSON. Up to date, as the chairman indicated, we have been handicapped in dealing with this problem because we have not had an executive branch decision on the general principles to be applied.

We now have that and I think our very first priority is to discuss with industry and with Congress, and within the Government itself, the means of implementing this interim proposal and we quite agree with you that this is something that should be considered urgently.

The reason that nothing was done beyond 200 meters before was simply because we had no policy at that time.

Senator STEVENS. Don't you agree that in some instances such as my State, this is actually going beyond national jurisdiction today?

Mr. STEVENSON. There is no question, Senator, that everyone recognizes out to 200 meters. I don't think there is any problem out to 200 meters as far as the seabed is concerned, because this is treated differently than the territorial sea concept.

Senator STEVENS. Under existing law, we can't keep the Korean fishermen out of the area out to 200 meters.

Mr. STEVENSON. But you are talking about the fisheries above. In the 200 meters, we are talking about the seabed, and the only species that is tied to that regime that has importance is the king crab. The fish above that are affected by the regular territorial sea concept.

Mr. RICHARDSON. I think that is an important distinction. I think the answer to the Senator's question is briefly, whether we would be prepared nationally to permit exploitation beyond 200 meters and within the limits of the continental margin is that as soon as technical capability of doing this is developed, we would be, but the precise terms and conditions under which we do so, would, as Mr. Stevenson says, require a considerable amount of additional discussion and consultation with the Congress, as well as with other countries prepared to support the principle of the ultimate initial regime.

Senator BELLMON (presiding). As I listened to your statement this morning, it seems to me you put forth two principal reasons for the proposal which the President has made and which you support in your testimony.

The first one is, that this arrangement would provide a substantial source of revenue for international community purposes. In the sec-

ond, on page 4, you say that there would be indirect national security implications. Are those two reasons for making this proposal?

Mr. RICHARDSON. I think one could add to these the important consideration of the development of, the establishment of, clearly recognized international principles and rules governing the whole problem.

This concerns us with respect to all aspects of the exploitation of the seabed. Our own investors need to know what the rules are and these rules, in turn, contribute to the possibility of a relatively stable situation as distinguished from one which is otherwise likely to be progressively chaotic.

So I think this is another identifiable interest. We are concerned, also, with the opportunity of the scientific community to engage in research in the waters and in the continental margin itself, that is, in the seabed of the continental margin, and this is an opportunity which is now largely subject to the unilateral determination of individual countries depending somewhat on where—on how the Geneva Convention of 1958 is interpreted.

Senator BELLMON. Then you look on this proposal as a method of actually hastening the development of these resources?

Mr. RICHARDSON. We think it could do this, since the result of a failure to develop, a failure to adopt a proposal like this would otherwise be to create uncertainties that would tend to discourage investment.

Senator BELLMON. Do you agree that most of the technology that has been developed for the exploitation of underwater resources on the Continental Shelf has been developed by American companies?

Mr. RICHARDSON. I am sure that is true, Senator.

Senator BELLMON. Do you feel this kind of regime would work to their advantage or disadvantage?

There seems to be a general antipathy toward American interests on the part of some international bodies that exist today. How are our own companies going to fare in this arrangement?

Mr. RICHARDSON. We think the very fact that they do possess a technological lead in this field would be potentially advantageous to them under an international system of this kind, more than might exist otherwise because there would at least be established clear rules of the game under which they would be in a position to be applicants for rights of exploration off the coast of other countries.

Without such a regime and without such a division of responsibility between the international regime and the coastal states as contemplated here, we can look again to a process in which there would be excessive unilateral control of waters.

Our investors would be wholly subject to whatever kind of relationship they could develop with the individual countries.

Senator BELLMON. We have had testimony from industry witnesses that indicates that they feel that as long as the coastal states governments have substantial jurisdiction over the Outer Continental Shelf that there will always be some governments ready to do business with companies to develop these resources, but if we become involved with an international regime and if this regime is unfriendly that perhaps this development could be halted for some lengthy period of time.

Do you have any comment on this?

Mr. RICHARDSON. We have, of course, in this proposal, contemplated that control over the granting of licenses would be vested in the coastal

states, in the continental margin, and to that extent, therefore, the situation would be much the same as it is now.

The differences would apply to the broader kinds of rules that the international regime adopted but each company seeking some sort of a contract or license from the coastal states would under this proposal deal with the coastal states just as it does now.

Senator BELLMON. That is the case out to 200 meters.

Mr. RICHARDSON. No. If you mean that is the case now out to 200 meters, yes. Under this proposal the interested company would deal with the coastal state out to the bottom of the continental rise or in other words, out to the edge of the deep seabeds themselves.

This would be deeper than 200 meters almost everywhere.

Senator BELLMON. Does the proposal the administration has made contemplate the establishment of some kind of international police force?

Mr. RICHARDSON. No; not in itself. The observance of the rules and regulations established by the international regime would have to be in the first instance a matter of the responsibility of the countries signatory to the treaty. It may be that over time, there could evolve cooperative relationships among them for the policing of the treaty as for example there is now in the northwest Atlantic for the observation of the rules and regulations established by the northwest Atlantic fisheries organization.

Our Coast Guard vessels participate in the enforcement of this as applies to our fishermen under the treaty, but I think we are some distance away from the establishment of an international police force as such.

Would you like to supplement that?

Mr. STEVENSON. I agree with that answer. I think in the trusteeship zone, the international regime would presumably delegate—and by the international regime I mean the treaty we would negotiate, would give to the coastal state the responsibility for enforcement of its own rules as well as general and international community rules, and even beyond that probably initially the most practical way of dealing with enforcement would be by imposing responsibilities on states with respect to their own nationals.

Now, as the Secretary pointed out, perhaps in this area, like many others, you would gradually evolve to a point where you had some more sophisticated international machinery, dealing with pollution and things of that nature, if it were efficient to do so.

But this is all for the future and for future negotiations to take into account. But initially, at least as we see it, we are talking about in terms of delegation to the national states to do the job.

Senator BELLMON. Do you have in mind any mechanism for making certain that the coastal states, acting as trustees do in fact pay to the international treasury the amount of royalties that are due?

Mr. RICHARDSON. This would have to be done pursuant to the regulations established by the international regime which would presumably contemplate certain kinds of requirements.

The principal exploitation of the resources in issue here would be carried out by companies engaged in activities of the kind in various areas of the world, and the international marketing, at least of petroleum, is such that there would be various ways, we think, of being

reasonably confident that the reported figures were consistent with fact.

Senator BELLMON. There has been a natural gas discovery in the North Sea by the Phillips Petroleum Co. Would this be beyond the 200-meter limit, or are you aware of this?

Mr. STEVENSON. The North Sea is all within the 200-meter depth and arrangements have been made among the coastal states to agree on the respective areas of jurisdiction. So that will remain under national jurisdiction. It would not be affected in any way by this proposal.

Senator BELLMON. Are there any cases where minerals of any kind are presently being produced where the status would change if we went into an agreement like this?

Mr. RICHARDSON. Not at the present time, I believe. In other words, there is no current exploitation of the resources as deep as 200 meters.

Mr. STEVENSON. There is exploration, but no commercial production beyond the 200 meter depth at the present time.

Senator BELLMON. I understand that there is production in depths or at least a discovery in depths of more than 200 meters off the coast of California.

Are you aware of this?

Mr. STEVENSON. Yes, sir. All of the leases that have been granted in that area would be within the 12-mile limit, so they would be covered by our new proposal or the territory of the sea.

Senator BELLMON. So the proposal does not then, so far as you know, upset any existing arrangement?

Mr. RICHARDSON. That is my understanding. Is that correct Mr. Stevenson?

Mr. STEVENSON. I think there may have been some leasing in other areas, but as far as we know, they would all be covered as far as the United States is concerned, by the 12-mile limit or by the present 200 meters, and, of course, as far as disturbing, it is contemplated that in our proposal that any regime that would be adopted would protect existing leases so that we don't feel, even if there were any beyond 200 meters, that this should be disturbing, because we contemplate taking care of that, because we are going to move beyond the 200 meters in the near future.

Senator BELLMON. Is it your thought that the interests that are contemplating development beyond the 200-meter limit, will perhaps be secure in any discoveries they find?

Mr. STEVENSON. This is the policy that has been adopted. As we indicated earlier, the precise regulation of this will be implemented, now that we have had a decision, we are beginning to discuss within the Government and with interested parties.

Senator BELLMON. I have a question here that has been furnished me by the staff. The President's announcement states that he will propose necessary changes in domestic imports and tax laws and regulations of the United States to assure that our own laws and regulations do not discriminate against our U.S. nationals operating in the trusteeship zones off our coasts, or under the authority of the international machinery to be established.

It would appear that production in the zone of our coast beyond the 200-meter line would be considered foreign production, and that oil

transported ashore would be foreign oil and subject to import quotas, duties, and other regulations applicable at that time.

The question is will taxes paid under that situation be the same as taxes paid to foreign governments?

Mr. STEVENSON. That was directed toward treating production in the international trusteeship zone where the United States would be acting as trustee on the same basis as domestic production for tax and import purposes.

Senator BELLMON. So that the production from these areas then, would not be in your judgment considered as imported crude?

Mr. STEVENSON. This would be the proposal.

Of course, necessary implementing action would have to be taken, but according to the proposal what you state would be the result.

Senator BELLMON. We may, if we are not careful, succeed here in losing two sources of revenue which have come to be quite substantial.

That is, first, we would lose the revenue from the lease sales, which would go to the international body, whatever it is, and, second, then, if we were to grant tax credits for taxes that are paid, as we do now to crude produced from foreign sources, we would lose this source of revenue as well.

As you know, at the present time any tax paid by a company to a foreign government is credited against our own taxes. Do you have a thought on how to handle this problem?

Mr. STEVENSON. On your first point, the question of the relative division in the revenues in the international trusteeship zone is something to be considered.

As we pointed out earlier, there are a number of factors. One the point that Senator Stevens was concerned with, we have this proposal attractive enough to the coastal states in order that we get enough coastal states to agree to this regime to have it be an effective regime. On the other hand, there is the desire to contribute to the international community, and the third point is that of course the royalty schedule cannot be so high as to discourage exploitation, or there won't be revenue for anyone.

So this is an area in which the proposal is purposely general, so that we can consult with other countries, within industry, and with all the various interests involved.

On the tax point we would, as far as exploitation in other countries' areas of sovereign jurisdiction, the situation won't be any different than what it is today.

As far as the exploitation in their own trusteeship area, this could presumably be treated, also, as production in their area. But this is something that would have to be resolved. The scope of the President's present proposal related primarily to the treatment of U.S. companies operating in the trusteeship zone, or in the area of the international regime operated by international machinery, where there is no significant production at the present time.

Senator BELLMON. If the United States is going to agree to pay royalties on production outside our 12-mile limit or outside the 200-meter zone to some international agency, is there any way we could assure that for this concession we would get, for instance, freedom to use coastal waters off other coastal states through this international regime we are discussing?

Mr. STEVENSON. Senator, as the secretary pointed out, there are two parallel proposals being made here. One is in the seabed area, and the other is in the area of the law of the sea as traditionally considered. We are very anxious to get this 12-mile limit generally accepted. We feel that in order to make progress in the law of the sea area, it is necessary to also make a parallel progress in the sea bed area, because a great many countries are going to be looking at progress in the two areas as being interrelated, so that the relationship is an indirect one.

I think I should also point out though that as far as our industrial interests are concerned that they will have certain benefits as the secretary pointed out, which will flow directly from this regime, since there will be presumably protection.

There will be provision for compulsory dispute settlement with respect to any disputes in other countries trusteeships, and this has been something that has been difficult to achieve where there have been disputes that have been within the sovereignty of a particular foreign country.

This proposal will clearly make the case that that area will not be conditioned on their sovereignty.

Senator BELLMON. Thank you, Mr. Stevenson.

Senator Pell is chairman of the Ocean-Space Subcommittee of the Foreign Relations Committee.

Do you have some questions? Senator Metcalf is voting, and has not returned, so I would be glad to turn it over to you.

Senator PELL. You are very kind. I feel very much a guest here, and in fairness to you and the chairman, he is gracious to permit me to participate.

The Interior Committee recognizes the strong interests on each side of this case, and that is to be commended. I only wish the Interior Department was as objective as is this committee. Mr. Secretary, I would like to congratulate you and commend the Department and commend the administration for coming to a decision with regard to a policy and for having a policy.

I think the policy goes very much along the lines that a good many of us have been thinking about. Personally, I don't think it goes far enough, but from your viewpoint it is probably satisfactory.

I am grateful to the committee here for permitting me to ask these questions.

Beyond the 200-meter line, is the coastal authority and the trusteeship zone subject exclusively to the international regime that is contemplated?

Mr. RICHARDSON. Senator, first let me say that I appreciate the opportunity to answer your questions and the courtesy of the committee in giving you the opportunity to ask them, because I know of your very long and deep interest in the subject matter.

The question, as I understand it, is the authority of the coastal state beyond the 200-meter isobath subject to the control of the international regime, exclusively. The answer is "Yes."

The coastal state, whatever it does, whatever powers it has beyond the 200-meter boundary line, and within the continental margin, are exercised by them on the basis of delegation to it by the international regime.

Senator PELL. To use fiduciary terms, the trustee would be able to exercise control over what is in the trust for the benefit of the beneficiary.

Mr. RICHARDSON. Yes. We had the earlier quality with the chairman on how far the law of trust as developed in English-speaking jurisdictions would apply here, and our answer to that was in substance that the concept of trusteeship would apply in the sense that the coastal State would be exercising powers for the benefit of mankind.

But we went on to say that the way this is in which to do so, and the precise delineation of the powers would be defined by treaty, and that if the treaty were well enough drawn and if the rules adopted by the international regime under the treaty such as are sufficiently clear, it should not be necessary too often to turn to volumes of Anglo-American jurisprudence to find out what their relative roles were.

Senator METCALF (presiding).

Senator PELL. Is the proposed 200-meter boundary intended as an international boundary then in both word and deed?

Mr. RICHARDSON. It would be an international boundary with respect to the exploitation of the seabed. It would not have implications otherwise than for the exploitation and exploration of the continental shelf. It would be a new boundary in the sense that there would be substituted a precise line of sovereignty over the seabed as distinguished from the rather vaguely defined limits under the 1958 convention which speaks in terms of exploitation—exploitability and adjacency.

Senator PELL. From a military viewpoint, would the seabeds beyond the 200-meter isobath be subject solely to the treaty limitations, soon to be concluded, we hope, being discussed at Geneva?

Mr. RICHARDSON. Yes, Senator. I am glad you mentioned that. The treaty with respect to weapons in the seabed would control that subject. Or to put it the other way around, the treaty proposed here with respect to the exploitation of mineral resources in the continental margin would not, as we visualize it, purport to restrict other uses, whereas the treaty now being negotiated in Geneva on weapons of mass destruction does, by definition, restrict a use which would not be restricted by the treaty we are talking about now.

So therefore, if restricted at all, it would have to be restricted in another treaty such as the one being negotiated in Geneva. I hope I did not make that too confusing, here.

Senator PELL. Are you worried at all about the jurisdiction? We go back to the higher problem. Are you worried that the water column above the marginal areas outside the 200-meter isobath that that will gradually acquire the character of the trustee, the administering authority?

Mr. RICHARDSON. We are concerned about this, and certainly a major reason for the interest of the United States in the adoption of treaties with respect both to territorial waters and with respect to the continental shelf and seabed is an interest in preventing the gradual extension of the kind of creeping jurisdiction you refer to.

On the other hand, our primary reliance with respect to the waters above the continental shelf seabed is adoption of the treaty on terri-

torial waters, under which, as you know, we have proposed a 12-mile limit with freedom of passage of international straits and so on.

If that treaty were adopted, it would provide a major, and we would hope sufficient degree of protection against the problem of creeping jurisdiction, even though we did not then also have a treaty on the seabeds in addition.

Senator PELL. Except for presumably a quite small fee, and an obligation to abide by pollution and navigation regulations, what do the petroleum interests of the adjacent nations lose under this treaty?

Mr. RICHARDSON. The petroleum interest as such would not lose anything. On the contrary, we think they would gain by the competence of an international regime, and international rules and regulations which made clear the rules of the game under which their investments would be made and which provide as Mr. Stevenson pointed out a few minutes ago, machinery for the resolution of disputes.

Neither of those things exist now so they would be essentially in the same position they are in now with respect to negotiation of leases and so on.

The revenues that they paid over to somebody else to distinguish from the share they kept would be divided differently, but that would not be, of course, a primary concern of theirs.

Senator PELL. This is what I would have thought. I would like to ask the Chairman's permission to have inserted in the record here what I consider rather misleading article from the Wall Street Journal by Mr. Jerry Landauer, which indicates to the contrary.

My opinion in this is exactly the same as yours, that except for abiding by regulations, losing a small fee, the economic interests and I say that in a perfectly proper term, do not lose anything under this treaty.

(The article referred to is on p. 361.)

Senator METCALF. It is my impression that this article is already in the record. If it is not, it will be inserted at this point.

Senator PELL. Thank you.

Another point that I am not sure has been brought out is that the United States is rather fortunate under this treaty, because we have a larger than our proportional share of the continental shelves of the world when compared with the slope and rise I think the figure is 7.1 percent of the continental shelf and 6.1 percent of the slopes and rises.

So actually we come out a little bit better because we control the shelf to the 200-meter line, and most of our shelf is within there. This is a complicated thought, which I hope in writing will appear more clearly than I am expressing it.

I am concerned here, too, that the United States have free access to as wide a portion of the continental margins around the world as is possible. I am concerned that under this treaty some 93 percent of the continental margins around the world are left, really, under the control, not jurisdiction but control, of noninternational and non-American interests.

Wouldn't that be correct?

Mr. RICHARDSON. Yes; if we understand clearly that the word "control" here refers to the right to exploit, and in that sense the coastal state would, under this proposed treaty, have control, because it would determine who did and who did not get a license or a lease permitting exploitation.

Senator PELL. So that in the years to come, if an American industry, an industrialist with his expert ability and his capital wanted to develop a resource on the slope of a state that was hostile to the United States, we would have a very difficult time doing that, whereas if he was under international jurisdiction, presumably we would have a much easier time in securing that right.

Mr. RICHARDSON. That is possible. On the other hand, as a practical matter, we think that it would be exceedingly difficult, if not impossible, to negotiate a treaty entered into by the principal coastal states of the world when denied them the power to exclude other countries or the corporate instrumentalities of other countries whose activities they felt might be hostile.

To put it another way around, I find it difficult to imagine that the United States is itself, or would be willing to enter into an international treaty which prevented us from excluding the North Vietnamese oil exploitation in the continental margin off California.

Senator PELL. I think you are practical and that is why I consider this proposal one great step forward, and I still have the view that it could have gone further. I thank you very much.

Thank you, Mr. Chairman.

Senator STEVENS. May I continue that a little bit?

Senator METCALF. Certainly.

Senator BELLMON. My good friend from Rhode Island and I disagree on this, and we know each other's views.

As I recall, Mr. Stevenson, you said we had less than 10 percent of the seabed that would be covered by this proposal?

Mr. STEVENSON. Yes, sir.

Senator BELLMON. That means that American industry dealing with 90 percent of the seabed is going to be subjected to what I would consider to be controls that are not existent at the present time. Is that correct?

Mr. STEVENSON. Senator, I think there are three choices, at the present time, they would be subject to dealing with the other coastal states with no international rules, whatsoever, no provision for dispute settlement, no provision dealing with pollution, and that sort of thing.

So that the only way in which they would have a better status is the way that Senator Pell mentioned, that if, in fact, that were determined internationally as the Secretary mentioned, we do not feel that other coastal states, any more than the United States, would be willing to give us the right to determine who can exploit within this trusteeship area.

We can't have this both ways.

We can't retain that right as far as the United States international trusteeship is concerned, and expect to not give a comparable right to foreign companies and coastal states.

Senator STEVENS. But you say they are going to be better off. Today if American industry wants to negotiate again with a South American country and obtain offshore rights, it pays them a royalty or whatever that coastal nation wishes for the development of the area they claim.

Under your proposal, they will pay them not only whatever tax or royalty they want to assess, but they will also go and be paying them a royalty that will be payable to an international regime. Is that correct?

Mr. RICHARDSON. May I add to that, Senator?

The question of what aggregate amount is again charged to a company that is seeking to exploit petroleum reserves in the continental margin off some country would need in the first instance to be made subject to some maximum established by the international regime but it would be an amount which took into consideration the attractiveness to an investor of exploiting the resources at all.

There would have to be a sufficient return to the investor would—in order that the investor would be willing to put in the necessary money into exploration and development of the means of producing the petroleum and so on.

This is the kind of question that any given country has to consider now. If they ask for too large a share of the proceeds, the oil company simply is not going to be interested and now, the international regime will have an interest in the encouragement of the exploitation of these resources. At any rate, whatever the aggregate royalty determined on is, in the light of the objective of encouraging exploitation, there would be a subdivision of that amount between the international regime and the coastal state.

The coastal state could impose an additional royalty over and above the amount determined by the international regime, but it would have to do so recognizing that then it might price itself out of the market by demanding too much, and thus stimulate a potential investor to deal with another coastal state.

At any rate, this kind of process is not essentially different than from what exists now in the sense that the whole allocation between the share of proceeds which goes to the investor and the share which goes to the coastal State would still be the subject of a bargaining process.

Senator STEVENS. Before I left, you were having an exchange with my colleague from Alaska concerning negotiation of the treaty, and as I recall, he made the comparison between the ability to obtain agreement to a treaty when the United States prepares it and lays it on the table and says, let's discuss this, or when it calls a meeting and says let's draft a treaty that we all can have an interest in. My question is, in this instance where the President's May 23d proposal was a new declaration of the U.S. position, was it in fact discussed with other coastal nations prior to the setting forth the U.S. position?

Mr. RICHARDSON. The proposal that we are discussing now?

Senator STEVENS. Yes.

Mr. RICHARDSON. Not precisely as such. We have had a lot of consultation with coastal States, through the United Nations and otherwise, and this proposal really emerges out of these consultations. We are now engaged in the process of discussing this particular proposal in much the same way we are discussing it here.

Senator STEVENS. What is the difference in this proposal and the position the United States took on the General Assembly resolution in December of 1969 when it was before the General Assembly?

As I understand, this morning there is no change. Is it a change in position, or is it the same position we had then?

Mr. RICHARDSON. It is a fundamental change, Senator. At that time, we simply said in effect that we did not think it was a good idea for there to be a freeze on all exploration beyond 200 meters, or, rather, beyond the limits of national jurisdiction, whatever those limits are, pending the negotiation of a treaty.

We said in effect that if such a moratorium were to be adopted that this would do two things: It would create a good deal of confusion as to the validity of any rights granted by a coastal state, because it is under what the limits of national jurisdiction are, and these might be questioned later.

Secondly, it was because we would be creating a situation which invited coastal states to extend their claims of national jurisdiction to the utmost in order to be in a position to negotiate leases with companies that they wanted to negotiate with, and this kind of unilateral assertion of national claims is the process most inimical to the interests of the United States, particularly, as Senator Pell pointed out earlier in the context of so-called creeping jurisdiction, the aversion not only about control of the seabed, but also of the waters above the seabed.

So at that time, in December 1969, we were saying that we were against a policy of calling a halt to any granting of rights of exploration until the treaty could be adopted.

What we are now saying is that—

Here is a treaty, in substance, which we believe properly protects all the interests involved, and we urge now on our international colleagues that they consider favorably the adoption of a treaty along these lines.

This is a very different treaty than the one we had in December 1969, because at that time we had no clear position within the executive branch on the question of whether we should support an assertion of broad national jurisdiction beyond the 200-meter isobath, or whether we should alternatively propose an international regime from that point, or some other depth demarcation outward without any coastal state jurisdiction or authority at all in the continental margin beyond that depth, or whether we should propose something in between.

We are proposing something that is in between.

We had had no position on any of those three possibilities in 1969. Indeed, it is fair to say that we had no clear-cut executive branch position until the President issued his statement last Saturday.

Senator METCALF. I am going to close the hearing at this time. It is now 12:30 and I announced that we would let the Acting Secretary go back to his office. I know that you have a raft of telegrams, letters, and memorandums in view of the fact that the Secretary is out of the country.

However, this does not close the hearing on this matter. We have opened up in this session many controversial questions. I hope that the members of my subcommittee and Senator Pell will examine the transcript if they wish, submit written questions to the State Department.

Would the written questions be submitted directly to you, Mr. Secretary?

Mr. RICHARDSON. Yes; I think that would be appropriate, Mr. Chairman.

Senator METCALF. Then they will submit their written questions. I don't know when we will reconvene the committee, but if it is necessary to reconvene the committee and have further questioning, we certainly will excuse you and your distinguished superior, Mr. Secretary Rogers, as I know from long experience with Mr. Stevenson that he can answer the technical questions that we ask.

Senator METCALF. So we may call him back after we have examined the record and the transcript of this testimony. Some of us have been devil's advocates today. We want to compliment the administration and all of you for finally coming to a unified position.

We are not critical of this proposal. We just want to know where it is going, and that is the purpose of the interrogation.

Senator BELLMON. Mr. Chairman, I wonder what your intentions might be with regard to printing this hearing? We have had an exchange with our colleague previously in other testimony. I would like to submit questions to the Department and have the questions and answers made part of the record.

Senator METCALF. This hearing won't be printed until your written questions or Senator Pell's written questions have received replies. I hope that you, Senator Pell, will consider yourself a de facto, or ex officio, or some kind of member of this committee, and if you have questions, submit them.

Senator STEVENS. I would like to respectfully disassociate myself from your comments. I think you have opened up a Pandora's box without thinking it over, and I know that my colleague from Rhode Island thinks you have gone part way toward a solution, but there are others of us who believe the concept of national jurisdiction should have been defined first and I think we are going to rue the date we did not.

Senator METCALF. Mr. Secretary, the first step toward asserting international jurisdiction or the first step toward orienting ourselves to the solution of this problem is an administrative policy, and an administrative policy has been forthcoming, one that we can query, one that we can question. I do compliment you on coming out with a forthright statement of policy, and Senator Stevens or Senator Pell or I may not agree with all of the aspects of that policy, as it developed, but we are both lawyers, and we know that you have to have pleadings in before you can have a decision.

We are going to analyze the matter carefully and give it as much consideration as possible.

Mr. RICHARDSON. Thank you, Mr. Chairman.

I appreciate very much, and I know Mr. Stevenson does, too, for the opportunity to appear here, and for the pertinent and searching questions that have been directed at us.

I can assure Senator Stevens that whatever we have done, whether by way of opening a Pandora's box or otherwise, has been done only after a great deal of thought to all the—

Senator METCALF. Pandora's box was there.

Mr. RICHARDSON. If this were not the case, we would have been here earlier and would have been able to testify on one of the earlier proposed dates.

We do attach—and I mean by that the whole administration—a degree of importance to this subject such that we would be glad to come back or furnish other witnesses or, in the interim, provide written answers to questions, in whatever ways seem appropriate to you, Mr. Chairman, and the members of the committee.

We are aware that it is a complex, controversial, difficult subject, but one of great actual and potential importance, and we would like to work as closely as possible with you in seeking a solution.

Senator METCALF. Thank you.

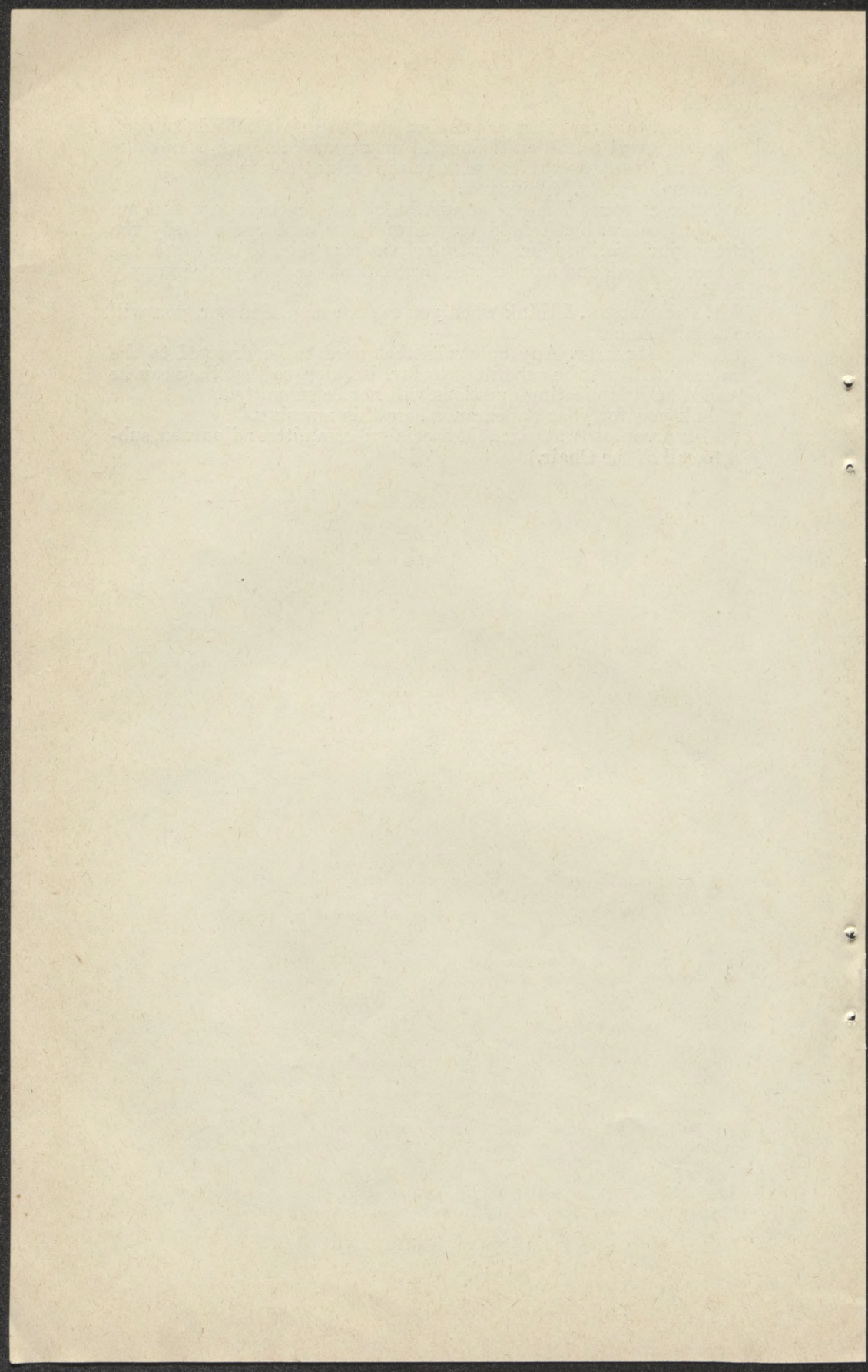
Senator STEVENS. I meant no disrespect for the Secretary, as I am sure you realize, but I hold very firm views, and again I say the national jurisdiction item, particularly as it applies to my State, has not been defined, and until it is defined I don't see how you can apply this theory.

Mr. RICHARDSON. I think when you see our map, Senator, you will see that it can be.

Senator METCALF. Any questions that need to be directed to the Secretary will first be submitted to Mr. Verkler, so that they can be screened and duplicating questions will not be submitted.

Thank you for your appearance here this morning.

(Whereupon, at 12:35 p.m., the special subcommittee adjourned, subject to call of the Chair.)



APPENDIX

(Under authority previously granted, the following statements and communications were ordered printed:)

U.S. SENATE,
Washington, D.C., June 29, 1970.

HON. WILLIAM P. ROGERS,
Secretary of State,
The Department of State,
Washington, D.C.

DEAR MR. SECRETARY: Subsequent to the appearance before the Special Subcommittee on the Outer Continental Shelf of Mr. Richardson and Mr. Stevenson on 27 May, the Subcommittee held an executive session on the unresolved issue of our national policy on the seaward limits of our legal Continental Shelf.

Out of that meeting on 16 June came S. 3970, introduced that day, and some questions about the Administration proposal. The latter are attached. We would appreciate your reply within two weeks if at all possible.

With respect to the development of a detailed proposal based on the President's statement of 23 May, we were informed by the White House that a draft treaty is being prepared for presentation at the U.N. Seabeds Committee's August session in Geneva. In view of my Subcommittee's interest in this subject we will appreciate learning the details of the contents of the treaty. Accordingly, please furnish us a copy of the draft treaty without regard to its present stage of completion.

Very truly yours,

(S) LEE METCALF.

Enclosures.

LIST OF QUESTIONS PERTINENT TO THE OUTER CONTINENTAL SHELF SUBMITTED TO THE STATE DEPARTMENT BY THE COMMITTEE, AND THEIR ANSWERS

Question. In proposing an international zone off our coasts, why is the concept of "trusteeship" used instead of jurisdiction?

Answer. The concept of trusteeship was devised as a new means of achieving an accommodation between the interests of the international community in general and the interests of coastal states. It is used in order to convey the idea that the coastal state exercises its functions pursuant to a treaty which establishes that the resources are the common heritage of all mankind but simultaneously recognizes that efficient administration of resources requires that coastal states play an important role in the management system. The concept of trusteeship therefore reflects the premise that the coastal state will exercise functions within an international framework specifically entrusted to it, rather than exercise those functions on the basis of any inherent right of sovereignty, sovereign rights or jurisdiction. The concept of the international trusteeship with respect to the seabeds would be fully defined by the provisions of a new treaty, and is not based either on the international trusteeship system of the United Nations or the Anglo-American law of trusts.

2. Question. To encourage industry to enter into leases beyond the 200-meter depth limit, the future costs of doing business in this area must be anticipated with a fair degree of certainty. In this regard, it would seem appropriate to assure industry that future institutional costs would remain the same on either side of the OCS boundary. Will U.S. government assume future liabilities incurred as a result of the international agreement?

Answer. Whether the institutional cost of doing business landward of the 200-meter isobath and seaward of that line would be the same would depend to some extent on the trustee nation. The trustee nation would be permitted to impose

in the trusteeship area payments additional to those provided for by the treaty. Such terms, however, would necessarily have to be competitive. Should payments which are too high be imposed by a trustee nation, the cost of doing business elsewhere would be smaller.

In the event that payments required by the treaty exceed those provided for in leases granted during the transition period, it is contemplated that the coastal nation itself would be obliged to make up the difference.

3. Question. The Administration proposal calls for obligatory payment of royalties to an international agency. Does this create, either in the interim period or the future, an automatic system of foreign aid beyond the budgetary control of Congress?

Answer. The provision for the collection of revenues for international community purposes is not designed either as a foreign aid system or as a substitute or supplement to a foreign aid system. It is designed to assure that funds will be available for international community purposes as a result of the exploitation of resources which would be regarded as the common heritage of all mankind. The promotion of the economic advancement of developing countries would clearly constitute a priority use for such funds, not only because this represents one of the most important common objectives of all nations interested in peace and stability, but also to assure that states which may not themselves have the technological capability or geographic position enabling them to derive direct benefits from the exploitation of such resources will in fact receive such benefits. Accordingly, the system of international revenues is regarded as an integral part of a general international settlement regarding rights and responsibilities in the seabeds, and is not a system of grants, gifts, or other forms of foreign aid.

4. Question. Under the present proposal, who would decide which minerals would be mined, which countries would mine them, and to which country they would be delivered once mined?

Answer. In the trusteeship area the trustee nation would itself decide which minerals should be mined, by whom they would be mined and under what conditions they can be imported into the trustee nation.

In the area beyond the trusteeship zone, the international agency would grant a license to the first applicant meeting the necessary standards. In some cases, for example where there are two or more simultaneous applications for the same minerals in the same area, the agency would grant licenses on the basis of competitive cash bonus bidding.

A nation sponsoring an applicant might, as a condition of such sponsorship, impose upon him conditions with respect to the disposal of minerals mined under a license obtained through that nation.

5. Question. What authority will the coastal state exercise as "trustee" in connection with the international zone off its coast? Will it only exercise authority delegated by the international regime?

Answer. The authority of the coastal nation in the trusteeship zone would be derived from the treaty establishing the international regime; it would only exercise authority delegated to it by that treaty. The treaty would specifically provide which powers might be exercised by the trustee nation. Such powers would include: issuing, suspending and revoking licenses; establishing work requirements; ensuring compliance with the treaty; exercising civil and criminal jurisdiction over its licensees; and enacting such laws and regulations as might be necessary to perform these and other specified functions.

6. Question. Could the rights to the mineral resources located on our continental margin, which are necessary to sustain our economy, be summarily and irreversibly removed by an international agency which could terminate the trust? In other words, would the United States be assured that its rights to explore and exploit the minerals of its continental margin could never be terminated without the consent of the U.S. government?

Answer. There can be no summary revocation of the rights of any coastal nation in the trusteeship area off its coast. If a trustee nation should violate its obligations under the treaty, the matter could be submitted to a tribunal either by another nation or by the international agency. If the tribunal should decide against the trustee nation and if that nation should refuse to comply with the judgment of the tribunal, the Council of the agency will have authority to decide upon the measures to be taken. If other means should prove unsatisfactory, the Council might temporarily suspend the rights of the violator, including a trustee nation, in whole or in part. The draft Convention provides that the extent of such a suspension should be related to the extent and seriousness of the viola-

tion. Any decision against the trustee nation cannot impair the rights of the licensees who have not contributed to the failure to perform such obligations.

7. Question. Would foreign nationals have the same status as a national of the coastal state in obtaining a lease in the international trusteeship zone?

Answer. Coastal nations would not be compelled to issue licenses to any particular person, and could accordingly decide to issue licenses only to their own nationals.

8. Question. If all leases beyond the 200-meter depth limit issued by the United States were subject to a future international regime, would the authority to issue leases beyond 200 meters in the interim period be derived from the 1958 Geneva Convention on the Continental Shelf?

Answer. Until a new Convention enters into force, our authority would be based on the 1958 Geneva Convention on the Continental Shelf and applicable principles of international law.

9. Question. The treaty as proposed would need to contain provisions so as not to impair existing contracts which the Government has entered into for leasing and exploiting seabed resources beyond 200 meters, e.g., leases that have already been granted out to 400 meters and more—contracts protected from impairment by the U.S. Constitution. What would be the nature of these provisions?

Answer. The draft treaty contains detailed provisions for the due protection of existing contracts. In particular, the United States would be obliged to compensate all its lessees for any investment losses resulting from the application of the treaty. In addition, existing contracts with the United States would also be entitled to all constitutional guarantees.

10. Question. Was the proposed administration position to provide for the payment of royalties to an international agency in the trusteeship zone motivated in part to encourage international acceptance for the U.S. proposal to limit the breadth of the territorial sea of each nation to 12 miles and to assure free passage of U.S. warships through the various straits of the world? If so, should the United States agree to pay royalties from this area to an international agency without assurances that our territorial sea and free passage objectives will be obtained? Why does the United States feel that it is necessary to reach international agreement on free passage for military vessels through straits when the 1958 Geneva Convention on the territorial sea already guarantees innocent passage of all vessels through straits?

Answer. Both proposals are aspects of a new United States oceans policy announced by President Nixon on May 23, 1970. At that time the President pointed out that at issue is whether the oceans will be used rationally and equitably for the benefit of mankind or whether they will become an arena of unrestrained exploitation and conflicting jurisdictional claims in which even the most advantaged States will be losers. The President stated: "The stark fact is that the law of the sea is inadequate to meet the needs of modern technology and the concerns of the international community."

Although the United States is interested in the satisfactory resolution of all of these issues, some nations attach more importance to the territorial sea issue while others place more emphasis on the seabeds issue. It is accordingly our assessment that only in a climate in which progress is being made on both sets of issues will it be possible to achieve orderly and satisfactory resolution of any of them.

11. Question. Some have suggested that the proposed administration position represented a capitulation in face of the militant demands which have been made by the underdeveloped nations who have a voting majority in the general assembly and who through various resolutions last year have attempted to achieve their objective by what the U.S. chief delegate to the U.N. Seabeds Committee referred to as the "politics of confrontation" and reliance on "paper majorities." One of these resolutions declared that no nation or its citizens should exploit the seabed beyond the limits of national jurisdiction prior to international agreement on a deep seabed regime. Does the United States intend to prohibit activities by its nationals related to exploration and exploitation of seabed minerals located beyond the continental margin prior to international agreement on a deep seabed regime in order to enhance acceptance of the President's proposals?

Answer. We continue to adhere to the views set forth in Mr. Stevenson's letter to Senator Metcalf on January 16, 1970.

12. Question. Under the announced U.S. oceans policy, what would be the status of the semi-enclosed seas or shelf areas off islands or waters such as the Gulf of Mexico or the Mediterranean Sea?

Answer. Both Article 1 and Article 26 of the draft Convention apply not only to seabed areas off the coast of continents but to seabed areas off islands as well. With respect to Article 26 of the draft Convention, it is explicitly noted that additional consideration will be given to problems of enclosed and semi-enclosed seas.

13. Question. Is it not true that the 200-meter depth limit in several places off the coast of the United States occurs within two to three miles off our coast? If so, is it not true that the jurisdictional reach of the international agency would extend to within three miles of our coast?

Answer. No. The President's seabed proposal concerns the status of the resources of the seabeds *beyond* the territorial sea. As noted in the draft Convention, the United States has simultaneously proposed an international convention which would, *inter alia*, extend the maximum breadth of the territorial sea to a distance of 12 nautical miles. The new seabed regime would not apply to the seabed under the territorial sea.

14. Question. What is your estimate as to the years required to negotiate the proposed treaty, bearing in mind the ten years of preparation that led to the 1958 Geneva Convention? How many signatories required for adoption? How long from adoption to implementation?

Answer. On August 3, 1970 the United States presented its draft treaty to the United Nations Seabeds Committee in Geneva. The draft is under active consideration by members of that Committee. We have also supplied copies to all other countries with which we have diplomatic relations. We recognize that difficult negotiations lie ahead but we are hopeful that the treaty can be agreed and come into force in a period much shorter than that which it took to obtain the 1958 Geneva Convention.

We believe that a treaty of this sort should be as widely ratified as possible. It is our preliminary view that about 40 ratifications, including those of the most industrially advanced states, would be necessary for the treaty to come into force.

15. Question. What is the likelihood of other nations agreeing with the administration proposal?

Answer. The draft Convention was designed to accommodate the different interests of a large number of nations. As we have indicated, governments are currently in the process of studying its provisions. Although many preliminary reactions at the United Nations Seabeds Committee have been favorable, we expect that most governments will require at least several months to arrive at more definitive views on the provisions of the draft Convention, and that there will be many suggestions for changes.

16. Question. What would be the general nature of the international regime and the composition of the international machinery which would authorize and regulate exploration and use of seabed resources beyond the continental margins?

Answer. The detailed provisions regarding the international regime and its machinery are contained in the attached Draft Convention.

17. Question. The President in his announcement on U.S. oceans policy stated "I am today proposing that all nations adopt as soon as possible a treaty under which they will renounce all national claims over the natural resources of the seabed beyond the point where the high seas reach a depth of 200 meters . . .". Later the Presidential announcement states: "first, I propose that coastal nations act as trustees for the international community in an international trusteeship zone consisting of the continental margins beyond a depth of 200 meters off their coasts. In return, each coastal state would receive a share of the international revenues from the zone in which it acts as trustee and could impose additional taxes if it deemed this desirable." On the fact of it this appears to be contradictory. We are on the one hand renouncing all claims but later we say that we are retaining the power of a trustee and we are retaining the power of taxation over the area. Are we not simply saying that we are willing to grant to an international regime a portion of the revenue available under the development of these mineral resources?

Answer. We do not believe there is any contradiction. By agreeing in the treaty not to recognize sovereign rights in the international seabed area, nations would clear the way for creation of an international regime covering that area. The treaty establishing this regime would simultaneously delegate certain limited but important rights to the trustee nation with respect to administration

of the resources and the licensing system to be used in the trusteeship area and to receive a share of international revenue from that area. These rights are specified in Chapter 3 of the draft Convention. The new treaty would supercede the 1958 Geneva Convention on the Continental Shelf with respect to the international seabed area, but not with respect to the natural resources of the seabed landward of the international seabed area.

18. *Question. In the Presidential announcement the following statement is made: "I suggest that all permits for exploration and exploitation of the seabeds beyond 200 meters be issued subject to the international regime to be agreed upon." This appears to contemplate the issuance of permits by the coastal nation, at least in the interim period. Does this mean that once the international machinery is established that it alone will have licensing or permit authority to determine who shall drill on the continental shelf beyond the 200-meter line?*

Answer. The responses to Questions 4 and 8 are relevant to this question. The Trustee State would itself issue, as well as determine the procedures for issuance, licenses in the International Trusteeship Area subject to the relevant provisions of the Convention.

19. *Question. What law will apply in the trusteeship zone—coastal state law or that of the international regime?*

Answer. The draft Convention makes it clear that unless otherwise specified in the Convention, the basic law applicable to the entire International Seabed Area would be the draft Convention, and its rules and regulations. The draft Convention delegates specific powers to the coastal state in Articles 27 and 28 and in the Appendices. It is anticipated that when States become Parties to this draft Convention it will be necessary for them to enact implementing legislation to give effect to the powers which have been delegated to them in the treaty. In view of the fact that the coastal state is permitted to decide on the licensing procedures to be used, it is expected that many States will want to use procedures similar to those they currently use with respect to the continental shelves off their coasts.

20. *Question. Will the coastal state have power to exclude exploration and/or exploitation in the trusteeship zone?*

Answer. Yes, the trustee nation would have the right to exclude either exploration or exploitation of the resources of the International Trusteeship Area. It should be noted that the draft Convention distinguishes between exploration and scientific research.

21. *Question. What powers would the coastal state have to regulate scientific research in the trusteeship zone?*

Answer. The coastal nation would not be entitled to impose any restrictions on scientific research in the trusteeship area. Any deep drilling in the trusteeship zones, which is not under an exploitation license from the trustee nation would require, however, a permit from the International Seabed Resource Authority.

22. *Question. What control is contemplated with respect to the coastal nation over who shall be permitted to drill on the continental shelf beyond the 200-meter line?*

Answer. All exploration and exploitation of the resources of the International Trusteeship Area requires a license from the Trustee Nation. Deep drilling for purposes of exploration or exploitation can only be conducted under an exploitation license. Deep drilling for purposes other than exploration and exploitation of resources requires a permit from the International Seabed Resource Authority.

23. *Question. If the international regime has complete authority over the issuance of licenses and permits, how does the coastal nation obtain the power to tax such production?*

Answer. Article 23 of the draft Convention specifically provides that the Trustee Nation may impose additional fees and payments related to the issuance of retention of a license.

24. *Question. In the proposal, the Presidential announcement states: "I will propose necessary changes in the domestic import and tax laws and regulations of the United States to assure that our own laws and regulations do not discriminate against U.S. nationals operating in the trusteeship zone off our coast or under authority of the international machinery to be established."*

For tax purposes, would oil produced in the zone off our coast beyond the 200-meter line be considered as domestic or foreign production?

(See answer to Question 25.)

Question. 25. Will taxes paid to an international regime and royalties be given similar tax treatment as taxes and royalties paid to foreign governments? (It would appear that it would have to be given similar treatment in order to make production in those areas at least as attractive as production in foreign countries.)

Answer. With respect to both Questions 24 and 25, tax experts are currently studying the means of implementing the guideline set by the President.

Question. 26. Are we not losing two sources of revenues: first, the lease bonus and royalties that could accrue to the U.S. from the lease sales and production; and second, through the granting in tax credits for taxes paid to international regime?

Answer. The draft Convention should be examined in the light of its overall benefits, including its contribution to international peace and security, the application of a stable investment climate, to a vast area of the seabed, as well as the revenues which would accrue to States Parties. Although it is difficult to project revenues under any circumstances, it is our view that these benefits outweigh any reduction in revenues that might occur.

Question. 27. What will be the treatment of taxes paid to a foreign coastal nation which imposes taxes in addition to those imposed by the international agency?

Answer. Tax experts are currently studying the means of implementing the guideline set by the President.

Question. 28. It is well known that in certain circumstances, economic aid to the military (is not desirable) since it may allow the diversion of the resources of a nation from civilian needs to the military.

What would prevent the international agency from using such funds for military aid or ancillary aid of military operations, such as food, medical supplies, transportation equipment, and so on?

Answer. As indicated in the response to Question 3, the system of international revenues is not considered to be a form of foreign aid, whether economic or military. It is designed to assure that funds will be available for international community purposes as a result of the exploitation of resources which would be regarded as the common heritage of all mankind. The Convention provides for these funds to be used to promote the economic advancement of developing States Parties to the Convention as well as for international projects relating to the marine environment.

29. Question. Another area of concern is the safety of the drilling and producing operations. It is clear that the people of this nation want such operations conducted in such a manner as will minimize the possibility of an oil spill, commensurate with existing technology. How much authority will the coastal nation have in regulating and monitoring such operations? At what point could the international agency declare that the affected coastal nation is interfering with its authority over the exploitation and disposition of minerals outside the 200-meter boundary and simply ignore the protests of that nation?

Answer. The draft Convention contains many provisions which we believe are essential to provide both effective rules and remedies for the prevention and abatement of pollution. The International Authority through the Tribunal and its rule-making powers will have considerable regulatory control in matters relating to pollution over all activities in the International Seabed Area. In addition, the treaty authorizes Trustee Nations to establish still higher safeguards than the International Authority may prescribe. The Trustee Nation and the International Authority will both be responsible for inspecting all exploitative operations in the International Trusteeship Area. The Council of the International Authority in emergency circumstances will be able to issue emergency orders to prevent serious harm to the marine environment from exploration and exploitation activities.

30. Question. In light of the fact that the Seabeds Committee operates on a consensus basis, rather than a majority vote basis, what are the prospects of achieving approval of the Presidential announcement which would be put in the form of a proposed treaty?

Answer. As indicated in the response to Question 14, it is still difficult to predict what the positions of the other members of the Seabeds Committee will be with respect to the draft Convention.

31. Question. Should not crustaceans and those living resources whose life histories show migration from inland waters to Territorial Sea, Contiguous Zone and beyond (salmon); or from within the 200-meter shelf limit to the so-called

Deep-Sea-Bed Region (King Crab, langoustes, etc.); be reserved to local industry of the country contiguous to the shelf or sea zone in question rather than be subject to artificial and sometimes illogical internationalization?

Answer. The draft Convention does not apply to the living resources of the waters superjacent to the seabed. It does apply to the living resources of the International Seabed Area such as king crab. Under the draft Convention, the Trustee Nation would be entitled to determine in its discretion who could exploit the living resources of the seabed in the International Trusteeship Area, and would be permitted to favor its nationals.

32. *Question. Has the United States discussed with Canada the choice of the boundary of the continental shelf in the Beaufort Sea?*

Answer. An initial meeting with Canada was recently held in order to open discussions regarding lateral continental shelf boundaries. Continental shelf boundaries off Alaska were not discussed at that meeting.

I.

1. *Question. Our best estimate as to how long we can expect to wait for the completion of the treaty?*

2. *Question. How many nations, coastal and non-coastal, will have to ratify the agreement before it will become effective?*

1-2. Answer. See replies to question 14.

3. *Question. Which of our allies are expected to agree and which to disagree with the President's proposed approach to the handling of the shelf problem?*

4. *Question. What has been the effect of our efforts on claims of jurisdiction by coastal states?*

3-4. Answer. See replies to question 14. A number of our allies as well as many other countries have already made statements in the Seabeds Committee welcoming the introduction of the draft Convention.

II—A.

1. Who will determine the royalties to be charged.

2. Who will collect and distribute them?

3. To whom will they be distributed, for what purposes and on what basis?

The general range of fees and payments within maximum and minimum limits would be determined in the proposed treaty. Actual fees and payments to be applicable after a specified date to new and renewed licenses would be determined from time to time by the Council of the international agency on recommendation of an expert commission. Additional payments may be imposed by trustee nations. The payments will be collected by the coastal nations in the area beyond the trusteeship area. These nations would be allowed to retain an agreed portion of the payments and would transfer the rest to the international agency. After paying the administrative expenses of the agency, a part of the net revenue would be spent on the improvement of marine environment and related activities, and the remainder would be transferred in agreed proportions to international and regional development agencies for distribution to the developing countries parties to the treaty.

B.

1. Who will determine the conservation policies and pollution standards under which the seabeds will be developed?

2. Who will enforce the conservation policies and pollution standards?

3. If policies and standards are determined by an international body, will individual nations be able to require stricter standards of developers operating in their trusteeship zones?

Pollution standards would be determined by the international agency, but a coastal nation might impose higher standards with respect to its licensees. Each nation would enforce the standards on the persons licensed or sponsored by it, but the international agency would inspect to discover violations and could bring any uncorrected violation before the tribunal to be established by the proposed treaty. The Council of the agency could also take certain measures in the case of a grave emergency. The tribunal could impose a fine, and the Council could revoke the license (or ask the trustee nation to revoke it) in case of a gross and persistent violation, except where the actions of the licensee were directed by the nation which authorized or sponsored his activities.

As far as conservation is concerned, each coastal nation would be permitted to arrange for proration to the extent permitted by its domestic law. It could also impose higher standards related to prevention of waste.

C.

1. What resources will be included in the treaty? Specifically, will fisheries be included? If not, how will conservation of fisheries be effected?

The treaty would be mainly concerned with the mineral resources of the seabed. There would be only a few general provisions relating to the living resources of the seabed, e.g. concerning the general need for their conservation, and the maximization of their growth and utilization. A coastal nation would have complete discretion to decide whether and by whom the living resources of the seabed (e.g., king crab) should be exploited in the trusteeship area.

2. What geographic areas will be included? Specifically, how will semi-enclosed areas like the Gulf of Alaska and the Bering Sea be treated?

Concerning semi-enclosed areas, see reply to question 12.

3. What machinery is envisioned for the administration of the treaty? Specifically, who will promulgate necessary regulations and keep them in step with changing technology? Who will settle disputes between developers? Between nations? Who will enforce the treaty provisions and regulations? How will the terms of treaty be enforced against trustee abuse?? Who will determine the terms and provisions of the leases and who will issue them?

While certain basic provisions would be laid down in the treaty, a flexible machinery would be established for bringing regulations up to date. All international regulations would be issued by the Council of the international agency on the basis of recommendations of an expert commission. They would come into effect on a specified date unless more than one-third of the parties to the treaty should reject them before that date.

A trustee nation would be authorized to establish higher operating, conservation and pollution standards than those established by international regulations.

A special tribunal would be established to settle disputes relating to the international seabed area. It would have jurisdiction over disputes between nations, between a nation and the international agency, and between licensees and the international agency. Disputes between two licensees in a trusteeship area would be settled by the courts of the trustee nation.

Each nation would enforce the treaty provisions and the supplementary international and national standards against persons licensed or sponsored by it. A nation would be authorized to establish sanctions in case of violations of the applicable standards.

With respect to enforcement against nations, see reply to question 6.

The trustee nation would determine the terms of the licenses in the trusteeship area, subject to the applicable provisions of the treaty and the rules adopted thereunder. The trustee nation might establish higher standards for its licensees. Beyond the international trusteeship area, the International Authority would issue licenses in accordance with specific procedures established in the draft Convention.

4. How are the continental shelf areas of coastal nations refusing to sign the treaty to be treated?

The coastal nation refusing to sign the treaty would not be entitled to any benefits under the treaty. The status of the areas off its coast would be governed by the general rules of international law on the subject. The Contracting Parties would be bound not to recognize any other nations' claims in the International Seabed Area.

III—A

1. How are existing leases to be handled?

2. How are leases issued between now and the effective date of the treaty to be handled? If they are to be subject to the provisions of a treaty which does not yet exist, how will this uncertainty affect potential developers trying to decide to invest in seabed development? How can continued interest in seabed development be maintained?

The treaty would provide special protection for existing leases, and more limited protection for future leases. In case the obligations under the treaty should

be more onerous, the coastal nation would itself be responsible for complying with such increased obligations and for paying any extra fees or other payments to the international agency. Should a lessee suffer any investment losses in consequence of the application to him of the provisions of the new treaty, the coastal nation, or in case of deep seabed activities the sponsoring nation, would be obliged to compensate him for those losses.

The knowledge that the exploration and exploitation of the resources of the seabed would be subject to an internationally agreed regime rather than to international conflict should encourage investment. That regime would provide greater certainty in place of the present uncertainty.

3. Who will set the lease terms and provisions?

Pending the coming into force of the treaty, each nation would determine the terms of its leases, but they would be subject to the treaty regime when it comes into force.

4. What machinery for the enforcement of lease provisions is planned for the interim period before the treaty becomes effective? Who will collect and hold the royalties? How will they be distributed and to whom?

Each nation would supervise its lessees during the interim period and would collect payments from them. If Congress would take appropriate action and a sufficient number of other nations would accept the President's proposal for turning over a substantial portion of the revenue to an international development agency, such portion of the money collected from licensees could be transferred to that agency in accordance with the interim agreement on that subject.

B.

1. What policy authority will the trustee have in the trusteeship zone? Can it implement its own conservation policies and pollution standards?

The trustee nation would have policing authority over licensed activities in the trusteeship area. It would be able to implement its conservation and pollution standards, but they would have to be consistent with the standards approved by the international agency.

2. What revenue powers will the trustees have? Can it impose taxes in addition to rentals and royalties collected for the international regime?

The trustee nation would collect all payments specified in the treaty, and would transfer a substantial portion of them to the international agency. It would be able to impose additional payments and taxes, but would have to transfer a portion of them to the international agency. In addition, it could impose additional fees to defray its administrative expenses.

3. What enforcement authority will it have? Can it enforce treaty obligations if the international regime fails? Can it collect revenues?

The trustee nation would have full enforcement authority over its licensees in the trusteeship area. The sponsoring nation would be primarily responsible for the activities of licensees sponsored by it in the area beyond the trusteeship zone. The international agency would, however, have full inspection power; its tribunal could impose fines in cases of a violation, and its Council might ask the trustee nation to revoke the license in case of a gross and persistent violation. If a Contracting Party fails to perform the obligations incumbent upon it under a judgment rendered by the Tribunal the Council has the power to suspend temporarily, in whole or in part, the rights under the Convention, of the party failing to perform its obligations. The draft Convention provides that the extent of such a suspension should be related to the extent and seriousness of the violation. For example, if there is a case of substantial pollution and a Contracting Party does not comply with a decision of the Tribunal or assure that its licensees comply in the Trustee Zone the Trustee Party's rights may be suspended in their entirety until compliance is assured.

Revenues are collected by the Trustee Party.

4. Would nationals from the trustee nation be given special consideration in leasing or developing the trustee's zone? Who would prevent such discrimination if it were not allowed? If it is allowed, what will be done to prevent unfair competition?

The trustee nation would be permitted to give special consideration to its nationals, and might establish such rules as it wishes to prevent unfair competition.

NATIONAL PETROLEUM COUNCIL,
May 25, 1970.

HON. LEE METCALF,
*Chairman of the Special Subcommittee on the Outer Continental Shelf, U.S.
Senate, Washington, D.C.*

MY DEAR SENATOR METCALF: I am most appreciative for the invitation extended to me to appear, as Chairman of the National Petroleum Council, before your Special Subcommittee on the Outer Continental Shelf. Would you kindly advise me as to your schedule of future hearing dates in order that we may agree upon a mutually satisfactory time for my appearance before your Committee. Meanwhile I would very much appreciate your inserting this letter in the record of your Committee hearings, particularly in view of the testimony presented before your Committee held last Wednesday, May 20th.

I have followed closely the testimony presented over the past several months before your distinguished Subcommittee relating to the establishment of the seaward boundary of the United States' outer continental shelf. The thoroughness with which your Committee is going into this extremely vital matter, which is of paramount concern to the United States, is impressive indeed.

I would like to call to your attention the fact that the views of the National Petroleum Council have been fully stated in the able testimony of Mr. Cecil J. Olmstead before Senator Pell's Subcommittee on Ocean Space (July 28, 1969); before Senator Hollings' Special Study Group on United Nations Suboceanic Lands Policy (September 24, 1969); and also before your Subcommittee on the Outer Continental Shelf (March 4, 1970). On behalf of the National Petroleum Council I endorse completely all the views presented by Mr. Olmstead at those previous hearings and assure you that those represent the position of the Council. Mr. Olmstead is Assistant to the Chairman of the Board of Texaco Inc.; was a member of the Technical Subcommittee that drafted the NPC Report in March 1969, entitled "Petroleum Resources Under the Ocean Floor"; and he is the incumbent president of the American Branch of the International Law Association.

I have reviewed with considerable interest the hearings which you conducted on May 20, 1970, at which Senator Pell presented testimony. I have the distinct impression that the distinguished Senator in those remarks implied the views previously submitted on behalf of the National Petroleum Council did not accurately reflect the views of the actual leaders of the oil and gas industries. To this I must take clear and unqualified exception.

The National Petroleum Council is an industry advisory body which represents virtually the entire United States oil and gas industries. It was established by the Secretary of the Interior in 1946 pursuant to a directive of the President of the United States for the sole purpose of advising, informing, and making recommendations to the Secretary of the Interior with respect to matters relating to petroleum submitted to it for consideration by the Secretary. The members of the Council (I am attaching membership lists as of March 1969, when the Report was adopted, and the current one) are appointed last year by the Secretary of the Interior and are drawn from all segments of the petroleum and natural gas industries, from the production phase to the retail marketing level. Almost uniformly Council members are the chief executive officers of their corporations or national oil or gas associations.

At the beginning of 1968, the Secretary of the Interior requested the Council to prepare a comprehensive study to consider all aspects (geological, technological, economic and legal) relative to petroleum resources under the ocean floor. Exhaustive analysis was undertaken requiring a year in the preparation thereof. The final report speaks for itself and is contained in the previously cited volume entitled "Petroleum Resources Under the Ocean Floor". This report was duly approved by the entire membership of the Council with the exception of two dissenting votes and two abstentions. For your information I attach copies of the membership rosters of the Committee which conducted this study, as well as the capable Technical Subcommittee which assisted it.

We have previously submitted to you all of our findings, as contained in this report, for formal insertion in the record of proceedings of your Subcommittee. May I emphasize that its contents are endorsed almost unanimously by the entire membership of the National Petroleum Council. The report and the presentations previously given at the above hearings by Mr. Olmstead in fact represent the official views of this Council. Should there be any further doubt about this matter I would be pleased to respond to any questions you may have at the time of my appearance before your Committee or by written inquiry.

I would like to reemphasize the conclusion of the Council on this subject, as stated on page 13 of its official report, a copy of which I am enclosing herewith and would like to have you treat as a part of this letter.

Sincerely,

JACK H. ABERNATHY.

[ENCLOSURE]

CONCLUSION

It is the firm and carefully considered conclusion of the National Petroleum Council, an industry advisory body to the Secretary of the Interior, representing virtually the entire American oil and gas industries, that the United States, in common with other coastal nations, now has exclusive jurisdiction over the natural resources of the submerged continental mass seaward to where the submerged portion of that mass meets the abyssal ocean floor and that it should declare its rights accordingly. We believe that this was the intent of the framers and delegates who composed the 1958 Geneva Convention on the Continental Shelf. We believe that this was the understanding of the Congress and of the President of the United States when this country ratified the Geneva Convention. We are convinced that this interpretation is in the best interests of this Nation, whether or not it is in the best interest of the American oil and gas industries.

This matter is extremely vital and involves basic principles and long-range implications concerning the well-being of this Nation and of all its people. The National Petroleum Council feels that it has a continuing responsibility to emphasize, as it has from time to time in the past, that adequate petroleum resources and the requisite conditions for their development are of major consequence to the economy and the security (in its broadest sense) of this Nation. The resources of this country, which do indeed include the resources of that part of our continent beneath the waters, are a great and priceless heritage. The oil and gas resources in these submerged portions of our continent may well prove to be larger than those remaining on the land. These strategic and valuable resources could well be the means of maintaining far into the future this Nation's essential self-sufficiency and avoiding the vulnerability inherent in dependence on foreign energy sources.

NATIONAL PETROLEUM COUNCIL, FEBRUARY 3, 1969—MEMBERSHIP (112)

OFFICERS

Chairman: Jack H. Abernathy, President, Big Chief Drilling Company.
 Government co-chairman: Hon. Walter J. Hickel, Secretary of the Interior.
 Vice chairman: E. D. Brockett, Chairman of the Board, Gulf Oil Corporation.
 Secretary-Treasurer: Vincent M. Brown, Secretary-Treasurer, National Petroleum Council.
 Assistant Secretary-Treasurer: Maxwell S. McKnight, Assistant Secretary-Treasurer, National Petroleum Council.
 Abernathy, Jack H., President, Big Chief Drilling Company, Post Office Box 14837, Oklahoma City, Oklahoma 73114.
 Anderson, Robert O., Chairman of the Board, Atlantic Richfield Company, 717 Fifth Avenue, New York, New York 10022.
 Avery, Wallace E., President, Western Oil & Gas Association, c/o Texaco, Inc., 3350 Wilshire Boulevard, Los Angeles, California 90005.
 Baldrige, Earl, Vice Chairman of the Board of Directors, Celanese Corporation, 1708 Commerce Building, 307 West Seventh Street, Fort Worth, Texas 76102.
 Bass, Perry R., Fort Worth National Bank Building, Fort Worth, Texas 76102.
 Batzell, Elmer E., Batzell & Nunn, 1523 L Street, N.W., Washington, D.C. 20005.
 Bennett, Carrol M., President, Texas Pacific Oil Company, Post Office Box 747, Dallas, Texas 75221.
 Bergfors, Fred E., Sr., President, Quincy Oil Company, 56 Federal Avenue, Quincy, Massachusetts 02169.
 Bible, H. Harold, President, Lion Oil Company, 800 N. Lindbergh Boulevard, St. Louis, Missouri 63166.
 Blackburn, W. T., President, Rocky Mountain Oil & Gas Assn., c/o Rig Tenders, Inc., Denver Club Building, Denver Colorado 80202.
 Blaustein, Jacob, President, American Trading and Production Corporation, The Blaustein Building, One North Charles, Baltimore, Maryland 21203.

- Borger, H. D., Chairman of the Board, Consolidated Natural Gas Company, 30 Rockefeller Plaza, New York, New York 10020.
- Boyd, Howard, Chairman of the Board, El Paso Natural Gas Company, Post Office Box 2185, Houston, Texas 77001.
- Brazell, Reid, President, Leonard Refineries, Inc., East Superior Street, Alma, Michigan 48801.
- Brockett, E. D., Chairman of the Board, Gulf Oil Corporation, Gulf Building, Pittsburgh, Pennsylvania 15230.
- Brown, Bruce K., Suite 2828, International Trade Mart, No. 2 Canal Street, New Orleans, Louisiana 70130.
- Bruce, Geo. H., President, National Stripper Well Assn., c/o Aladdin Petroleum Corp., 809 Petroleum Building, Wichita, Kansas 67202.
- Buck, E. O., Vice Chairman, Texas National Bank of Commerce, Post Office Box 2558, Houston, Texas 77001.
- Calvert, F. Allen, Jr., President, Calvert Exploration Company, 418 National Bank of Tulsa Building, Tulsa, Oklahoma 74103.
- Casey, Sam H., President, Commonwealth Oil & Refining Company, Inc., Post Office Box 4065 (G.P.O.), San Juan, Puerto Rico 00936.
- Chambers, R. Eugene, General Manager, Armour Properties, Oil and Gas Building, Wichita Falls, Texas 76301.
- Donnell, J. C., II, President, Marathon Oil Company, 539 South Main Street, Findlay, Ohio 45840.
- Elliott, Frank G., President, Elliott Production Company, Post Office Box 1355, Roswell, New Mexico 88201.
- Erickson, Elmer R., President, Northwestern Refining Company, Post Office Drawer Nine, St. Paul Park, Minnesota 55071.
- Foree, Robert L., First National Bank Building, Dallas, Texas 75202.
- Fox, Stark, Executive Vice President, Independent Oil & Gas Producers of California, 609 S. Grand Avenue, Los Angeles, California 90017.
- Garver, George P., President, Natural Gas Pipeline Company of America, 122 South Michigan Avenue, Chicago, Illinois 60603.
- Getty, George F., II, Executive Vice President, Getty Oil Company, Post Office Box 54050, Los Angeles, California 90005.
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- Goodrich, Baxter D., President, Texas Eastern Transmission Corp., Post Office Box 2521, Houston, Texas 77001.
- Graham, Ford M., Chairman of the Board, The Louisiana Land and Exploration Company, Post Office Box 60350, New Orleans, Louisiana 70160.
- Haider, Michael L., Chairman of the Board, Standard Oil Company (New Jersey), 30 Rockefeller Plaza, New York, New York 10020.
- Halbouty, Michel T., Consulting Geologist and Petroleum Engineer, 5111 Westheimer Road, Houston, Texas 77027.
- Hammer, Armand, President, Occidental Petroleum Corporation, 10889 Wilshire Boulevard, Los Angeles, California 90024.
- Hamon, Jake L., Post Office Box 663, Dallas, Texas 75221.
- Hartley, Fred L., President, Union Oil Company of California, Union Oil Center, Los Angeles, California 90017.
- Hess, Leon, Chairman of the Board, Hess Oil & Chemical Corporation, 1 Hess Plaza, Woodbridge, New Jersey 07095.
- Hope, Alvin C., 1032 Milam Building, San Antonio, Texas 78205.
- Hornby, Robert A., c/o Pacific Lighting Service and Supply Company, 720 West Eighth Street, Los Angeles, California 90017.
- Howell, P. N., President, Howell Refining Company, Post Office Box 2776, San Antonio, Texas 78206.
- Hurd, John G., Post Office Box 499, Laredo, Texas 78041.
- Ikard, Frank N., President, American Petroleum Institute, 1271 Avenue of the Americas, New York, New York 10020.
- Jacobs, W. Morton, President, American Gas Association, c/o Southern California Gas Company, Post Office Box 3249, Terminal Annex, Los Angeles, California 90054.
- Jacobsen, Jake, 208 Westgate, Austin, Texas 78746.
- Jackson, Harry A., Chairman of the Board, American Petrofina, Incorporated, 50 Rockefeller Plaza, New York, New York 10020.
- Jones, J. Paul, President, Pennsylvania Grade Crude Oil Association, 52 Boylston Street, Bradford, Pennsylvania 16701.
- Jones, Wm. S., President, National Oil Jobbers Council, Inc., c/o Jones Oil Company, Post Office Box 19, Kennett, Missouri 63857.

- Kavouras, George N., Director, Petroleum Division, Farmers Union Central Exchange, Inc., Post Office Box "G," St. Paul, Minnesota 55101.
- Keeler, W. W., Chairman of the Board, Phillips Petroleum Company, Phillips Building, Bartlesville, Oklahoma 74003.
- Kelly, John M., Petroleum Consultant, 1001 Connecticut Avenue, N.W., Washington, D.C. 20036.
- Kenny, Wm. F., Jr., President, Meenan Oil Company, Inc., 44 East 23rd Street, New York, New York 10010.
- Kiltz, Alfred A., Post Office Box 271, Mt. Vernon, Indiana 47620.
- Levy, Walter J., 30 Rockefeller Plaza, New York, New York 10020.
- Lichtblau, John H., Director of Research, Petroleum Industry Research Foundation, 60 East 42nd Street, New York, New York 10017.
- Liedtke, J. H., Chairman of the Board, Pennzoil United, Inc., 900 Southeast Tower, Houston, Texas 77002.
- Loomis, Cecil E., Chairman of the Board, The Columbia Gas System, Inc., 120 East 41st Street, New York, New York 10017.
- Ludwig, D. K., President, National Bulk Carriers, Inc., 360 Lexington Avenue, New York, New York 10017.
- McClure, Harold M., Jr., President, McClure Oil Company, Post Office Box 147, Alma, Michigan 48801, and President, Independent Petroleum Association of America.
- McCollough, E. H., Director, Amerada Petroleum Corporation, Post Office Box 2040, Tulsa, Oklahoma 74102.
- McCurdy, Richard C., President, Shell Oil Company, 50 West 50th Street, New York, New York 10020.
- McGee, D. A., Chairman of the Board, Kerr-McGee Corporation, Kerr-McGee Building, Oklahoma City, Oklahoma 73102.
- McGraw, E. Clyde, Chairman of the Board, Transcontinental Gas Pipe Line Corporation, Post Office Box 1396, Houston, Texas 77001.
- Maddox, Earle L., President, Association of Oilwell Servicing Contractors, c/o Maddox Production Company, 2909 Junipero Avenue, Long Beach, California 90806.
- Marshall, J. Howard, Chairman of the Executive Committee, Great Northern Oil Company, 1320 Esperson Building, Houston, Texas 77002.
- Mecom, John W., Post Office Box 2566, Houston, Texas, 77001.
- Miller, Otto N., Chairman of the Board, Standard Oil Company of California, 225 Bush Street, San Francisco, California 94120.
- Mitchell, Charles S., Chairman of the Board, Cities Service Company, 60 Wall Tower, New York, New York 10005.
- Moriarty, F. C., President, National Petroleum Refiners Association, c/o Marathon Oil Company, 539 South Main Street, Findlay, Ohio 45840.
- Murphy, Charles H., Jr., President Murphy Oil Corporation, 200 Jefferson Avenue, El Dorado, Arkansas 71730.
- Nickerson, A. L., Chairman of the Board, Mobil Oil Corporation, 150 East 42nd Street, New York, New York 10017.
- Nielson, Glenn E., Chairman of the Board, Husky Oil Company, Post Office Box 380, Cody, Wyoming 82414.
- Niness, S. F., President, Chemical Leaman Tank Lines, Inc., Post Office Box 200, Downingtown, Pennsylvania 19335.
- Parten, J. R., Bank of the Southwest Building, Houston, Texas 77002.
- Penrose, Neville G., Chairman of the Board, Penrose Production Company, 1605 Commerce Building, Fort Worth, Texas 76102.
- Potter, L. T., Chairman of the Board, Lone Star Gas Company, 301 South Harwood Street, Dallas, Texas 75201.
- Rambin, J. Howard, Jr., Chairman of the Board, Texaco, Inc., 135 East 42nd Street, New York, New York 10017.
- Ritchie, A. S., 352 North Broadway, Wichita, Kansas 67202.
- Ritts, L. Chase, Jr., President, Union Carbide Petroleum Corp., 270 Park Avenue, New York, New York 10017.
- Rodman, Roland V., Chairman of the Executive Committee, APCO Oil Corporation, 1000 Liberty Bank Building, Oklahoma City, Oklahoma 73102.
- Rowan, Arch H., Director, and Chairman of the Oil Advisory Board, Rowan Drilling Company, Inc., Post Office Box 12247, Fort Worth, Texas 76116.
- Sanders, W. K., Chairman of the Board, Panhandle Eastern Pipe Line Co., Post Office Box 1642, Houston, Texas 77001, and President, Independent Natural Gas Association of America.
- Scott, Wilton E., President, Tenneco Oil Company, Post Office Box 2511, Houston, Texas 77001.

- Sewell, J. L., President Mid-Continent Oil & Gas Assn., c/o 2909 Fidelity Union Tower, Dallas, Texas 75201.
- Shaw, John S., Jr., President, Southern Natural Gas Company, Post Office Box 2563, Birmingham, Alabama 35202.
- Shertz, Robert H., President National Tank Truck Carriers, Inc., c/o Matlack, Inc., 10 West Baltimore Avenue, Lansdowne, Pennsylvania 19050.
- Shumway, Forrest N., President, The Signal Companies, Inc., 1010 Wilshire Boulevard, Los Angeles, California 90017.
- Simmons, J. J., Jr., President, Simmons Royalty Company, 228½ North Second Street, Muskogee, Oklahoma 74401.
- Smith, William Wikoff, President, Kewanee Oil Company, Post Office Box 591, Bryn Mawr, Pennsylvania 19010.
- Spahr, Charles E., President, The Standard Oil Company (Ohio), Midland Building, Cleveland, Ohio 44115.
- Steed, N. A., President, Texas Independent Producers & Royalty Owners Association, 902 International Life Building, Austin, Texas 76701.
- Strauss, W. A., President and Chairman of the Board, Northern Natural Gas Company, 2223 Dodge Street, Omaha, Nebraska 68102.
- Swearingen, John E., Chairman of the Board, Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois 60680.
- Taliaferro, Paul E., Deputy Chairman, Sun Oil Company, Post Office Box 2039, Tulsa, Oklahoma 74102.
- Tarkington, A. W., President, Continental Oil Company, 30 Rockefeller Plaza, New York, New York 10020.
- Taylor, Albert W., President, Natural Gas Processors Association, c/o Amerada Petroleum Corporation, Post Office Box 2040, Tulsa, Oklahoma 74102.
- Thomas, O. P., President, Sinclair Oil Corporation, 600 Fifth Avenue, New York, New York 10020.
- Thompson, Van, President, Aztec Oil & Gas Company, 200 First National Bank Building, Dallas, Texas 75202.
- True, H. A., Jr., Partner, True Oil Company, Post Office Drawer 1612, Casper, Wyoming 82602.
- Van Gorkom, J. W., President, Union Tank Car Company, 111 West Jackson Boulevard, Chicago, Illinois 60604.
- Vaughley, W. M., Vaughley and Vaughley, Post Office Box 4268, Jackson, Mississippi 39216.
- Vockel, R. L., President, The Waverly Oil Works Company, 1627 Bryn Mawr Drive, Newark, Ohio 43055.
- Warren, J. Ed, 1271 Avenue of the Americas, 7th Floor, New York, New York 10020.
- Wells, Everett F., Chairman of the Executive Committee, Ashland Oil & Refining Company, 1409 Winchester Avenue, Ashland, Kentucky 41101.
- West, Wesley, Post Office Box 7, Houston, Texas 77001.
- Wheless, N. H., Jr., President, American Association of Oilwell Drilling Contractors, c/o Wheless Drilling Company, Post Office Box 1746, Shreveport, Louisiana 71102.
- White, John H. President, Port Oil Company, Post Office Box 372, Charleston, South Carolina 29402.
- Whiteman, S. D., Chairman of the Board, Kansas-Nebraska Natural Gas Company, Inc., 300 North St. Joseph Avenue, Hastings, Nebraska 68901.
- Williams, J. H., President, Williams Brothers Company, National Bank of Tulsa Building, Tulsa, Oklahoma 74103.
- Winger, John G., Vice President, The Chase Manhattan Bank, One Chase Manhattan Plaza, New York, New York 10015.
- Woosnam, Albert W., Chairman, National Oil Fuel Institute, c/o Sinkler Inc., Southampton, Pennsylvania 18966.
- Wrather, John, 163 Royal Palm Drive, Fort Lauderdale, Florida 33905.
- Wright, M. A., Chairman of the Board, Humble Oil & Refining Company, Post Office Box 2180, Houston, Texas 77001.

NATIONAL PETROLEUM COUNCIL, MARCH 23, 1970—MEMBERSHIP (110)

OFFICERS

Chairman: Jack H. Abernathy, President, Big Chief Drilling Company.
Government Co-Chairman: Hon. Walter J. Hickel, Secretary of the Interior.
Vice Chairman: E. D. Brockett, Chairman of the Board, Gulf Oil Corporation.

Executive Director: Vincent M. Brown, Executive Director, National Petroleum Council.

Assistant Director: Maxwell S. McKnight, Assistant Director, National Petroleum Council.

Department of the Interior Officials: Hon. Hollis M. Dole, Assistant Secretary for Mineral Resources; Gene P. Morrell, Deputy Assistant Secretary for Mineral Resources; Wilson M. Laird, Director, Office of Oil and Gas.

ESTABLISHMENT AND PURPOSE OF THE NATIONAL PETROLEUM COUNCIL

In May, 1946, the President of the United States, by letter to the Secretary of the Interior, stated that he had been impressed with the great contribution of government-industry cooperation to the success of the World War II petroleum program, and that he felt the values of such close and harmonious relations between Government and the petroleum industry should be continued. Accordingly, the President suggested that the Secretary of the Interior establish an industry organization to consult with and advise the Secretary on oil and gas matters.

Pursuant to this direction, the National Petroleum Council was established by the Secretary of the Interior, Hon. J. A. Krug, on June 18, 1946.

The purpose of the National Petroleum Council is solely to advise, inform, and make recommendations to the Secretary of the Interior with respect to any matter relating to petroleum or the petroleum industry submitted to it by, or approved by, the Secretary. The Council does reserve the right to decide whether it will or will not consider any matter referred to it. The Council does not concern itself with trade practices or the like, nor does it engage generally in any of the usual trade association activities.

Members of the National Petroleum Council are appointed each fiscal year by the Secretary of the Interior for one-year terms, the membership being drawn from all segments of the petroleum and natural gas industries, from the production phase to the retail marketing level. The Council is wholly supported by the voluntary contributions received from its members.

The Council is headed by a Chairman and Vice Chairman, both members of the Council and the Industry. The Secretary of the Interior serves as Co-Chairman of the National Petroleum Council.

NATIONAL PETROLEUM COUNCIL MEMBERSHIP (FISCAL YEAR 1970)

- Abernathy, Jack H., President, Big Chief Drilling Company, Post Office Box 14837, Oklahoma City, Oklahoma 73114.
- Anderson, Robert O., Chairman of the Board, Atlantic Richfield Company, 717 Fifth Avenue, New York, New York 10022.
- Avery, Wallace E., President, Western Oil & Gas Association, c/o Texaco Inc., 3350 Wilshire Boulevard, Los Angeles, California 90005.
- Baldridge, Earl, Vice Chairman of the Board of Directors, Celanese Corporation, 1708 Commerce Building, 307 West Seventh Street, Fort Worth, Texas 76102.
- Bass, Perry, R., Fort Worth National Bank Bldg., Fort Worth, Texas 76102.
- Bauer, R. F., Chairman of the Board, Global Marine, Inc., 650 South Grand Avenue, Los Angeles, California 90017.
- Bennett, Carrol M., President, Texas Pacific Oil Company, 1700 One Main Place, Dallas, Texas 75250.
- Bille, Lester J., President, Association of Oilwell Servicing Contractors, c/o Tex-Well Service, Inc., Post Office Box 597, South Houston, Texas 77587.
- Blaustein, Jacob, President, American Trading and Production Corporation, The Blaustein Building, One North Charles, Baltimore, Maryland 21203.
- Borger, H. D., Chairman of the Board, Consolidated Natural Gas Company, Four Gateway Center, Pittsburgh, Pennsylvania 15222.
- Boyd, Howard, Chairman of the Board, El Paso Natural Gas Company, Post Office Box 2185, Houston, Texas 77001.
- Brazell, Reid, Chairman of the Board, Leonard Refineries, Inc., East Superior Street, Alma, Michigan 48801.
- Brockett, E. D., Chairman of the Board, Gulf Oil Corporation, Gulf Building, Pittsburgh, Pennsylvania 15230.
- Brown, Bruce K., Suite 2828, International Trade Mart, No. 2 Canal Street, New Orleans, Louisiana 70130.
- Bruce, Geo. H., President, National Stripper Well Assn., c/o Aladdin Petroleum Corporation, 809 Petroleum Building, Wichita, Kansas 67202.

- Burch, Bob, President, Rocky Mountain Oil & Gas Assn., c/o 550 East 12th Avenue, Suite 805, Denver, Colorado 80203.
- Calvert, F. Allen, Jr., President, Calvert Exploration Company, 2300 Fourth National Bank Bldg., Tulsa, Oklahoma 74119.
- Casey, Sam H., President, Commonwealth Oil & Refining Company, Inc., Post Office Box 4065 (G.P.O.), San Juan, Puerto Rico 00936.
- Chandler, Collis P., Jr., President, Chandler & Associates, Inc., 1401 Denver Club Building, Denver, Colorado 80202.
- Donnell, J. C., II, President, Marathon Oil Company, 539 South Main Street, Findlay, Ohio 45840.
- Erickson, Elmer R., President, Northwestern Refining Company, Post Office Drawer Nine, St. Paul Park, Minnesota 55071.
- Foree, Robert L., First National Bank Building, Dallas, Texas 75202.
- Fox, Stark, Executive Vice President, Independent Oil and Gas Producers of California, 609 South Grand Avenue, Los Angeles, California 90017.
- Garver, George P., Vice Chairman, Natural Gas Pipeline Company of America, 122 South Michigan Avenue, Chicago, Illinois 60603.
- Gerdes, Robert H., Chairman of the Executive Committee, Pacific Gas & Electric Company, 245 Market Street, San Francisco, California 94106.
- Getty, George F., II, Executive Vice President, Getty Oil Company, Post Office Box 54050, Los Angeles, California 9000.
- Gonzalez, Richard J., 48 Tiel Way, Houston, Texas 77019.
- Goodrich, Baxter D., President, Texas Eastern Transmission Corp., Post Office Box 2521, Houston, Texas 77001.
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AMERICAN MINING CONGRESS,
Washington, D.C., July 1, 1970.

HON. LEE METCALF,

Chairman, Special Subcommittee on the Outer Continental Shelf, Committee on Interior and Insular Affairs, U.S. Senate, Washington, D.C.

DEAR SENATOR METCALF: On March 4, 1970, Mr. C. H. Burgess, Vice President-Exploration, Kennecott Copper Corporation, testified on behalf of the American Mining Congress before the Special Subcommittee on the Outer Continental Shelf of the Senate Interior Committee. In your letter of March 11 to Mr. Burgess you emphasized questions which were contained in your opening statement at that hearing and which, in your judgment, did not receive adequate attention.

As chairman of the AMC Ad Hoc Committee on Undersea Mineral Resources, I have been asked to respond to these questions on behalf of the Mining Congress. In conformity with the custom of the Subcommittee, I am also attaching a personal resume for the record.

Your statement expressed the importance of protecting the ocean area from environmental damages. The need to protect the environmental quality of the Outer Continental Shelf is fully recognized by the mining industry. As we have stated previously, the oceans offer a potentially large source of minerals and their development must be achieved with due regard to other uses of the sea.

Through research we have an opportunity to discover many of the environmental effects of ocean mining. Environmental problems may vary for different minerals and for different ocean locations. Environmental control regulations should be promulgated before decisions are made to develop ocean mining projects and the mining industry should be afforded the opportunity to assist in the development of such regulations. Such regulations should be promulgated only after close examination of the facts, a full exchange of views of all parties concerned and a careful reference to the technological and economic factors that will determine whether proposed controls are realistic and effective.

Your statement posed the following questions:

To what extent do you think the Government should provide incentives for marine mining?

In our judgment, the basic role of the Federal Government should be to provide a climate which recognizes the element of risk inherent in all mining ventures and which encourages such enterprise. This requires the removal of legal uncertainties, recognition of the frontier character of ocean mining and a realization of the importance of ocean minerals to the nation's economy and self-sufficiency.

What kind of incentives would be best and what time frame would you recommend for their implementation?

If financial incentives are desirable, should these be in the form of tax easements, market controls or other more direct forms of support?

Financial incentives are desirable and, of those listed in the question, incentives in the form of tax easements are, by far, the most desirable. A major incentive to the mining industry would be the establishment of a Federal legal regime providing favorable arrangements for acquiring mineral rights on the Outer Continental Shelf.

If Federal research programs are desirable, should these be restricted to basic research or should they include general surveys, the delineation and evaluation of resource sites or the development of mining technology?

The Federal Government should increase its commitment to basic research and this research should include general surveys of the ocean floor. Efforts to delineate and evaluate resource sites and to develop mining technology are the responsibility of the mining industry itself and other areas of the private sector. Such activities clearly fall beyond the purview of the Federal Government.

In expanding its role in basic research, the Federal Government should devote specific and increased attention to the definition and solution of environmental problems which may be created by ocean mining.

The American Mining Congress appreciates the opportunity to submit this additional information for the hearing record.

Sincerely,

T. S. ARY,
*Chairman, Committee on
 Undersea Mineral Resources.*
 T. S. ARY,

RÉSUMÉ

My name is T. S. Ary; I am Vice President of Union Carbide Exploration Corporation.

I have spent approximately 25 years in various phases of the minerals industry.

I started my career in the mining industry in the southern Illinois coal fields as a coal miner. After receiving a degree in Mineral Sciences from Stanford University, I continued my work with the Anaconda Cooper Company in Butte, Montana, as a mining engineer, geologist and production supervisor.

For the past 17 years I have worked for Union Carbide Corporation in the following capacities: Mining engineer; Exploration geologist; Assistant Manager of Exploration, Domestic; Manager of Exploration, Domestic; Land Manager, International; and Vice President.

I have served in various capacities with the American Mining Congress on the Public Lands Committee and the Ad Hoc Committee on Undersea Mineral Resources.

I have served in a general capacity with various State Mining Associations.

I have served on the Marine Resources Advisory Panel of the National Chamber of Commerce.

STATEMENT OF LEWIS M. ALEXANDER, PROFESSOR OF GEOGRAPHY, UNIVERSITY OF RHODE ISLAND

My name is Lewis Alexander. I am Professor of Geography at the University of Rhode Island and Executive Director of the Law of the Sea Institute. Nothing in my remarks here should be taken as in any way reflecting policy positions of the Institute.

In the course of the hearings before this Subcommittee a great deal of useful information has been generated on the various interests of the United States in the continental shelf. I shall confine my remarks primarily to the question of the outer limits of the legally-defined shelf, and more specifically to some of the global implications of alternative limits to the shelf. Three questions I would like to address are (1) how can the legitimate interests of the United States with respect to the shelf be accommodated with those of other States of the world community; (2) what are the advantages and drawbacks of alternative methods for delimiting shelf boundaries; and (3) how might proposals for redefinition of the outer limits of the shelf be implemented?

ACCOMMODATING U.S. INTERESTS WITH THOSE OF THE WORLD COMMUNITY

Considerable data has been presented before this Subcommittee on the interests of the United States with respect to such shelf activities as mineral exploration and exploitation, fisheries, defense operations, and scientific investigations. In general the United States would seem to favor a narrow shelf in terms of defense and science, in order to permit it to operate in as large an area of the high seas as possible. But from the standpoint of mineral exploration and exploitation, the reverse seems to be true, namely that we should favor a broad shelf policy so that our authority extends down the continental slope and out onto the continental rise. Certainly this would seem to be the position of the oil industry; the hard minerals spokesmen seem less concerned with the question of exclusive rights to the resources of the slope and rise. For commercial fisheries, sentiment is divided. There are those spokesmen of distant-water fisheries, particularly tuna and shrimp, who would argue for maximizing the area of the free seas in which

fisheries of all nations can operate; and there are spokesmen for the coastal fisheries, such as haddock and flounder, who would take the position that the national interest requires we adopt as broad a jurisdictional zone as possible in order to protect against the depredations of foreign fishermen. Thus we are faced with the need to accommodate conflicting domestic interests in the shelf, before seeking to adjust these to the interests of other States of the world community.

We need protection, and yet at the same time we want freedom of action for certain activities, not only with respect to our own shelves, but also in terms of foreign shelves off which we may desire to operate. One means of rationalizing these interests lies in the adoption of some sort of intermediate zone in the outer portions of the legally-defined continental shelf—a zone in which certain activities can continue to be regulated by the coastal State, while others can be freely pursued by all member countries of the world community. I shall go into the details of a proposed international regime for the shelf a bit later; suffice it to say here that in the proposed regime, mineral exploration and exploitation would be under the control of the coastal State, while defense and scientific activities could be carried on by other countries within the zone.

I strongly believe that world community interests—and those of the United States—are best served by maximizing freedom of the use of the seas. This is particularly true for navigation and for scientific investigation; in general it is true also for fisheries. Dividing the oceans up into exclusive fisheries zones tends to reduce the total volume of protein produced world-wide. In cases of severe congestion, as for example occurs off the Northeast coast of the United States and Canada, there are various restrictive devices to employ—such as national quotas, abstention agreements for certain species, and limited entry arrangements—without totally closing large areas to foreign fishing.

If the United States has a unique combination of interests with regard to the shelf, what then of the interests of other countries with which these should be accommodated? Here again the issues are by no means clear cut. There are in the world today 141 independent States¹ of which 29 are land-locked² and 112 are coastal. Of the coastal States, 22 are in effect "shelf-locked", that is, their shelves do not extend beyond the 200-meter isobath, or they face on semi-enclosed seas, only a small part of which are deeper than 200 meters.³ Among the remaining 90 coastal States of the world, there are 84 delegations to the United Nations. Twenty-eight of these States might be classified as having broad shelves, and 62 as having narrow shelves.⁴

Given these statistics, what can be inferred in terms of national interests? It might be generalized that the 51 land-locked and shelf-locked States would favor maximizing the extent of the seabed under some form of international regime in the hopes of deriving a share of the profits from future resource development there.

And it is interesting to note that among the narrow-shelf countries, 8 have total coastlines less than 100 miles in length, while 6 others have lengths of from 100–200 miles. Thus the total area of their continental margin—including shelf, slope, and rise—is small. In other words, close to half the independent States of the world might find it in their interests to support an international regime for the deep sea floor covering as broad an area as possible, since they have little or no continental margin of their own to develop.

It is difficult to predict what type of regime the other countries of the world would support. The remaining States with narrow shelves (48) might press for a broad-shelf policy as compensation for their narrow zone out to the 200-meter isobath. Here, as in the case of the 28 broad-shelf States, the governments of the

¹ The Department of State lists 136 national states; to these should be added Mainland China, North Korea, North Vietnam, East Germany, and Mongolia.

² Afghanistan, Andorra, Austria, Bhutan, Bolivia, Botswana, Burundi, Central African Republic, Chad, Czechoslovakia, Hungary, Laos, Lesotho, Liechtenstein, Luxembourg, Malawi, Mali, Mongolia, Nepal, Niger, Paraguay, Rwanda, San Marino, Swaziland, Switzerland, Uganda, Upper Volta, Vatican City, Zambia. Twenty-three of these are members of the United Nations.

³ These include Belgium, Cambodia, Denmark, Ethiopia, Finland, East Germany, West Germany, Iran, Iraq, Jordan, Kuwait, Malaysia, Netherlands, Poland, Saudi Arabia, Singapore, Sudan, Sweden, Thailand, North Vietnam, Yemen, Yugoslavia. Nineteen of these are members of the United Nations.

⁴ The criterion used here for a "broad shelf" country is that the 200-meter isobath, for a significant distance along the country's coast, lies more than 50 nautical miles from shore. In some instances, of course, the country in question may have a narrow shelf, but one or more of its possessions have a broad one. The classification here does not include possessions.

so-called "developed" countries might reason that their best interests lie in extending jurisdiction down the continental slope and out onto the rise, rather than turning control over to an international administration, while the governments of less-developed countries could argue that if they retain control over these areas they can lease out development rights to foreign entrepreneurs, and again receive all or most of the proceeds. On this basis it is suggested that a hypothetical division of national interests might exist between some 65-68 countries which would in the long run favor maximizing the extent of seabed area to be placed under an international regime for resource development, and some 73-76 States whose interests would lie in extending the limits of their legally-defined continental shelves as far seaward as possible.

One of the key factors in any discussion of shelf limits is, of course, the type of regime to be established for the deep seabed beyond these limits. While it is the intention here to dwell on alternative regimes for the deep seabed, let me say that I believe under current conditions that an arrangement may eventually be worked out which provides that a portion of the revenue derived from exploitation of seabed and subsoil resources beyond shelf limits will go to an international fund, from which they will be distributed, under some formula, primarily to the less-developed countries of the world. These countries have expectations, based in part on the statements of diplomats in the United Nations and elsewhere, of benefiting from the potential wealth of the resources of the seabed and subsoil within the foreseeable future. According to some estimates several billion dollars may be realized within the next few years from resource exploitation beyond the 200-meter isobath, and a portion of these funds may become available "for the benefit of mankind". One important question here is, will the funds come primarily from the exploitation of the continental slope and upper parts of the rise, or will they evolve from development of the deep sea floor beyond the continental margin? If the former condition prevails, then it is highly important that some of the revenue derived from resource development on the slope and rise become available to any international fund which is established.

I noted earlier that one means of accommodating the various national interests of the United States with one another might lie in the creation of an intermediate zone in the outer part of the legally-defined continental shelf, along the general lines recommended by the President's Commission on Marine Science, Engineering and Resources. Within this intermediate zone (which, since it lies beyond the edge of the physical shelf, should operate under a regime of the *slope*, rather than being referred to as a part of the shelf regime) only the coastal State or its licensees would be permitted to explore for and exploit the resources of the sea floor, but they would do so under the rules of the coastal State. A portion of the revenue produced from resource exploitation on the slope would go to an international fund—a portion sufficiently large so as to create a viable fund over the coming years as resources beyond the 200-meter depth are developed.

The restrictions on foreign scientific research as outlined in Article 5(8) of the Geneva Convention on the Continental Shelf, should not apply to this intermediate zone. Under no conditions should national authority over exploration and exploitation on the slope be extended to the superjacent waters or to the airspace above these waters. In other words, the intermediate zone is a zone of limited competence, in which the coastal State may determine the conditions under which exploration and exploitation of the seabed and subsurface resources may take place, subject only to the provision that a fixed percentage of any revenue derived from such exploitation shall go to an international fund.

The great advantage of the intermediate zone concept is that it provides for a belt of transition between the area where the legitimate interests of the coastal State prevail, and that where the interests of the international community are paramount. It also has the advantage that it could be adopted in stages, starting with some interim provision for exploration and exploitation beyond the 200-meter isobath and then moving to the resolution of more difficult problems without damaging the proposal's basic intent. Whatever type of regime is ultimately developed for the deep ocean floor beyond the limits of the continental block can be readily accommodated with the proposed system.

ALTERNATIVE METHODS FOR DELIMITING SHELF BOUNDARIES

Within the context of shelf and intermediate zones, there are various means for defining geographic limits on the seabed. The four basic methods for fixing seabed boundaries are exploitability, water depth, geology, and distance from shore. Each of these will be considered in terms of its advantages and drawbacks.

Exploitability: The Geneva Convention on the Continental Shelf provides that the outer limit of the shelf be based first on the 200-meter isobath, and then, if applicable, on the exploitability criterion, limited by the requirement of adjacency. Approximately 7.6 per cent of the world ocean is underlain by depths of less than 200 meters; the distance offshore of the 200-meter isobath ranges from less than one mile off several coasts to over 500 nautical miles off the coast of Siberia. No country to date has made formal claim to the seabed and subsoil beyond the 200-meter isobath on the basis of exploitability, although quite a few have granted leases for the development of seabed resources in deeper waters. Nor is there evidence now of active commercial exploitation of submarine resources at depths even approaching 200 meters; the deepest producing oil wells are at 340 feet, and hard minerals are recovered commercially at considerably lesser depths.

There are at least three obvious advantages to the exploitability test. A first is that it is a tenet of international law, as evidenced by the February, 1969 decision of the International Court of Justice in the North Sea Continental Shelf Cases. Second, it is a flexible doctrine which can change with changing needs, and permits coastal States to make claims to specific ocean areas while leaving the general problem of jurisdiction open-ended. Finally, for coastal States with broad shelves, the exploitability test is, in a sense, "tailor made" since the rules can be adjusted to conform with the country's development needs.

But there are also a number of drawbacks, one of them being that for most States of the world the exploitability doctrine offers little direct benefit since the countries do not have access to extensive shelf resources. There is also the problem of ambiguity of the term "exploitability". Does it imply commercial exploitation, or can exploratory testing be used to "prove" an ability to exploit, and thus the right to advance national limits beyond the 200-meter depth? Some officials, at least in the United States, have contended that the mere issuance of leasing maps to sea floor areas adjacent to the coast is an affirmative assertion of U.S. jurisdiction over these areas. With this, of course, goes the question whether an extension seaward of one State's limits, on the basis of ability to exploit, does not automatically extend to all other coastal States the right to extend their limits on the shelf to a similar depth?

A more serious problem, perhaps, is that of the outer limits to exploitability. Although the Geneva Convention specifies that the shelf area be "adjacent to the coast" there is no further definition of adjacency. Certainly the International Court, in its 1969 decision, did little to resolve the issue when it states: "* * * by no stretch of the imagination can a point on the continental shelf situated say a hundred miles, or even much less, from a given coast, be regarded as "adjacent" to it, or to any coast at all, in the normal sense of adjacency."

If one is several hundred miles from shore, but still at a depth of less than 200 meters (as off Alaska or Siberia) is one still on the legally-defined shelf "adjacent to the coast"? And if, on the basis of exploitability, a country seeks to extend its seaward limits beyond the 200-meter isobath, does it matter whether this extension is done from a narrow shelf—say thirty miles from the coast—as opposed to a broad shelf, where the 200-meter line may be 100 miles or more from the shore? These definitional problems could conceivably be worked out to the mutual satisfaction of all or most of the world's nations within the framework of the United Nations. Unless and until they are resolved, however, the exploitability criterion, as it stands now, may not be a viable one for the changing needs and expectations of the countries of the world community.

Depth: The use of fixed depth as a basis of marking the outer boundaries of the shelf brings with it a precision which is lacking in the exploitability test. Marine scientists tend to think in terms of depth since it has a limiting effect on activities involving both the seabed and subsoil and the superjacent waters. Maps and charts showing depth form the basis for much of the use of the oceans.

But there are two major drawbacks. One is that if depth—any depth—is used as the sole criterion for defining the limits of the shelf, some countries will have jurisdiction over the resources of large submarine areas, while others will get very little. Also, any depth beyond 200 meters is, in a sense, "artificial." Senator Pell's recommendation of 550 meters as the limiting depth of the shelf has as a rationale the fact that this is the greatest depth at which the physical break in slope on the shelf occurs anywhere in the world. Adoption of this depth would have the advantage of leaving open for future decisions the choice of greater depth limits as conditions warrant. On the other hand, Dr. Pecora of the U.S. Geological Survey, has noted that a depth of 2,500 meters "... could be used

as an interim line of demarcation to delineate the continents from the oceans until more permanent boundaries can be agreed upon." His reasoning was based on his findings that the geologic boundary generally "lies near the base of the continental slope which throughout much of the world is at or below the 2,500-meter isobath." Although other geologists have disagreed with Dr. Pecora's suggestion, we have here at least a suggestion, if depth is to be used for defining the shelf's outer edge, of an isobath which might over a period of time be equated in people's minds with the edge of the continental block. In between the 200 and 2,500 meter figures are, of course, all manner of intermediate depths, such as 1,000 meters, 1,000 fathoms, or 2,000 meters, no one of which seems to have any intrinsic advantage over the other. Table 1 indicates the percentage of ocean seabed closed off by alternative depth.

Table 1

	Percentage of all oceans
200	7.6
550	9.5
1,000	11.9
2,000	16.1
2,500	19.5
3,000	22.9
4,000	42.5
5,000	75.5
6,000	98.8

It should be noted that as depth limits increase, new patterns of potential "shelf" areas appear. For example, increasing the depth limit to 1,000 fathoms (1,830 meters) would represent a growth of the United States shelf area to just under 50 per cent over its extent out to the 200-meter isobath. But New Zealand's shelf would increase six and a half times by the change in depth, and Iceland's would grow more than five times. Off Newfoundland, western Australia, and Norway, the shelf would extend considerably farther seaward at 1,000 fathoms than at the present limits, and many small islands which now have a narrow shelf would find that at depths of 1,000 fathoms or greater, their adjacent shelf area would be greatly increased. At 2,500 meters one of the most striking features is a thousand-mile long north-south ridge which appears in the mid-Atlantic, centered on the Azores. Compounding the problem of shelf definitions at greater depths would be the many shallow underseas areas which have no natural islands associated with them; increasing the depth limits increases also the frequency and extent of such phenomena.

Geology: An alternative regime of the shelf might be based on geology. A first geologic feature is the edge of the shelf itself, as represented by the 200-meter isobath, or, as noted above, by the 550-meter isobath representing the greatest depth anywhere in the world at which the shelf edge appears. A second physical phenomenon is the point of contact between the continental slope and the rise; the depths at which this occurs vary from 1,000 to 4,000 meters, and along some coasts the continental rise is absent. A third feature is the contact point beneath the seabed between continental and oceanic-type rock. This occurs at the foot of the geologic slope, and is frequently overlain by sediments of the geologic rise. Still another, though less distinct, geologic feature is the foot of the continental rise on the deep ocean floor.

Of these four phenomena, the point of contact between continental and oceanic rock has been receiving considerable attention, in part through the efforts of the National Petroleum Council. The Council notes the International Court's findings in the North Sea Continental Shelf Cases that "the most fundamental rule of international law pertaining to the continental shelf is that it comes within the sovereign rights of the coastal State because it is a natural prolongation of the land territory." Such reasoning, the Council feels, would imply national rights over the whole of the continental block. Certainly there is a strong rationale for defining the edge of the shelf on the basis of physical differences. It would guarantee to the coastal State control over all the resources of the slope and the upper portions of the rise. But there are also strong counter-arguments to this proposal.

The inequality among coastal States noted in connection with a fixed depth criterion would also apply here. Certainly there is a question whether a regime based on geology would be acceptable to most of the world's nations. A decision to move the limits of national sovereignty out onto the upper portion of the con-

tinental rise would leave little room for flexibility of action in the light of future needs. The die would have been cast in favor of broad national limits—but with one exception. In later years coastal States might seek (again on the grounds of geology) to extend their limits even further seaward to the foot of the continental rise, particularly if the sediments of the rise prove to be important sources of petroleum.

Selecting the contact point between continental and oceanic-type rocks as the outer boundary of the legally-defined shelf would, in itself, raise serious problems of precise boundary delimitation. For this reason it has been suggested, rather than follow the sinuosities of a geologic contact point, that a system of straight lines joining fixed geographic coordinates be established—the coordinates to be located approximately on, or just seaward of, the geologic boundary. This system could also be applied in case a fixed depth were selected to mark the outer boundary. One advantage is that the coordinates can be located on the seabed within an accuracy of some 500 feet.

Perhaps the greatest objection to the use of geologic criterion, from the standpoint of the international community, is that the cession of the continental slope and upper portions of the rise to the coastal state deprives an international regime of the possibility of sharing in the wealth derived from the resources of these areas. In most estimates of anticipated revenue for an international fund, account has been taken of development of the resources of the slope, since this development will probably take place in an appreciable magnitude considerably sooner than will large-scale exploitation of the resources of the deep sea floor. Thus to remove from a potential international fund the anticipated wealth from the slope may result in a long delay in the creation of a viable international arrangement for sharing the benefits of what are often referred to as “the common heritage of mankind.”

Distance: A final criterion might be that of setting the outer limit of the shelf at a fixed distance from shore. Although lengths of coastline differ greatly among countries, ranging from less than 10 miles for Jordan and Monaco to over 23,000 for the Soviet Union, the selection of distance would tend to compensate for one of the most troublesome inequalities among coastal States, namely the variations in the breadth of the shelf.

The criterion of distance is used here not in the sense that a coastal State be compensated for its lack of a broad shelf by exercising jurisdiction over the superjacent waters out to one or two hundred miles from shore. Rather it is seen in terms of a state having sovereignty over the resources of the sea floor at whatever depth, out to a fixed distance from the coast. In most suggestions distance is generally paired with depth—although it could also be used in conjunction with exploitability or geology. The two most frequently-noted pairings of this type are 200 meters/50 nautical miles; and 2,500 meters/100 nautical miles. The former, if used on a world-wide basis, would close off some 15 per cent of the oceans' seabed; the latter would close off some 28 percent. If applied to the continental shelf of the United States, a substitution of the 200 meter/50 mile rule for the present 200-meter isobath would result in an increase of the shelf's extent by 60 percent; if the 2,500 meter/100 mile system were used, the shelf area would increase by 150 per cent. Similar calculations can, of course, be made for any other country. The point here is that the depth/distance criteria may result in the inclusion of large areas of sea floor within national limits.

The problem of islands and island groups, noted earlier in connection with the criterion of depth, becomes even more serious here. Describing a circle of 50 miles radius about a single mid-ocean rock, would close off some 7,850 square miles of seabed within national territory; increasing the radius to 100 miles would increase the area enclosed by 23,000 square miles. Suggestions have been made, particularly by Senator Pell and by the Commission to Study the Organization of Peace, for handling delimitation problems in the case of islands, but neither takes into account all the complexities of the problem. For example, what is to be done in the case of independent island countries, such as Nauru, which is 8 square miles in area, the Maldives Island (115 square miles), Malta (122 square miles) or the soon-to-be-independent Tonga Islands (270 square miles). Should distinctions be made between inhabited and uninhabited islands? Here is an area in which much greater technical knowledge is needed than now exists.

There is also the problem of baselines along the coast from which to measure the distance offshore of the shelf's edge, assuming this criterion were selected. Some 30 countries now employ straight baseline regimes which are independent of the low-water line; in some cases these lines depart to a considerable extent

from the coast. The result has been to extend the outer limits of their territorial waters considerably seaward of what they would be if the rule of the tideline were adhered to; this situation would be compounded if the baselines were also used for continental shelf measurements as well.

Given these various conditions I would suggest the following. The continental shelf, over which the coastal State exercises sovereign rights for the purpose of exploring it and exploiting its natural resources, should extend only as far seaward as the 200-meter isobath. Beyond this would be the intermediate zone, described earlier, extending to the geologic point of contact between continental and ocean-type rock. This would represent a more viable geologic boundary than would the outer edge of the continental rise, which is some areas would lie hundreds of miles out on the ocean floor. The seaward boundary of the intermediate zone would be a series of straight lines joining geographic coordinates equated as closely as possible with the point of contact beneath the seabed between the two types of rock. This regime would apply to islands as well as to the mainland.

IMPLEMENTATION OF PROPOSALS FOR REDEFINING THE OUTER LIMITS OF THE SHELF

It now appears likely that there will be one or more Law of the Sea Conferences within the next few years. If the procedures of the 1958 and 1960 Conferences are followed, all 126 delegations from the United Nations will be present and voting, together with delegations from some non-member States (i.e., Switzerland, West Germany, South Korea). Assume, for example, that 132 delegations are present at the next Conference; under these conditions, it would take 88 votes (a two-thirds majority) to adopt any new proposals, including a new definition of the outer edge of the legally-defined continental shelf, replacing the current exploitability criterion.

Three factors should be considered here. A first is the possibility of a dead-locked conference so far as new limits to the shelf are concerned. Earlier it was noted that a division exists between 51 land-locked and shelf-locked countries, and 90 States with adjacent shelves extending down into deep waters. At least 14 of the 90 have rather insignificant areas of continental margin, so that their interests in future limits to the shelf might tend to correspond with those of the 51 land-locked and shelf-locked States. Under these conditions, it could be difficult to muster 88 votes in support of any particular proposal for redefining shelf limits.

A second consideration is the chance that a voting majority at a future Conference might be obtained in support of some proposal which the United States could consider as inimical to its best interests. In a sense the United Nations moratorium of last December represented such a situation. Less than one-third of the States of the world could probably be classed as "developed". Despite the statistics cited above with respect to land-locked and coastal countries, might it not be possible at some future Conference for all or most of the less-developed countries to support a proposed regime for the seafloor beyond the 200-meter isobath, which could muster the needed 88 votes, but which the United States would refrain both from supporting and from ratifying? Both in this situation, and that of a dead-locked Conference on the question of shelf limits, the present exploitability criterion would represent a fall-back position. While it would appear to this writer at least that the intermediate zone concept suggested earlier might in the long run prove preferable to the present regime, it is necessary to consider briefly a third element—namely the possibility of modifying Article 1 of the 1958 Geneva Shelf Convention so as to make it more compatible with changing needs and conditions.

It should be noted that to date there have been only 40 ratifications or accessions to the Convention.⁵ A majority of the States which have ratified or acceded could, acting together, propose to the United Nations, one or more amendments to Article 1 spelling out more explicitly the definitions of the terms "adjacent to the coast" and "exploitation". "Adjacency" for example, might be agreed upon as having some geologic or fixed-distance limit. Alternatively, the member States to the Convention might agree among themselves on new definitions for such terms, and any new States joining the Convention would do so with recognition

⁵ Actually only 38 independent States are involved, since not only did the USSR ratify, but also Byelorussia and Ukraine. Four of the States are land-locked, 9 are shelf-locked, 17 have narrow shelves, and 8 have broad shelves. About half of the total number of States would probably be classed as "developed".

of the new conditions. The point here is that the existing Convention would, with a few modifications, continue for some time be a suitable vehicle for resolving a great many of the problems encountered in development of the outer parts of the continental margin.

One of the important criteria of any regime for defining the outer edge of the legally-defined continental shelf is that it be flexible and capable of change in response to new knowledge about the marine environment, and to new needs of nations and entrepreneurs. The present Continental Shelf Convention is so designed, although perhaps not for long, if countries begin exerting their exclusive authority over resource exploration and exploitation down the continental slope, out onto the rise, and perhaps even beyond the edge of the rise. A moratorium on national claims to areas beyond the 200-meter isobath (but not on exploration and exploitation activities) would seem highly desirable at this time, until more specific efforts have been made at the international level to work out more detailed arrangements for the continental shelf and slope. The United States should approach with extreme caution any proposals for further reducing the areas of the high seas, whether within the water column or on or beneath the seabed. Where restrictions to freedom are necessary, alternative arrangements to the outright extension of exclusive national rights are often possible.

NATIONAL WILDLIFE FEDERATION,
Washington, D.C., May 11, 1970.

Senator LEE METCALF,

Chairman, Special Subcommittee on the Outer Continental Shelf, Senate Committee on Interior and Insular Affairs, Washington, D.C.

DEAR MR. CHAIRMAN: Thank you for your letter of April 25, 1970, and the invitation to comment about issues related to the establishment of a seaward boundary of the United States on the Outer Continental Shelf.

Due to a conflict, it will be impossible for the National Wildlife Federation to appear personally before this Subcommittee but we would appreciate having this letter made a part of the official record of this hearing.

The National Wildlife Federation long has been interested and concerned about the coastline of the United States and offshore resources which are inseparably and irrevocably intertwined. This interest and concern has been expressed with respect to preservation of estuarine areas, through the preservation of numerous national lakeshores and recreation areas, and through the expressions of our organization on water pollution control, especially that relating to oil. As a consequence, we appreciate and welcome the opportunity to comment about the few principles which we believe should be followed with respect to these important natural assets.

Attached are several resolutions from a list of 56 which were adopted at the 1970 annual convention of our organization held March 20-22, 1970, in Chicago, Illinois. We call your particular attention to Resolution No. 3 which opposes the installation of a German industrial plant in South Carolina; Resolution No. 10 which relates to oil exploration guidelines and these guidelines are applicable to offshore areas as well as those on land areas; Resolution No. 29 which recommends that a protective fishing zone of at least 300-meter depth be established; Resolution No. 32 which relates to coordinated Federal action to prevent oil or chemical spills on navigable waters; Resolution No. 50 which relates to leasing of submerged lands for offshore oil drilling; and Resolution No. 54 which calls for U.S. opposition to any high seas nets and long lines fishing for salmon in waters east of 175 degrees west longitude.

Last year, in Resolution No. 25, this organization deplored the offshore drilling problem which related to Santa Barbara, California and we are attaching a copy of this as well.

Other than the principles expressed in these resolutions, the federation is of the opinion that a *long-range program must be developed for coastline areas and contiguous offshore areas. We also are of the firm belief that the United States must not forfeit any of its rights to natural resources as outlined in the Geneva Conference on the Continental Shelf.*

To conclude, however, we also urge that the Subcommittee give important consideration to some of the more intangible values of the offshore areas for recreational purposes such as sport fishing and hunting and the important roles which these offer for millions of Americans. These cannot always be given prices or accurate economic value and for this reason frequently are ignored.

Thank you again for the opportunity of making these remarks.

Sincerely,

THOMAS L. KIMBALL,
Executive Director.

RESOLUTION NO. 3—GERMAN INDUSTRIAL PLANT, SOUTH CAROLINA

Whereas a German firm known as Badische Anilin and Soda-Fabrik Corporation (BASF) is proposing to locate a \$100 million chemical industrial complex in Beaufort County, South Carolina; and

Whereas the proposed location of the complex at Port Victoria poses threats of water pollution in the largest unpolluted estuary in South Carolina, which would damage important fisheries and shellfisheries resources as well as other outdoor and aesthetic values; and

Whereas the installation also may create problems of air pollution; and

Whereas salt water may intrude upon fresh water areas if a ship channel is dredged to the plant site, thereby creating undesirable ecological changes; and

Whereas reports from Europe indicate that the firm's plant at Antwerp has resulted in significant pollution of natural resources; Now, therefore be it

Resolved, That the National Wildlife Federation, assembled in annual convention at Chicago, Illinois, March 20-22, hereby petitions the Governor of South Carolina and the officials of Beaufort County to *deny permission for BASF to locate and operate in the proposed area until the state has firm assurances and agreements that the plant, through the installation and efficient operation of suitable facilities, will not pollute water or air resources or create other undesirable effects upon the environment.*

RESOLUTION NO. 10—OIL EXPLORATION GUIDELINES

Whereas improper exploration, extraction, and transportation procedures (by either land or sea) involved in producing and marketing oil could seriously threaten wildlife habitat remaining in North America: Now, therefore, be it

Resolved, that the National Wildlife Federation, in annual convention assembled at Chicago, Ill., March 20-22, 1970, hereby recommends that the United States Government through stringent regulations and controls, strictly enforced by well-trained personnel, require procedures of oil exploration, extraction, and transportation which will assure the maximum possible protection for, and preservation of, fragile soil, water, vegetative, and wildlife resources, with adequately-financed research efforts providing any information not presently known about the effects of transportation corridors upon the environment.

RESOLUTION NO. 25—OIL POLLUTION

Whereas, the conservationists of the world were alarmed at the oil pollution and damage done by the Torrey Canyon ship disaster off the coast of England; and

Whereas, now the conservationists and the citizens of the National are shocked and stunned by the Santa Barbara off-shore pollution disaster which has caused millions of dollars of damage to the wildlife, marine life, beaches, private property and natural resources; and

Whereas, the restrictions on off-shore drilling for oil under the jurisdiction of the U.S. Department of the Interior are less restrictive than those imposed by the State of California on oil well drilling; and

Whereas due to the fact there is a lack of strong regulations on off-shore oil drilling, the greatest oil pollution has occurred; and

Whereas there has been and can be a greater damage to our wildlife, property and natural resources, because there is a great need for better and safer drilling methods to protect our wildlife, property and natural resources: Now, therefore, be it

Resolved, that the National Wildlife Federation, in annual convention assembled Feb. 28–March 2, 1959, in Washington, D.C., strongly urges the Secretary of the Department of the Interior to immediately stop off-shore oil well drilling until complete safeguards are developed to prevent another oil pollution disaster in our Coastal California area; and be it further

Resolved, that the Federal off-shore drilling regulation be as stringent as, or more stringent than those enforced by the State of California on oil well drilling.

RESOLUTION No. 29—EXTENSION OF U.S. FISHING, COASTAL WATERS

Whereas the 9-mile protective fishing zone contiguous to the U.S. territorial sea has proved to be inadequate for the protection and preservation of our fishing resources; and

Whereas it has become necessary for all nations to assert their authority over the marine resources on their respective continental shelves that are so necessary for the well-being and survival of their nations; and

Whereas the continued exploitation and decimation of the fishery resources of the continental shelf of the U.S. by foreign fishing fleets, with little regard of prior rights to the resources by the U.S., has created the necessity for this nation to assert itself and take complete control over its marine resources by legislative action: Therefore, be it

Resolved, That the National Wildlife Federation in annual convention assembled in Chicago, Ill., March 20–22, 1970, recommends that a protective fishing zone of at least 300-meter depth or the continental shelf, whichever is further, be established at the earliest opportune time;

That adequate licensing privileges be granted to those foreign nations wishing to harvest certain fishes of the continental shelf that are not being harvested to their established maximum sustainable yield by American fishermen and only the portion declared as surplus is to be caught by foreign licensees;

That a reasonable incidental catch of other species of fish be permitted to be taken by licensees but that the taking of over-exploited fish be controlled by closing known nursery or feeding areas of these species to those licensed foreign fishing vessels and protecting the resource by any other means deemed feasible;

That licensing procedures be implemented by the appropriate Federal and/or State agencies only after adequate research by American fishery scientists have proven an abundance exists in the particular fishery which the foreign licensee wishes to enter;

That boarding privileges be granted by the licensee upon demand of the licensor for the purpose of inspection and evaluation of the catch.

RESOLUTION No. 32—OIL AND CHEMICAL SPILLS ON NAVIGABLE WATERS

Whereas several catastrophic oil and chemical spills or leaks in navigable waters have occurred in recent months; and

Whereas catastrophic oil and chemical spills or leaks may occur in waters beyond the jurisdiction of a coastal state; and

Whereas spills may be harmful to the resources of that State or adjacent States or to those in other countries; and

Whereas spills inside a state's jurisdiction may be of such magnitude and scope that they may be beyond the capabilities of a state to control; and

Whereas the States have the primary responsibility and authority to prevent pollution of their waters; and

Whereas one Federal agency can work more closely than several with State agencies in controlling oil and chemical spills inside territorial waters: Now, therefore, be it

Resolved, That the National Wildlife Federation, in annual convention assembled in Chicago, Ill., March 20–22, 1970, hereby urges that one Federal agency be vested with the primary authority to take command in the direction of operations to control a spill of oil, petroleum products, or chemicals in international waters or to cooperate with appropriate state agencies in appropriate actions to prevent or minimize damage to fish shellfish, wildlife, and outdoor recreational resources in state waters; and be it further

Resolved, That the designated Federal agency should be authorized to prevent the application of oil dispersants and other chemical substances on navigable waters or adjacent beach areas until appropriate state or federal wildlife agencies have been consulted with respect to the possible effects on fish and wildlife.

RESOLUTION No. 50—OFFSHORE OIL DRILLING POLICY

Whereas spillage and/or leakage from off-shore drilling operations has occurred in many parts of the country; and

Whereas oil pollution causes disastrous damage to scenic, recreational, and wildlife resources and results in severe economic losses; and

Whereas there is a great need for the development of improved drilling methods to protect valuable natural resources: Now, therefore, be it

Resolved, That the National Wildlife Federation, in annual convention assembled in Chicago, Ill., March 20-22, 1970, hereby requests that the Secretary of the Interior refuse to lease additional submerged lands for off-shore oil drilling until adequate safeguards are developed and imposed to prevent damage to natural resources.

RESOLUTION No. 54—HIGH SEAS FISHING

Whereas there is undisputable evidence that a fishing company of the Republic of Korea is outfitting a large fish processing vessel and a number of catcher vessels with gear designed to catch and process salmon; and

Whereas amongst said gear are gill nets designed specifically for the taking of salmon and which will also catch steelhead; and

Whereas information also states that the South Korean fishing company plans to operate its vessels east of 175 degrees west longitude in waters adjacent to Alaska; and

Whereas under the International North Pacific Fisheries Treaty, Japanese cannot fish east of said line; and

Whereas if the South Koreans fish east of said line, other Nationals will be influenced to also fish east of said line and the treaty which restrains the Japanese will be abrogated; and

Whereas if this does occur, the salmon and steelhead stocks destined for the United States streams will be seriously decimated and damaged: Now, therefore, be it

Resolved, That the National Wildlife Federation, in annual convention assembled in Chicago, Ill., March 20-22, 1970, hereby resolves that the United States Government through the Secretary of State take strong position in opposition to any high seas nets and long lines fishing for salmon in waters east of 175 degrees west longitude, and that the Secretary of State immediately make that position known to the appropriate representatives of the Republic of Korea.

NATIONAL AUDUBON SOCIETY,
New York, N.Y., May 11, 1970.

HON. LEE METCALF,
*Chairman, Special Subcommittee on the Outer Continental Shelf,
Senate Committee on Interior and Insular Affairs,
Washington, D.C.*

DEAR SENATOR METCALF: I thank you for the invitation to submit comments during your present hearings on the question of a seaward boundary of United States jurisdiction over the outer continental shelf. I regret that I cannot present my thoughts in person, but my presence is required in Seattle for the annual convention of the National Audubon Society. Will you please make this letter a part of the hearing record?

I commend the subcommittee for its forthright exploration of the problems of the outer continental shelf which cannot, as a matter of ecology, be separated from the seas that lie above it or from the biological resources that these seas support. The shallow waters overlying the continental shelf are, by far, the most productive of fishes and other marine life—far more productive than the deep waters of all the oceans.

As a conservationist I am dismayed that most of the testimony offered your subcommittee, reflecting most of the technological studies about the ocean floor, has emphasized the exploitation of the sea beds for their mineral resources with little or no regard for ecology. I seriously doubt that any technology exists today that would permit such exploitation without serious pollution. We are probably going to need the protein production of the continental shelf waters in future decades far more than we need the minerals.

I trust, therefore, that no measure or action will be recommended by the Subcommittee that would invite and permit unregulated, wholesale exploitation of continental shelf resources without due regard for conservation, and without the concurrent establishment of rigid protective measures.

Sincerely,

CHARLES H. CALLISON,
Executive Vice President.

BOSTON FISH MARKET CORP.,
Boston, Mass., May 11, 1970.

HON. LEE METCALF,
U.S. Senate,
Washington, D.C.

DEAR SENATOR METCALF: After reviewing the testimony on issues related to establishment of the Seaward Boundary of United States Outer Continental Shelf which were heard before your committee, I feel that I do not have sufficient knowledge of that important subject to accept your invitation to appear before the committee.

If it is in order, I should like to comment briefly on the testimony of Dr. Wilbur M. Chapman who in his written paper discusses "jurisdiction by the coastal state over fisheries lying in the high seas". He asserts that jurisdiction by the coastal state over the fisheries lying in the high seas adjacent to its coast and I assume he means both complete jurisdiction or coastal state preference, will: (a) not contribute usefully to the rational use of the living resources of the sea. (b) slow down the rate of increase in producing fish from the seas by increasing costs. (c) make the United States Fishing Industry the chief benefactor of such a jurisdiction. (d) lead to further broadening of the territorial sea.

My comments on these assertions are as follows: (a) National supervision of adjacent fishery resources combined with bilateral agreement between neighboring states and maintenance of "historic rights" provisions would have a far greater chance of success than the existing multilateral fishing agreements. (b) Attention to adjacent fishery resources when treated as a national asset free from raiding mobile fleets, should be productive of a greater yield by allowing better conservation management. (c) It is arguing against the facts to assert that the United States fishery would receive more benefit from coastal state preference than, for example, Canada or Norway or any emerging nation whose adjacent banks are being fished presently by a foreign mobile fleet. (d) There is no necessity to broaden the territorial sea if the concepts of "freedom of the seas" and "freedom of fish" are not purposely confused and employed for the intention of broadening the territorial sea.

Sincerely yours,

THOMAS A. FULHAM.

SPORT FISHING INSTITUTE,
Washington, D.C., May 28, 1970.

HON. LEE METCALF,
Committee on Interior and Insular Affairs,
Senate Office Building,
Washington, D.C.

DEAR SENATOR METCALF: In connection with the hearings of the Special Subcommittee on the Outer Continental Shelf, Senate Committee on Interior and Insular Affairs, I have the honor to submit to you, as the testimony of the Sport Fishing Institute, the following Resolution on "Extension of U.S. Zone of Exclusive Jurisdiction Over Fisheries Resources":

Whereas, several nations have already established or are presently seeking to establish beyond the narrow limits of their traditional Territorial Seas, broad zones of exclusive jurisdiction over fisheries resources that occur in adjacent coastal waters for distances up to several hundred nautical miles offshore; and

Whereas the establishment of a similar broad zone around the continental United States beyond the Territorial Seas out to the outer or seaward boundaries of the Continental Shelf, as delineated by the 200-meter-deep ocean bottom contour, would contribute materially to eventual practical management of major coastal sport fisheries resources, whose welfare is closely bound to the environment of the Continental Shelf and its inward extensions within estuaries: Now therefore be it

Resolved, That the Directors of the Sport Fishing Institute, assembled in regular Annual Meeting this 16th day of May, 1970, at Washington, D.C., do herewith urge the Administration and the Congress to support legislation that would establish a Contiguous Fisheries Zone extending beyond the adjacent Territorial Seas of the United States to the outer edge of the subjacent Continental Shelf, as indicated by a depth of 200 meters, or to a distance of 100 nautical miles, whichever is farther offshore, in order to effect needed control over fishing in this zone by foreign-flag vessels and otherwise contribute to improved long-term management and conservation of the related living aquatic resources that occur in those waters.

It will be appreciated if this letter can be included in the Record of Hearings.

Sincerely yours,

RICHARD H. STROUD,
Executive Vice President.

SAN RAFAEL, CALIF., May 11, 1970.

HON. LEE METCALF,
U.S. Senate, Washington, D.C.

DEAR SENATOR METCALF: I would like to express my great concern over the actions taken by President Nixon without approval of the Congress. Whatever your feelings about his specific actions, you should act to protect the right of the Senate to be consulted.

I believe your only leverage is to control appropriations which make the President's actions possible, and urge you to support amendments to defense appropriation bills which will make the Senate's role absolutely clear.

Sincerely,

JOHN A. STARKWEATHER.

RALSTON PURINA CO.,
Saint Louis, Mo., April 1, 1970.

HON. LEE METCALF,
Chairman, Committee on the Outer Continental Shelf, Committee on Interior and Insular Affairs, Washington, D.C.

DEAR SENATOR METCALF: I have at hand your letter of 11 March attaching the opening remarks prepared for the hearing of 4 March and requesting additional response to the questions therein. I must apologize for being so slow in responding. There has been a rash of meetings of the several public bodies on which I serve in the intervening time and this evening is the first spare moment I have to attend to correspondence.

I also was sorry that you were unable to appear and chair the hearings not only out of sympathy for your damaged condition, but because of the personal interest you have in these ocean affairs. I hope this finds you quite healed and in good shape again.

I also was rather curious as to why Mr. Olmstead did not care to appear with the rest of us, and will be interested to see how he replies to your inquiry. For my own part, I considered it an honor, rather than demeaning, to appear in the company of Mr. Burgess and with Dr. Crutchfield, many of whose ideas I disagree with, but whom I respect very highly as a man and a scholar.

I did not respond to the questions you originally asked in my testimony for two reasons.

In the first place I do not purport to be an expert on non-living resources whether marine or land, and what I say below in response to those questions will be simply as an ordinary citizen viewing them from that condition.

The second reason for not responding to them, was that I did not think them to be particularly relevant to the major issues that have become excited through this fussing about seabed minerals. I will explain that statement further below.

I have great difficulty seeing what is different between a particular mineral that is produced from the seabed or that same mineral that is produced from dry land as to the desirability. If the nation has some particular need for some particular mineral, or groups of minerals, and feels that it is prudent to take extra-ordinary measures to produce them by its own labor rather than importing them, then there are several normal steps to be taken. We all know this, because the United States Government has used these steps in the past on numerous occasions with, quite often, great benefits to the nation.

The first, cheapest, and often quite fruitful way to proceed in these matters is for the government to undertake appropriate surveys of the areas where those minerals are most likely to occur, and provide the resultant information publicly to industry and the public alike. Our geological survey is famous around the world for the excellence of its work in this field, and it has the facility, and common practice of bringing into its purview academic geologists to assist it in many parts of its work.

If this is not a satisfactory stimulus to get industry to produce the minerals desired in the quantity that the nation needs then a variety of subsidies are available and well tested. One of these is to give a depletion allowance which is a direct subsidy. Another way is to give tax benefits of other sorts which do not look so plainly to be direct subsidies, but which provide the identical stimuli. Another way is to limit imports by quota so that the price of the mineral is boosted internally within the customs area of the nation to the level which will induce industry to do the necessary work. Another form of subsidy which is weaker than those listed above, but very commonly used by our government and others, is to stimulate the growth of technology by research and otherwise to the level where the cost to industry of getting the mineral out of the ground to market is lessened.

All of these remedies have been used to get petroleum out of the ground within the United States customs area, and the results have been sufficiently successful to not only provide the United States with the petroleum it requires, but to subsidize the industry sufficiently so that it can go abroad and thus become one of the strongest segments of the petroleum industry in the world, and of the United States industry totally.

A third sort of action we have also tried, in the case of helium, and that is for the Government itself to take over totally the production of the needed mineral. This has also been done in the case of the radio active minerals, but perhaps for somewhat different reasons. This third method is generally frowned upon in our society, but I see nothing particularly wicked in it if the need of the country is real and it can only be met by those means.

What escapes me is the critical difference in these matters between minerals of the seabed and minerals of the dry land. With the exception of petroleum I have not heard sufficient argument made that supply of other minerals to be found in the seabed are needed by the United States over and above its ability to produce them on dry land or to import them. It seems rather obvious that in the present state of knowledge it is not economically for the industry to use these other than petroleum minerals of the seabed. Otherwise they would be in production, and they are not in any consequential way. It is obvious that subsidy of some sort is required to get the industry into producing these minerals from the seabed if that is what is desired. I have no compunction whatever as a tax payer against the government paying whatever subsidies it finds to be necessary to get any mineral it needs brought from the ground. The question really is to establish need over and above the economics of importing, and if that question is decided, then it is a rather technical matter as to whether the subsidy should be applied differently to seabed and land minerals, or whether it should be applied across the board.

In the case of petroleum products it appears to me that the United States has somewhat over done the matter of subsidies for production inside the United States customs area, and that there should be a considerable backing off in order to make the industry more competitive with world necessity, a thing that cannot be done excepting through the pressure of competition. Also I think that it is possible that petroleum matters have been permitted to concentrate in rather too few hands so that the particular firms, and their combinations, have become so powerful as to affect unduly governmental action in respect of them. I need not review for you the numerous studies that have been made by the Department of Defense and Presidential Task Forces upon this subject, nor the reviews of the subject by academic economists, all of which are as available to your Committee as they are to me, and I am sure that your Committee members can evaluate their results with much better judgment than a relatively uninformed person such as myself.

My expertise, such as it is, lies in the field of living resources, and thus I may take the liberty of pointing out some economic factors respecting this which may not have been brought to the attention of the Committee, and may be useful in its deliberations.

We hear a great deal about the value of the petroleum resources of the seabed. The Department of the Interior reports that in 1969 the one 1,031 oil, gas, sulphur, and salt mineral leases on continental shelf land produced in 1969 \$1.3 billion dollars worth of product of all four of these sorts of minerals.

This is seldom compared against the value of fish production. The Department of the Interior reports that the catches of U.S. flag vessels in 1969, at the fishermen's level, were valued at between 475 and 480 million dollars. For some peculiar reason which has never been explained the Department of the Interior does not include in these fish value statistics the landings of tuna made by United States vessels in Puerto Rico, within the customs area of the United States, and these values would bring the total value for 1969 closer to 500 million dollars. They also do not include the catches made by U.S. flag vessels of shrimps and tuna landed in ports of Latin America and Africa, and these would bring the figure above a half billion dollars.

Thus the value of oil, gas, sulphur, and salt from the continental shelf is clearly greater than that of the fish, and may actually be somewhat more towards three times that value than twice.

It needs to be kept in mind, however, that most of the above noted mineral values comes from petroleum, that this is kept, by manipulation of import quotas, at twice the world value for United States production. There is no effective import quota or tariff or other barriers to the flow of fresh and frozen fish into the United States, and for that reason about three fourths of the total amount of fish used in the United States derives from imports.

I think at least two things can be said about this. When the subsidy value of the petroleum products is taken away from the above values, they are not more than about twice as great as the fish value. The second thing that always puzzles me, is why we can afford to buy fish on the world market at the cost of about one billion dollars per year, and cannot afford to buy petroleum products in that market.

A third thing that has always puzzled me is why we sacrifice our fishing industry in order to aid our allies by letting them earn dollars on our market, but give the petroleum industry such very large and multitudinous sorts of subsidies. We then go on to think of our petroleum industry, very proudly, as the strongest one in the world, and of great value to our society, whereas the denigrate our fishing industry as being old fashioned, uneconomic, and suitable for total sacrifice, as the Bureau of the Budget is now in the process again of trying to do.

One may go on from this point to look roughly at what potentials there are available close by the United States for United States industry in both fields. I cannot get any straight story on this in respect of petroleum resources, but undoubtedly they are large. With respect to fish and shellfish resources the picture is somewhat more clear. The scientists of the Department of the Interior, backed up by the academic scientists, are prepared to say that the fish and shellfish resources of the nearby coastal areas of the United States are capable of producing on a sustainable yield year after year in the neighborhood of 20 million metric tons per year. This is renewable resources, unlike petroleum, which once used does not recur. This is about 8 times the average annual catch from these resources by the U.S. flag vessels. As a matter of fact fishermen from Europe and Asia catch more fish from our coastal resources presently than do United States flag vessels.

It is also interesting to look at the potential production of fish and shellfish from the coastal waters of the United States in relation to present use and future of the land by the United States. The United States is the biggest market for fish products of any nation of the world, either in value or on a round weight basis. On a round weight basis the United States used 8.5 million short tons in 1968, the last year for which I have records. 76.2% of this was imported. The known resources off our coast could have, on a sustainable yield basis, produced about two and a half times this amount of fish and shellfish. In view of the fact that animal protein is somewhat shorter and more needed in the world than petroleum, this might be taken into consideration.

The most recent statistics available to me on the value of petroleum products produced from the seabed are for 1964. This indicates that 800 million dollars worth of these products were produced from the seabed in the United States in that year, and 3 billion 600 million dollars for the world as a whole. Thus, with 1.3 million dollars being produced in the United States in 1969, perhaps the value for ocean produced petroleum product as a whole might be taken as 5 billion

dollars in 1969, or thereabouts. The production of fish and shellfish in the world in 1969 was 64 million metric tons, valued at somewhat more than 10 billion dollars at the fishermen's level. A little more than 90% of this production was either from the ocean, or from fish that came out of the ocean. Thus the value of world wide fish and shellfish production from the entire world would appear to be in the neighborhood of twice the value of global production of petroleum products from the seabed.

Again one cannot predict very usefully how much of the remaining oil under the seabed will be used economically, or how rapidly its rate of use will grow, because the economics of oil extraction go up almost exponentially with depth, and there are the great supplies available from the oil shales and sands on dry land which will come into production if costs go as much as 25% higher than they presently are.

Again one can predict with some degree of assurance what the increased use of fish in the world will be. For the 20 years since 1950 world fish production has increased at a steady 6% to 8% per year, and there is no indication that it is likely to decrease for the rest of this century, at least, given the crying need in the world for animal protein for human consumption, and the known resources that exist which are under fished.

As I noted above, I think all of these issues are rather irrelevant now in comparison with the very real struggle the nation is engaged in on the Law of the Sea.

When I prepared my testimony for your Committee, all of this key material was still under a secret classification in the Government and could not be discussed very freely. What with the public utterances of the legal advisor of the Department of State, the displays in Forbes Magazine, and the articles in the Wall Street Journal these key issues are now out in the open where they are being freely discussed. One now sees how the Department of State is caught in the middle between the Department of Defense, which must preserve the navigation rights of airplanes and vessels on and above the high seas, and the Department of the Interior which must preserve the petroleum industry.

If the issue were as clear cut as this, then the President would have no trouble at all in deciding in favor of the security of the United States and of the Free World, against the welfare of the United States petroleum industry. Unfortunately, however, this is not the case because the issue has now been pushed into such prominence in the United Nations that it is quite impossible for the United States, by accepting either the position of the Department of Defense, or of the Department of the Interior, to come off with either its petroleum industry or its security in as good a shape as when this exercise was initiated back in 1965 (or really back in 1945, as I set out in my testimony before the Committee).

To anyone who was through the international negotiations on this subject that took place between 1954 and 1960, the reasons why the United States will lose in the forthcoming negotiations on the Law of the Sea are plain and clear.

In the exercise that resulted in the United Nations conferences on the Law of the Sea in 1958 and 1960 the United States sought to establish the exclusive jurisdiction of the coastal state over the resources of the continental shelf without losing the navigational rights in the superjacent water and air. The bargaining material it had for this in the last ditch, after it's diplomatic strength was exhausted, was fish. It would win votes by giving on the fish issue. This was plainly spelled out to us who were in those delegations, and there was nothing we could do about it, because obviously the welfare of the United States and its security were supervening over the interests of the United States flag fishing industry.

It turned out that that strategy was incapable of successful issue. The reason was that while we could give away our own fishing industry, there were a sufficient number of countries around the world who were not willing to give up their fishing industry that we could not quite get enough votes to solve the issue of the breadth of the territorial sea by trading fish for votes. The consequence was that the two issues which could not be resolved at the 1958 conference were (a) the breadth of the territorial sea, and (b) the jurisdiction of the coastal state over fisheries lying in the high seas adjacent to its coast. We lost a lot of other skin in this bargaining operation, and came out with the rights of warships to transit international straits rather cloudy. Since the conference of 1958 did not solve those problems, and they were recognized to be urgent,

the 1960 conference was called to discuss those two issues only, that is, breadth of the territorial sea, and jurisdiction of fisheries lying in the high seas. This conference also failed totally of success in solving those two issues.

Curiously, the fight in those two conferences was absolutely polarized between the United States and Russia, with Russia wanting to nail down a 12 mile territorial sea, and the United States wishing to get 6 miles or 3. The two great powers used every diplomatic pressure at their command to achieve success, and both failed.

Now we are pressing for a new law of the Sea conference with all of the diplomatic vigor at our disposal. Now the Department of Defense position, and we all must subscribe to what is best for the security of the United States, depends upon the same sort of strategy by which we lost the last two Law of the Sea conferences. This time both Russia and us agree that what we want to do is get a 12 mile breadth for the territorial sea, and the two enemies of the first two conferences now are in the same camp. The problem is still considered to be the problem of warships and airplanes going through international straits, or what were international straits before the conference began. This time the Department of Defense believes that it can trade oil for the necessary votes, by giving all of the oil outside the 200 meter level to the United Nations for use for the benefit of the developing countries.

This is so hopeless from the international political standpoint that it is very difficult to understand why otherwise intelligent men will make the attempt except through utter desperation.

The reason for this is that oil under the continental shelf is so ubiquitous around the world. At least two thirds of the coastal countries of the world are either known to have oil under their continental shelf, or there is a strong suspicion that they have. Aside from the United States, and possibly Russia is equally desperate about the navigational problems of the high seas, no other nation that I know of in the world, large or small, is going to give up any possible future earnings from oil beneath the seabed off its coast to an international agency for sharing out amongst all developing nations of the world. There simply are not votes enough left to make a simple majority for what the United States and Russia now seem to want, much less the two thirds majority that is required for a substantive question of this sort.

The reason for this, essentially, is the case which has been made with such clarity by the National Petroleum Council. A reasonable case can be made that the existing definition of the continental shelf in the existing convention on the continental shelf gives the coastal state a right to exclusive jurisdiction over any resources off its coast down to the deep seabed. No small nation that I know of is likely to vote in favor of rolling back that possible right. The ferment, on the other hand, is all in the direction of the extension by the small countries, rather than rolling back.

Thus the paradox, amongst the other paradoxes that this current Law of the Sea conference is bringing about, is that the position of the National Petroleum Council is very apt to prevail in the next Law of the Sea conference over the most vigorous opposition of the United States and Russia combined. This will be done at the expense of the United States security and public order on the ocean.

There is still the fish issue hanging around, and it will confuse the vote taking this time just as much as it did the last time, because there are more long range fishing countries now than was the case in 1958 or 1960. These newcomers to this game include both industrialized and developing countries, amongst which are Italy, Spain, Israel, Romania, Bulgaria, Greece, Egypt, Senegal, Ghana, South Africa, Ceylon, Thailand, South Korea, Taiwan, amongst others.

The greatest likelihood of issue at the forthcoming Law of the Sea conference is that nothing will be decided on a two thirds vote, there will be another rash of claims to high sea territoriality by countries, the purported rights of airplanes and warships to fly over international straits will be weakened further, and public order on the ocean will continue to decay.

The reason why this gives me concern is that in history whenever public order on the ocean has decayed this has been followed by decay of public order on the land, which has eventually resulted in general war. I do not like war, having had experience of it.

I must mention one last paradox in all of this. That paradox is that the developing countries over the past decade have been developing their sea fisheries

at a much greater rate than either the developed or the Communistic countries, and in 1968, the last year of record, the developing countries actually exceeded in physical volume the catch of fish of the developed countries.

Thus if a 200 mile fishery zone comes out of the next conference, which is what many of the developing countries presently desire, the chief beneficiary will be the United States fishing industry, and the chief loser will be the fishing industries of the developing countries.

The reason for this is quite plain. The United States flag fishing industry has access to the biggest fish market in the world, it has access to some of the most abundant underfished resources in the world, and a 200 mile limit would give it extra advantage therein, and it has more foreign vessels fishing off its coast on these resources within a 200 mile limit than any other country in the world. Thus a 200 mile limit is bound to be economically beneficial to the United States flag fishing industry, even if not to the United States as a whole.

On the other hand, many of the developing countries whose fisheries have been growing so rapidly over the last decade have rather narrow windows onto the ocean and their further increase in fishery development will be limited by the narrowness of that window on the ocean. Particular examples are the Senegal, Ghana, South Korea, Thailand, and Taiwan, but dozens of others can be listed.

The developing countries do not realize that they are in the process of cutting off their nose to spite their face. I have set out a more extensive coverage of these matters in the two papers attached hereto written recently "Some Problems and Prospects for the Harvest of Living Marine Resources to the Year 2000", and "The Application of Oceanography to the Development and Management of Ocean Fisheries".

The issue of a regime for the deep seabed is the biggest lot of baloney that has come along in international affairs in my acquaintance with those matters over the past 25 years. This arose from the 6 billion dollars per year balloon that Ambassador Pardo quoted in the General Assembly in 1967, no part of which has any authenticity.

In the first place nobody knows how to make any money out of manganese nodules in the present time, and the likelihood of this being developed in the near future is remote.

In the second place manganese modules are so ubiquitous on the deep sea floor of the world, and so abundant in relation to possible market of the metals they contain, that unique possession of any particular piece of the deep seabed is not a critical matter in their use. The governance of their use can be fully and adequately handled under the system of international practices that have been carefully built up over the past 70 years in dealing with fishery resources on the high seas. I attach hereto a copy of a recent paper "The Theory and Practice of International Fisheries Development and Management", which gives some detail of those practices.

I think it will now become more apparent to you why I believe the questions you ask in your opening remarks to be irrelevant and rather immaterial to the important issues the United States is presently facing in the Law of the Sea and seabed minerals matters.

One of the other things that completely puzzles me is the almost fanatic faith in the Department of State and the Department of Defense that the forthcoming Law of the Sea conference can be restricted to action on the three or four items they seek action on. The Department of State lost exactly this same fight at the General Assembly in 1954 and 1957, when the world was much more simple. It and Russia, working hand in glove lost the same issues in December of 1969 at the General Assembly by more than two thirds vote. The United States and Russia, putting all of their diplomatic forces together, will not be able to control the agenda for the upcoming Law of the Sea conference which both have been so eagerly seeking. It will be murder all of the way around.

I hope that these additional remarks will prove useful to your Committee.

Sincerely yours,

W. M. CHAPMAN.

P.S.—It goes without saying that I write this letter, as I gave my testimony, as an independent expert without purporting to represent the views of any other entity, including, particularly, the Company for which I work, or the governmental agencies which I serve in an advisory capacity, including the Navy, Interior, Coast Guard, and State.