FEDERAL OIL SHALE PROGRAM

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HEARINGS

BEFORE THE

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS UNITED STATES SENATE

NINETIETH CONGRESS

FIRST SESSION

ON THE

FEDERAL OIL SHALE PROGRAM

FEBRUARY 21 AND 22, 1967
SEPTEMBER 14 AND 15, 1967

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FEDERAL OIL SHALE PROGRAM

TUESDAY, FEBRUARY 21, 1967

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

The committee met, pursuant to notice, at 9:40 a.m., in room 3110, New Senate Office Building, Senator Henry M. Jackson (chairman), presiding.

Present: Senators Jackson, Moss, Nelson, Burdick, Allott, Jordan of Idaho, and Hansen.

Also present: Jerry T. Verkler, staff director; Stewart French, chief counsel; James H. Gamble, professional staff member; and Darryl A. Hart, assistant minority counsel.

The CHAIRMAN. The committee will come to order.

This is an open, exploratory and informational hearing by the Senate Interior Committee on the development of oil shale, a great natural energy resource that is not now being utilized, and that is found in rich deposits in our public domain. While at this time there is no proposed legislation before us dealing with the subject, the Secretary of the Interior, on January 27 of this year, announced a 5-point action program to promote economic recovery of shale oil and associated minerals from the Green River formation in Colorado, Wyoming, and Utah.

This hearing, while general in nature, will focus on this 5-point program, and without objection, I will direct that the text of the Secretary's press release of January 27 appear at this point in the record, together with my brief statement on the floor of the Senate on January 31 announcing these hearings in which I tried to outline briefly some of the background facts with respect to oil shale.

(The documents referred to follow:)

[News release from the Office of the Secretary, Department of the Interior, Jan. 27, 1967]

FIVE-POINT OIL SHALE DEVELOPMENT PROGRAM ANNOUNCED

Secretary of the Interior Stewart L. Udall today announced a five-point action program to promote economic recovery of shale oil and associated minerals from the rich oil shale resources of the Green River Formation in Colorado, Wyoming and Utah. It is estimated that known oil shales of the area contain the equivalent of about 70 times the present domestic proved reserves of crude petroleum.

Steps leading to the program announced by the Secretary began in 1964 with the appointment of a distinguished group of private citizens to the Oil Shale Advisory Board. The Board's interim report, presented to the Secretary in February 1965, has been the subject of intensive and detailed review within the Interior Department during the past two years.

The Secretary pointed out that mounting energy demands in the United States made it increasingly important to develop oil shale to the point where it can begin to make a contribution to meeting U.S. energy needs.

The Secretary explained that the five-point program will involve the following:

"Action to clear title to public oil shale bearing lands of the three-state area. This will involve withdrawal of oil shale lands from all mineral entry other than for oil and gas leases, the initiation of examination and contests to remove clouds on title arising from oil shale and other mineral claims, and restoration of sodium to withdrawn status except where the Secretary specifically finds that particular sodium deposits can be extracted without damage to the oil shale resource. Pending sodium preference right lease applications will be promptly considered on their merits.

"A 'blocking-up program' in which the Secretary will give consideration to applications from private owners of scattered oil shale lands to exchange part of them for Federal lands of similar quality as to mineral and other physical characteristics. The purpose of these exchanges would be to permit some consolidation of private holdings which are at present too scattered for efficient mining operations. Under this program the Secretary will consider applications for blocking only where the applicant agrees to a time schedule and investment commitments for the development of economic mining and recovery operations. Applicants will also be required to agree to develop the blocked up lands in accordance with the best conservation principles, both with regard to maximizing the mineral values to be recovered and to minimizing damage to the environment.

"As the third point of the Department's oil shale program the Secretary will announce procedures which will permit the Department to consider applications from individual firms and combinations of firms for provisional developmental leases of oil shale lands. Under this part of the program, it is contemplated that the Department will contract with interested parties for a variety of approaches to the development of economic processes for the recovery of oil and associated minerals from shale. Applications for contracts would describe the process sought to be developed, a commitment of research and development expenditures, a time schedule within which these expenditures would be made, and the approximate volume and location of oil shale and associated minerals required to support operation of a commercial plant if the research and development project is successful. Parties to such contracts will be permitted access to the necessary acreage of oil shale lands for testing purposes, but leases for larger tracts for commercial development will not be issued until the research and development contract has been successfully performed. Leases will contain firm assurances that a commercial scale plant will be constructed, and that good conservation practices will be observed in the commercial operation.

"A fourth program will seek to enlist the Atomic Energy Commission and private capital with the Department of the Interior to find ways to retort the oil from the shale *in situ*. Underground atomic explosions will be researched as a means of fracturing deep deposits of shale, and making possible the retorting of the shale without ever bringing it to the surface. Such a program, if found technically and commerically feasible, would go far toward solving the difficult problems of protecting the landscape of the Green River Formation area from the scars of traditional mining and processing of minerals. The organic matter (kerogen) present in the rock formation known as oil shale is a solid that is converted to a liquid by heating. The concept of underground retorting is that the shale first should be broken into small pieces by a massive explosion. Thereafter heat would be applied to the broken shale, and the liquid oil pumped to the surface.

"Finally, the Department will request funds for a broad program of research and investigation by the Geological Survey, Bureau of Mines, and Bureau of Land Management. Some of these research projects will involve close cooperation and joint participation with other Federal agencies, industry and public and private research facilities. Objectives of this part of the prorgam will include the development of more information on the location, characteristics, and values of the oil shale and other mineral resources of the Green River Formation, and of better technology for resource development consistent with sound principles of conservation and environmental control.

"A major concern in developing the oil shale program," the Secretary said, "has been to enunciate policies and procedures that will protect the public interest fully, and at the same time will offer reasonable incentives to private capital to participate in an accelerated research and development program.

"The public interest requires," he said, "that in our efforts to develop the technology of extracting oil from shale, we write into every rule, regulation, contract, and permit affecting the public lands those terms and conditions that will—

"Encourage competition in development and use of oil shale and related mineral resources;

"Prevent speculation and windfall profits;

"Promote mining operation and production practices that are consistent with good conservation management of overall resources in the region;

"Encourage fullest use of all known mineral resources;

"Provide reasonable revenues to the Federal and State Governments.

"We intend," the Secretary said, "to seek the broadest possible participation in the development of our oil shale resources. The public lands in the region, representing the largest untapped sources of hydrocarbon energy known to the world, belong to all of the people and must be used for the benefit of all the people."

The Secretary emphasized that the contracts involved in Point 3 of the oil shale program will involve two distinct phases. The first phase, in which the contractor expends research and development funds, will require only small acreages of public lands necessary for research and development operations. The second phase, reached only when the research and development work has proved successful, will require acreages large enough to assure an adequate supply of oil shale and other minerals for a commercial operation of specified capacity over an agreed term of years.

Total Federal holdings of oil shale lands approximate seven million acres, but these holdings vary widely as to the richness and thickness of the shale.

"I do not underestimate the difficulties that will attend all five parts of our program," the Secretary said. "For at least 50 years legal, economic, and technical difficulties have stood in the way of efforts to develop the Nation's oil shale resource. To bring this program to fruition may take more than a decade, but if we are to realize the potential of our vast oil shale resources we must undertake intensive efforts now."

Although oil shale deposits are found in several States, the richest deposits are found in the Green River Formation of Colorado, Utah and Wyoming. It is in this area where the Department anticipates the greatest interest under Point 3 of its program.

The amount of oil that can be recovered will depend upon technology and economics. The Green River deposits extend over about 16,000 square miles and include several geologic basins. The total thickness ranges from a few hundred feet to more than 2,000 feet and the potential oil yield ranges from a few gallons to more than 65 gallons per ton of shale. The Federal Government has title to about 72 percent of the total oil shale acreage with potential yield of at least 15 gallons per ton; this amounts to about 79 percent of the estimated equivalent oil in place. Some of this acreage, however, is the subject of mining claims not yet adjudicated. The remaining acreage is owned by the States or private individuals or companies.

The Bureau of Land Management will today submit an application for a withdrawal order and the Department will begin to take the other steps necessary to clear title to the Federal oil shale lands.

Proposed regulations setting forth the terms and conditions under which the Department will administer the oil shale program should be promulgated within sixty to ninety days.

[From the Congressional Record, Jan. 31, 1967]

OIL SHALE HEARING

Mr. JACKSON. Mr. President, for the information of Members of Congress and other interested persons, I announce that the Senate Committee on Interior and Insular Affairs, which has initial legislative responsibility for development of the mineral resources of the public lands of the United States and for mineral production generally, has scheduled a public hearing on oil shale for Tuesday, February 21. Last Friday, the Secretary of the Interior, Stewart L. Udall, made public a proposed five-point action program for economic development of the vast deposits of shale oil and associated minerals in the fabulously rich Green River Formation which underlies millions of acres and thousands of square miles in parts of Colorado, Wyoming, and Utah.

It is on this proposed program that the Interior Committee's February 21 hearing will center, but at the same time we will welcome new, additional ideas and suggestions, as well as be glad to receive information and views with respect to development of this truly tremendous potential source of energy within our country that the Nation will need for its security and economic growth during the next few years.

Some idea of the extent of the Green River Formation reserves may be gathered from the statement by the then Under Secretary of the Interior at our committee's informational hearing on oil shale held May 12, 1965, that high-grade oil shale deposits there are computed at 600 billion barrels. Known world recoverable reserve of petroleum from conventional sources are only about 300 billion barrels. Much of these latter sources are beyond our borders, available to us only at the will and by the grace of other nations, and over perilous ocean routes. But more than twice the known conventional reserves of petroleum of the entire world are in the shales of a single area in the heart of our own country. The former Under Secretary, John A. Carver, who is now a member of the Federal Power Commission, described the Green River Formation as "the world's largest known resource of hydrocarbons."

By far the richest and most extensive of these oil shale deposits are in federally owned lands. The problems of developing these publicly owned resources have been greatly complicated by the relatively recent realization that the oil shale is associated with dawsonite, an alumina-producing ore, and other minerals.

The five-point program of the Secretary of the Interior faces up to the difficulties, legal, technical, and political, of the situation. It would permit development in the time-tested, historic American tradition of free, private enterprise with careful controls and oversight to protect the public interest.

Mr. President, this matter is of such interest and importance that I ask unanimous consent that the text of Secretary Udall's announcement of last Friday be printed in full at this point in the RECORD, and on behalf of all of the members of the Committee on Interior and Insular Affairs, I invite any interested Members of the Congress or the public to attend and to participate in our February 21 hearings.

There being no objection, the announcement was ordered to be printed in the RECORD, as printed above.

The CHAIRMAN. It will be recalled that on May 12, 1965, in an open hearing this committee went into the physical facts respecting oil shale in detail and also discussed some of the legal and economic problems. These hearings have been printed, and I will direct that they be incorporated, by reference, in today's hearing. Incorporated by reference means, of course, that we will not go to the expense of reprinting the text, but that the material in it will be considered by the committee as a part of its present record.

Thus, there will be no need for us this morning to take the time to go in detail into the physical facts concerning oil shale. These physical facts have not changed in any substantial degree in the less than 2 years since the 1965 hearing, except possibly in the recognition of dawsonite and other minerals associated with the shale. Rather, we can concentrate on the policy questions involved.

We have an imposing list of witnesses, headed by Stewart Udall, the Secretary of the Interior, the agency of the executive branch of the Government that has initial responsibility for the public lands of the United States and the development of their mineral resources. Secretary Udall has just returned from an extensive survey trip overseas, and has another commitment this morning in addition to our hearing. This is the reason why I agreed to open this hearing a half hour earlier than our usual time, and I ask that the members of the committee withhold any statements that they may wish to make until after we have heard the Secretary.

The Chair might announce that there have been submitted a number of statements by Senators, Congressmen, and Governors and other interested persons. These statements will be made a part of this hearing record.

Mr. Secretary, we are delighted to have you. Do you have a prepared statement?

Mr. UDALL. Yes, sir.

The CHAIRMAN. You may proceed in your own way.

STATEMENT OF HON. STEWART L. UDALL, SECRETARY OF THE INTERIOR, ACCOMPANIED BY UNDER SECRETARY CHARLES F. LUCE AND SOLICITOR FRANK J. BARRY

Mr. UDALL. Thank you very much, Mr. Chairman. I do have a prepared statement. I would like it to appear in the record. In fact, I will read it in toto in a moment. I would like to make a few preliminary remarks that do not appear in my statement.

The first thing I should like to say is that in developing and implementing an oil shale policy, it has been very plain for some time that the committees of the Congress and the Congress itself must ultimately be not only our overseers in formulating the policy but our partners as well. It is already clear to us that some legislation will be needed and I will discuss that in a moment, but in any event, the magnitude of this resource is so great that this committee would be derelict if it were not intimately interested in the evolution of this policy.

I had a fascinating experience, Mr. Chairman, earlier this month in seeing an area of the world I had not seen before. I spent nearly 2 weeks in the Middle East and I was in some of the countries that have tremendous reserves, proven reserves, of petroleum. I was told in Saudi Arabia, for example, as the officials there showed me the Garwar field, and in Kuwait, where I viewed the Burgan field from the air, that these two single fields, which are merely part of the developed area, have greater petroleum reserves than the total reserves of the United States. You can understand this did not make me feel too optimistic for the future of my country, except when I recalled that the one petroleum reserve in the world that is larger than those of the Middle East is to be found in the oil shale deposits in the Western States of this country.

Of course, the one thing that is lacking—I think it is important to make this point—the one thing that is lacking at the present time is development of the technology. The resource is there. It awaits the work of the scientists and the researchers in developing a technology to make this resource available for the use of the Nation.

I want to make one other general point to the committee, since I know that some have criticized us for moving too slowly in developing an oil shale utilization policy. Indeed, it was 2 years ago this month that the oil shale advisory committee, which I had appointed nearly 2 years prior to that, presented its report and we made it public. Although there were divisions of opinion, I felt the report was extremely useful. And I still feel that way, because I think, like a great searchlight, it illuminated the whole landscape. It illuminated

all of the policy alternatives, and I will assert it as my own present judgment that we have taken into consideration every one of the statements that were made, every one of the policy alternatives that were outlined. I can say to you very honestly here today that the policy that we have developed and which we hope to evolve has benefited greatly from the searching analysis that was carried out by this Oil Shale Advisory Board.

It does seem to us, and it has seemed to me from the beginning, that we would rather go a bit slow and be sure that our policy was sound, that it would stand up under any kind of scrutiny or criticism, than move too fast toward an ill-considered policy. The confusion arising from a poorly conceived development effort could easily set back the progress of an overall program. So I want to make these two general statements, Mr. Chairman, more or less to provide a setting for what I am going to say in my prepared statement, and I will now proceed to it.

Two years ago this committee performed a very useful public service by conducting a seminar on the basic nature and character of the national oil shale resource. By providing that forum you were able to throw considerable light on a subject that has perplexed both the public resource managers and our mining and energy industries for half a century.

I do not think that any useful purpose would be served by repeating what was said on that occasion. Rather, I have looked upon your current invitation as a request for a briefing on more recent developments and our plans for moving ahead on this subject.

Two years ago we had to confess a considerable amount of ignorance on how this resource could be developed under existing statutory standards with adequate protection for the public interest. In terms of an actual leasing program open to all comers on a long-term basis, there are still many unresolved problems. But we believe we have made good progress in analyzing the situation and in plotting a systematic course that will aid in the development and utilization of this valuable resource.

The results of this effort are referred to in recent announcement of a five-point program. Some of the committee members and staff were briefed at the Department prior to release of our announcement. For purposes of review as well as convenience of other members, I shall like to summarize the essential elements of that program.

First, we recognize that 50 years of uncertainty have given rise to legal questions about title to some of the lands involved. Prior to 1920, oil shale as well as conventional petroleum deposits had been locatable under the U.S. mining laws. Thousands of claims were filed on the Green River oil shale formation. Some of these went to patent in due course. Others were contested or rejected for failure on one ground or another to meet the standards of the mining law. But the vast majority have never been adjudicated to this day. Many holders assert the continued validity of their claims. On many of them, the Government is equally adamant that they are invalid and should be formally canceled. If the Government is right, the cloud on its title should be removed promptly so that development can proceed with confidence; if the claims are indeed valid, then the holders are entitled to a prompt decision and a clear title.

One aspect of this legal problem has already reached the courts. Over 30 years ago the Department canceled a number of oil shale mining claims upon the ground that the claimants had failed to perform their annual assessment work. In a very large majority of cases the claimants accepted the Department's determination and did not appeal. One case, however, was carried to the Supreme Court by an aggrieved claimant. That Court held that failure to perform assessment work was not ground for cancellation. In the last few years application for patents to the old canceled claims have been made. The Department rejected these applications upon the ground that the claims had been canceled in the earlier proceedings and, since the claimants had not appealed, the decisions were final and their validity could not be reexamined.

A short while after this decision, action was brought in the U.S. District Court for Colorado and that court has recently rendered a judgment which will be entered this week, reversing the Department and ordering the reinstatement of the applications for patent. Since a large number of old claims will be affected by this judgment, we anticipate that further appellate review will be sought.

It is also the feeling of our legal staff that a large percentage of the old claims will not meet the tests of the mining law on other counts, such as discovery, proper monumentation of claims, and other essential requirements. These, too, will be brought to a prompt test, first through administrative adjudication, then through review in the courts if claims are canceled and the claimants seek judicial review.

A second form of encumbrance has developed since your last hearings which I want to emphasize particularly this morning. As your record shows, the oil shale has been withdrawn since 1930. There was no desire at that time to forestall other mineral development consistent with protection of the oil shale. Accordingly, oil and gas and sodium leasing has been permitted. There are many oil and gas leases on the oil shale lands and their development and operation have not disturbed the oil shale deposits. The important Wyoming trona mining industry, for example, has also developed in the oil shale area. A dozen sodium prospecting permits were issued by BLM a few years ago. Explorations were made and dawsonite, a sodium aluminum carbonate, and nahcolite, a sodium carbonate, were found. It appears, however, that they are a part of and intermingled with the oil shale and that they cannot be developed without disturbing and possible damaging the oil shale.

It is thought by many that the oil shale lands, although withdrawn, are open for location of deposits of metalliferous minerals under the mining law of 1872. A very large number of claims estimated to exceed 7,000, have been filed for dawsonite during calendar year 1966—on the theory the aluminum in dawsonite is locatable. For the most part dawsonite and nahcolite exist as an integral part of the oil shale deposits; they cannot be removed without removing the shale. The claims based on presence of dawsonite must be resolved before the oil shale resources can be made available for extensive development.

We have taken steps to resolve these title questions on a broad front. In the first place, application has been filed and published and is in

process of consideration for the complete withdrawal of these lands from all forms of mineral entry or leasing, with the exception of deposits which are found by the Department to be extractable without damage to oil shale. Second, the Director of the Bureau of Land Management has initiated action on pending sodium lease applications to expedite decision on whether the leases should issue. Third, a series of immediate tests of the validity of dawsonite mining locations is being instituted.

This task of clearing away a half century of legal underbrush will be time consuming, vexatious, and difficult. But it is a necessary prerequisite to the long-term development of the lands in question. In this connection, there is one way in which the Congress could be very helpful in simplifying the task.

As you know, there never has been and there is not at this time any general requirement that notice of a mining claim be filed with any Federal office or agency. It has been the view, Mr. Chairman, of my own people for many years that this is a major defect in terms of procedure, in terms of the public interest, in terms of the responsibility of those making claims under the old mining laws, and this defect can be cured.

Recordation in the land records of the county is all that is required and a search of those records must be made to determine whether Federal public lands are so encumbered. Our search of county records may not disclose the present address of the locator, nor assignments of the claim that he has made to third parties. We think that such information should also be a part of the land records of the Bureau of Land Management and that the locator or claimant should bear the burden of such a filing.

Undoubtedly there are hundreds of thousands of mining claims that have been recorded but have, in fact, been abandoned. Not only for the purposes of the oil shale program but for orderly administration in general, we urge that a recordation statute be enacted requiring that all past claims be recorded within a reasonable period—2 or 3 years—and that all future claims or transfers be recorded currently. Assuming widespread publicity, this seems a reasonable and equitable way to eliminate a tremendous volume of potential work for our Federal land managers. And this is work that can only delay the forward movement of the oil shale development program. I want to underscore that.

We have proposed such recordation legislation in the past and very shortly will transmit a new proposal for your consideration. I would say, because I know many of the members of the committee are very familiar with the law that was passed a few years ago with regard to scrip and the land claims thereunder, this is precisely the procedure the committee followed. In our judgment the result was very successful and we think if there is any one single stroke that the Congress could take to enable us to eliminate the underbrush and get on with the development, that this is the most immediate step that will be helpful.

The second element of our program involves the blocking up of oil shale properties into efficient development units. One of the explanations advanced for failure to develop privately owned oil

shale deposits is that they are either too scattered or not well located for mining operations. You may recall from the map which was reproduced in your 1965 hearing record that the private lands in the richest oil shale area of Colorado tend to stretch out into very narrow ribbons—usually following stream valleys. And this is understandable because that is where the old homesteads were made and the patents were issued. Similarly, it would assist Federal management of public land oil shale deposits if isolated pockets of private land could be eliminated. Accordingly, we are proposing to undertake an extensive program of exchanging public for private lands with the primary objective of assembling manageable blocks for development purposes. Let me emphasize the development aspect of that objective. We fully intend, as a condition of the exchange, to require the private party to make definite development commitments. We do not propose to assist in the assembly of valuable properties for the purpose of speculation or hoarding of the oil shale resource.

It goes without saying, of course, that such exchanges could only be made on a value-for-value basis. Given the nature of this resource and our comparatively limited knowledge of it, this necessarily means that we would exchange only oil shale lands for oil shale lands. And I should like to add that the BLM have a long history, we have a lot of the tools that have been developed over the years for this type of exchange and I am confident, although we want to proceed very carefully on this front so that we protect the public interest, that we can carry out a rational blocking-up program that will involve the traditional type of exchange of lands of equal value to block off holdings.

The central core of this effort to get oil shale into the mainstream of the American economy is aimed directly at development of the resource itself. Two years ago we advised you that the Mineral Leasing Act of 1920 was the only authority that existed for this purpose and that we had doubts about its adequacy. We now believe, however, that section 21 of that act, as amended, is broad enough to permit the Department of the Interior to receive and act upon a number of the types of proposals contemplated by point 3 of our five-point program.

Accordingly, we are proposing to open small areas of oil shale lands to development on a test basis. Each area must be large enough to accommodate a prototype of actual production conditions. But in terms of the total area of Federal holdings, the acreage committed will be relatively small at the outset—the most limited that will accomplish the purpose, naturally. In essence we are proposing several development contracts, giving high priority to variety in the methods and techniques to be employed. Depending on performance results and what is learned from these contractual arrangements, the development contract may ripen into a lease for full-scale production on terms which must also evolve out of experience.

It is not possible at this time to specify how many such contracts will be made or their precise terms. Much will depend on industry's response to our invitation to submit applications. Our objective is to get the broadest kind of industrial participation, either through a number of individual companies or through joint ventures. In every

instance, however, certain minimum requirements will be included in the public interest.

A commitment of research and development expenditures, a time schedule for conducting such a program and access to resource and technological data will be among these. Heavy emphasis will also be placed on maximum recovery and development of all the minerals present—sodium and aluminum as well as shale oil. And this again, is a new factor that has entered the picture since 2 years ago.

In our public announcement of this development program it was indicated that implementing regulations would be prepared in 60 to 90 days. This appears, I was told by my people yesterday, to be on schedule, at least to the extent that such regulations will be released for public comment within that period. And we fully intend to follow our customary procedure. We will put out regulations for comment rather than as final rules, and the States involved, industry, any citizen may submit their views on these proposed regulations. We will then finalize them and then we will be ready to proceed and to receive applications at that point.

If, after careful study of the development proposals submitted by industry or at any time thereafter, we conclude that new legislative authority or criteria are advisable, we shall recommend to the Congress the specific legislation required to achieve our objectives. And I would think just to give the committee, Mr. Chairman, a time scale here, that probably within, let us say, 5 or 6 months we should be able to form firm judgments on this. If we feel that additional legislation is needed, because we do want to move ahead with this program, I can assure you that we will recommend quickly what legislation we feel is needed and give the committees an opportunity to give it thorough consideration.

Similarly, we will analyze the proposals received for the blocking of private lands. If the broad authority of the Taylor Grazing Act proves inadequate to permit such transactions or conditions essential to their acceptance, we shall likewise seek whatever further legislative authority is needed.

The Department's approach to extend research and development on oil shale includes two essential elements, both aimed at increased knowledge on the nature, extent and technology of the resource and its efficient recovery.

The first of these, identified as point 4 in the announced program, is aimed at the ultimate objective of an *in situ* retorting process. Interest in such a technique stems from both efficiency of extraction and concern for the landscape and other conservation values. This effort will require close collaboration with the Atomic Energy Commission and, ideally, substantial input of private research capability as well. It also involves extensive preliminary work in core drilling, laboratory analysis and selection of test sites broadly representative of the total oil shale area. As presently conceived, the full development of this research program and its evaluation will cover the better part of a decade and an investment on this Department's part of about $15 million.

On a far more general front, research and investigations must be conducted on other aspects of shale oil recovery as outlined in our

point 5. These will include alternate mining methods research, deeper insights into the basic composition and utilization of shale and shale oil, associate minerals, and related economic and environmental studies. A research program outline and prospectus has been developed for a 10-year effort involving a total budgetary requirement of $86 million, exclusive of the *in situ* investigations and experiments. We offer this prospectus for the record, with the caveat that it has not been reviewed by the Bureau of the Budget.

This, in general, then, is the direction we propose to take on this very important resource issue. Much thought and deliberation has gone into the subject over the past 4 or 5 years. I think, therefore, that I should summarize for you some of the philosophical or policy considerations that have gone into the development of the proposed program.

Here we have a resource which has lain dormant for nearly half a century since its value was first recognized. The question has been asked in many quarters, "Well, why should we bother with it now? Why not let it lie until it is required to meet a real shortage in our energy requirements? Wait until it can demand a premium price!" In other words, keep it as a reserve and hoard it.

In our judgment there are at least two very good answers to this challenge.

In the first place, let us concede that we are in no immediate danger of a national petroleum shortage. Our known and potential reserves, according to present technology, are adequate to carry us into the next century at or about present costs. However, as a recent interdepartmental energy study reports, oil and gas now supply 73 percent of our total energy requirements, and we have the potential for developing additional reserves through advanced discovery and recovery technology. Conventional sources of these fuels represent the smallest known and potential reserves, worldwide, of all the fuel resources. Thus, unless we are to be forced by possible shortages within half a century into radical dislocation of our heating, power generation and transportation systems, we must begin now to plan in an orderly way for substitute sources.

We have the lead time to plan the development of shale oil on a systematic, economical and sound conservation basis. To me the very best argument for moving ahead in a slow deliberate way now is that if we begin now, not in the haste of some national emergency but out of the desire to plan an orderly, rational program, then I think we have the time to do it right: do it right in terms of protecting the long-term national interest, do it right from a conservation point of view, and do it right in terms of our traditional approach to resource development.

Past history tells us that the difficulties are formidable. Prudence therefore dictates that we utilize the time available to us now to phase shale oil into our long-range energy forecast. The potential in good quality deposits in Colorado, Utah, and Wyoming is on the order of 600 billion barrels of shale oil, or about twice the world's proved petroleum reserves. Deferral of development measures now could easily result in the need for a "crash" effort later with attendant increased costs and sacrifice of adequate conservation planning to protect the total resources of the region.

The second, and equally important, reason for moving ahead at this time is that we want the time and experience to fix the policy guidelines that will govern the long-range development of this fantastic energy resource. In this regard, I have established the following policy objectives which we hope will be an inherent part of our ultimate oil shale leasing practices:

(1) To encourage competition in the development and use of oil shale and related resources; this has been the great principle used to develop our resources up to this point.

(2) To prevent speculation and windfall profits; and I think, on the basis of nearly half a century's experience under the mineral leasing act, that we can do this. It will reflect on us as administrators if we fail.

(3) To promote operation and production practices that are consistent with sound conservation management of overall regional resources; and may I comment here, this very region that contains the oil shale has in my judgment some of the finest summer and winter outdoor playgrounds in the entire Nation, and the trick here is can we develop the mineral resources without spoiling the wilderness, the ski areas, the water, the trout streams, and all the other fantastic resources of nature that are present. This again, is the challenge that we face and we want to see if we can do the one without damaging the other.

(4) To encourage fullest use of all known mineral resources; all the mineral resources that are present, in other words, to optimize or maximize the recovery of the resource.

(5) To provide reasonable revenues to the Federal and State governments.

Mr. Chairman, we do not underestimate the magnitude of the task that lies ahead. Past experience tells us that the hurdles are numerous and formidable. We know, for example, that there are economic and policy issues far removed from our area of responsibility that could have a direct bearing on development trends. One of these, the question of tax treatment, for example, can be readily identified as a serious factor in determining oil shale's competitive standing in the energy community.

Another question to be faced is the perennial one in the West: water requirements and supplies and I cannot underscore this too much.

Research to date demonstrates that the production of crude shale oil itself—the processes of mining, crushing, and retorting—requires relatively little water. Refining of shale oil is comparable to petroleum refining in requiring large amounts of water for cooling and steam generation. Municipal requirements for the communities needed to support a large shale industry would also be comparable to other communities of the same size. Our most recent estimates, developed in 1965, indicate that a 50,000-barrel-a-day shale oil operation would require 950 acre-feet of water per year for all industrial processes through refining. At a million barrels a day, the annual water requirement rises to 20,000 acre-feet. Community requirements would, of course, be additional and substantial.

We are equally aware that the objectives and procedures recently announced do not carry us very far into the development process.

But we think we have taken steps in the right direction. We made a beginning and that is the important thing. We may be unsure of the ultimate rules for routine and unrestricted leasing, but we have started machinery in motion to gather the knowledge and experience for that long-range goal. This, it seems to me, is the important development at this stage of our knowledge.

I have indicated some of the areas where further legislative policy may prove necessary or useful. Based on the attention this committee has devoted to the subject, especially in recent years, we have great confidence that such legislative proposals will receive understanding and informed consideration. In this regard, I would like to emphasize again the ultimate power of Congress to deal with matters affecting the disposal of public land resources. As administrative custodians and technical experts, it is our duty to manage the lands and learn all we can about their values. But we can dispose of those values only as the representatives of the whole people dictate or authorize.

I should like to end with a point that I began with, that I think that the best way to prevent us from getting too far off the right road is for there to be keen congressional interest and sharp congressional oversight as we move ahead. We welcome this hearing and any further hearings that this committee may want to carry out.

The CHAIRMAN. Thank you, Mr. Secretary, for your excellent presentation of the oil shale problems and of your program.

With reference to your last comment, the Chair wishes to announce that today's meeting in all probability will be merely the beginning of hearings on this complex, important subject. It is obvious that there will be a continuing need for this committee to keep informed concerning this program. I am delighted, and of course, really not surprised, that the Secretary welcomes this approach on the part of the committee.

After the witnesses who have asked to testify have been heard, we will leave the record open so that others may submit statements or comment on the testimony. When we conclude this morning, we will reconvene tomorrow at 10 o'clock. It is not a holiday as far as the U.S. Senate is concerned and I hope that that will not cause any great inconvenience for those on the outside, including the fourth estate—fourth and fifth estates.

Mr. Secretary, with reference to the first point, I have never understood the requirement that with respect to entry on the public domain under the mining law, why recordation of claims is made only locally, in county offices. It would seem to me that what should be required is that the recordation be made with the Department of the Interior, Bureau of Land Management, and a copy of that be recorded in the county pursuant to local law where the property is located. Such dual recordation appears logical.

Mr. UDALL. Mr. Chairman, I want to dwell on this because this is one immediate thing that can be done to help us move forward. I think from the statement that I read you can see what a morass we have. We merely can guess at the number of these dawsonite mining claims that were filed last year. The old mining laws of 1872 were based on the experience of that time, where the man went to the county recorder in the county in which the claim was located and filed

his claim. This may have made sense at that point but today it seems to me there ought to be a responsibility along with the rights that a mining claimant has. There ought to be some responsibility and one of the responsibilities ought to be to let the public and the country and particularly the management agency know what claims he has located and where. When claims are transferred or assigned, the fact should also be recorded in the Federal land records.

As it is, the whole thing is a complete thicket that we cannot penetrate with any exactness. If we are to move forward to be able to block up lands, to be able to lease lands, it is essential that we have a mechanism to get the facts and discover what we need to do in order to clear title or to issue patents, whichever the case may be.

I cannot see, myself, how the mining claimants could feel that there is anything onerous or unreasonable or burdensome about this procedure and I call the attention specifically to the action this committee took a few years ago on the scrip lands. There, in effect, you said all holders of scrip step forward. Let us know what scrip you have, make your claims, and this was done. I heard no claim at any time from anyone that this was inequitable or unreasonable and what we are proposing is essentially the same thing here. But I think this is really the beginning point because these legal problems we must tackle promptly to clear the way for action.

The CHAIRMAN. When you are dealing, of course, with unpatented mining claims you run into some unique legal problems. My recollection is that in many States—it is true in the State of Washington—an unpatented mining claim is, in fact, personal property and, therefore, it is involved in the filing of requirements with reference to chattel mortages and other documents of the sort, whereas in other States a nonpatented mining claim is considered real property. So you can really get into the underbrush trying to find out where the records are, depending on the State law. Am I not correct in that regard?

Mr. UDALL. Yes.

The CHAIRMAN. I won my first law case on the question of an unpatented mining claim. That is how I remember it. The party made the mistake of filing the mortgage as a real estate mortgage and, of course, failed to comply with an affidavit of good faith on chattel mortgage. I remember that point quite well.

Now, how long do you think it is going to take to remove some of this legal underbrush? I realize it is difficult to speculate, but what additional help, if any, will you need in the Department to undertake this rather massive effort to clear title?

Mr. UDALL. Well, Senator, I think the term, the figure of speech, we have been using here of "underbrush" is a very good one. We are almost like a farmer approaching a large tract of land and he can get started if he can clear away the underbrush. Whether you are talking about blocking up lands, whether you are talking about these initial development leases, we have got to clear an area away before we begin.

Of course, the logical beginning place, where our people should concentrate their efforts at the outset, should be those places where development has the greatest promise. We want to make develop-

ment agreements at the most logical places in terms of the opportunity for technology, in terms of the location of the resource, and so logically we should begin at those points to clear away the mining claims so we can lead to some of the others later. And the whole forward movement of this, it appears to me at this point, will move just as fast as we can clear away claims and get our leasing techniques perfected.

The CHAIRMAN. In connection with the blocking up program which is point No. 2, I do not envy your task in trying to ascertain the value of the property to be exchanged. Now, this phase is going to require, of course, a lot of core drilling, I assume, and extensive surveys by the appropriate agencies within the Department of the Interior to make sure that the exchange is fair and equitable and just, so as to prevent a situation in which there can be the accusation of an unequal exchange.

Mr. UDALL. Well, because of the tremendous values here, Senator, I think you are correct. We are probably going to have to refine and elaborate upon our land exchange techniques. This may involve a type of drilling or other mineral analysis that we would not normally do because the values are so tremendous. But if one follows the general assumption that you are going to have what we would call value for value exchanges, and if the technology of exploration enables you to ascertain what values are, you can make an exchange without fear or favor.

One of the things that any Secretary of the Interior blanches at normally is a land exchange. He always wants to know whether the values are equal and ofttimes when a controversy arises we have as many as two or three appraisals if it is surface land values that we are talking about.

So I want you to know I am very wary on this and it is one of the things that I and my predecessors have learned, that you better know what the values are when you start making the exchange or you could have a giveaway of resources which may lead to and certainly merits a public outcry.

The CHAIRMAN. The techniques by which you determine property values beneath the surface, of course, have not been fully perfected, I take it. There is a lot yet to be learned. And this is an area that has to be handled very carefully.

With reference to the fourth point, Mr. Secretary, I am concerned about the course of events in our Plowshare program. You know, we recently canceled one of the tests and I believe Mr. Kelly may be testifying on that. But I expressed concern at the time of the test ban treaty about its possible effect on the development of the peaceful uses of atomic energy. I have always felt that there is a tremendous opportunity for pushing this program forward through Plowshare, and possibly Mr. Kelly can address himself to that problem when he is called upon to testify, unless you care to say something at this time.

Mr. UDALL. I want to make two points, Senator. It is our judgment that the potential—at this point no one can describe it with precision—but the potential for using contained underground atomic explosions to enhance oil shale recovery may be very great. We do not know yet. This may be the key. This may be precisely what is needed to make the *in situ* process feasible.

I think the committee should know that we are already taking one initial step in this area, using atomic energy for peaceful uses with regard to oil and gas development. Three weeks ago Dr. Seaborg and I signed a contract with the El Paso Natural Gas Co. In northern New Mexico, near the Colorado border, we are going to carry out next fiscal year this Operation Gasbuggy project. I want to describe it to the committee very briefly because I thing it is important.

This is an area in what is called a tight gas formation. Because of the nature of the rock formation, the amount of gas that is recovered is limited to about 10 percent.

The calculation is that by making an underground nuclear explosion, which I need not describe, and I am not an expert on anyway, that you will enhance the recovery to 70 to 80 percent. If this proves to be useful in certain types of formation, we may make a fantastic increase of our natural gas reserves by using atomic energy as a recovery device.

This is a thing that everyone has talked about, dreamed about, and so on.

Now, in terms of oil shale, if Operation Gasbuggy works, then the next big step is what is being called Project Bronco. This would be an attempt at some carefully chosen place, probably at the edge of the oil shale deposits, to determine whether, by using an atomic device, you can fracture the oil shale to permit the *in situ* process to work. So it will not surprise us at all if—we are not speaking positively on this—but it will not surprise us at all if the linkage of atomic energy and oil shale development proves to be one of the keys to rapid development.

The CHAIRMAN. I do not think there is any question, but based on the views of some of our experts in this field, there should be a tremendous opportunity to further advance this program. The many, many tests the we are conducting underground for weapons development, of course, have enormous peaceful applications and will be extremely useful in connection with this program.

It will be necessary for me to leave the hearing at this time. We have a meeting of the CIA watchdog committee. There are a few problems there, also.

I will ask Senator Moss to take over and chair the meeting for the balance of the morning.

Senator MOSS (presiding). I want to ask one question, Mr. Secretary, about this process of blocking up. There are, of course, a good many school sections out in this area of oil shale deposits, such as in Ford Township in my State. School sections are not encumbered by mineral entry as a general rule.

Is it going to be possible to block up through use of school sections and get into this area sooner, so that we might have some oil shale development, rather than go through the long involved process you spoke about of getting titles cleared on a lot of this land?

Mr. UDALL. Well, certainly. It so happens that the Senator, in his own State, has been through exchanges involving other minerals and we have successfully done this. I believe I am correct—and my Solicitor will stop me if I am not—the normal laws concerning State land selections and the new selection process as well can apply as far as

the lands that the State may have in the oil shale region. If the State wanted to block up its lands for purposes of a development project of its own, it would seem to me within the limits that we have been discussing here of the equal value rule that this should be possible; yes.

Senator Moss. You were discussing earlier the desirability of having a filing with the Bureau of Land Management (BLM) of mineral entry and, I believe we are all in agreement on that. Do you envision also that there should be a recording of assessment work so that you can keep that filing up to date, as it were, within the records of the BLM?

Mr. UDALL. Well, the Solicitor says the Federal Government cannot take advantage of failure to do assessment work because of a Supreme Court ruling. Therefore, this particular item of assessment work would not be one that we would require information on. But I assume there are other provisions.

It is not simply a notice provision but it would require them to provide data so that we could ascertain the essential facts regarding the claims.

Senator Moss. I may have some additional questions but I would like to call on my colleague from Colorado, if he has any questions. Senator Allott?

Senator ALLOTT. Thank you. Mr. Secretary, first of all, I want to express my appreciation to the chairman of the committee and to you both for opening up this recordation problem. As you know, in the past few years I have had several bills—I will comment later about two of them—looking in the express direction you are moving now. Perhaps we are at last devoting to this area, in which I have been vitally interested ever since my coming to the Senate, the necessary effort to try and resolve some real and complicated problems. Only the complete amateur can tell us off the top of his head how to solve these, because they are extremely complicated.

I know that my other colleagues have questions and you have to be out of here at what time?

Mr. UDALL. 11:40, Senator, at the latest.

Senator ALLOTT. You have to leave at 11:40?

Mr. UDALL. Yes.

Senator ALLOTT. All right. I may have other questions after these, but we can attend to them. I was pleased that the chairman announced that we would perhaps have other hearings and give industry an opportunity to make whatever comments they might care to about what is brought out here this morning.

Perhaps I can get at this most expeditiously by starting on your announcement of January 27. In your first suggestion, it contains four elements, as I see it. The withdrawal of oil shale lands from all mineral entry other than for oil and gas. And so this would hold in abeyance the development of dawsonite and nahcolite and other similar minerals at least for the time being.

The initiation of examinations and contests to remove clouds on title. Now, perhaps I should ask here—the Department of the Interior is presently trying to clear title to oil shale lands. Do you intend to expedite this program or merely continue at the same pace?

Do you intend to institute blanket court procedures? And, third, what is your personnel problem with respect to this?

Mr. UDALL. Senator, we do intend to quicken the pace of action and as I have already indicated, the one way I think the Congress could help us to quicken it would be with some kind of recording statute. We are going to need additional personnel. We are planning to add additional personnel, both examiners to hold hearings an persons to acertain factual data, and so on.

The solicitor might comment on the specific steps that are envisioned here, but it is obvious that we do need to move at a more rapid pace. We also need very judiciously to select out and get into the courts as quickly as we can test cases that will apply across the board.

Now, this does not mean that a particular case, once the rule of law is laid down, of and by itself immediately—as I am sure the Senator will understand, he being a lawyer—demolishes all the claims. But it will certainly make it a lot easier for us once we have the basic law laid down to work with counsel representing claimants and to dispose of those cases that have no merits.

Senator ALLOTT. Would you like to comment, Mr. Barry?

Mr. BARRY. Only that our present pace in the oil shale contest is pretty well set by the complications of the cases at this time. We have been 2 years bringing the contests to trial. They have been continued several times. They were recently continued until June. I do not know whether the last continuance was at our request or at contestees' request. I have been informed that we were ready for trial. The contests had been set to start in April.

But these are extremely difficult cases. These are the old pre-1920 cases involving the issue of discovery; whether oil shale is a valuable mineral in the terms of the 1872 act. This question necessarily requires an enormous amount of technological work. But it has to be done once by us and by the claimants. We have selected claims to raise the issue with a design to test the very best claims so that if it turns out that they do not support a discovery, the rest of the claims would fall according to some sort of domino theory. Although, of course, each has to be contested before it is cleared.

With respect to the claims recently located, it is our misfortune perhaps in this matter but otherwise the good fortune of the States of the Colorado River Basin, that we have a good snowpack. We have not been able to send our people out to inspect the lands to determine the facts and whether a particular claim justifies a contest. The practice is to send a geologist or an engineer to inspect the claim, to report on the facts and, if a contest is filed, to testify at the trial. Most of these recent claims that are in the Piceance Basin, we are informed, are now covered with snow. We expect to get people out there as early as we can this spring.

Senator ALLOTT. Well, then, I assume from your answer—and you correct me if I do not state this correctly—that what you are trying to do is draw some definitive lines from a legal standpoint by which you would hope to include in various classes of cases or classes of decisions a large number of claims so that the ones which have to be individually determined later would hopefully fall into a determination that has already been made in one or other of these classes.

Mr. BARRY. That is correct, Senator, but, of course, every claimant is entitled to his day in court. We anticipate that we will certainly have less of a problem later on if, having made this huge preparation at the very beginning, we have laid the groundwork for a decision of all of the cases.

Senator ALLOTT. Now, is it your intention to commence these contests from your department or wait until they arise?

Mr. BARRY. We intend to initiate the contests.

Mr. UDALL. Senator, let me give you one very good example which I think will make the point to the committee. I am holding here a specimen or core of oil shale from this richest area in the Piceance Basin. This is oil shale. It has intermixed in it probably 10 percent of dawsonite, but the two are completely intermingled. There is also nahcolite there, I assume.

Now, all of these dawsonite claims that were made last year—mining claims, where they went out and located in the area on the assumption that although the oil shale had been withdrawn, that the dawsonite was locatable—present a legal question as to whether, since the oil shale with withdrawn, you can locate, legally locate, a mineral that is intermixed with it. It may very well be, assuming that the geological conditions are the same, that once you get a basic determination of that question, most of these claims may prove to be ill-founded. Thus, if you decide one broad issue, you can resolve many of the claims in this class. This, I think, is the process that we are going to have to take initially with the big new group of claims that were made last year under the mining laws.

Senator ALLOTT. Without in any way attempting to embarass you, have you asked for additional personnel for the purpose of clearing up this work, and what happened to that request?

Mr. UDALL. Senator, we could do this in one of two ways: either by shifting BLM or legal personnel from other areas and other functions into the Denver office, or we could ask for additional appropriations. I think it is likely that we will consider and use both alternatives.

Senator ALLOTT. But you did not request any additional personnel for this coming year's budget for this purpose, as far as you know?

Mr. BARRY. With respect to the Solicitor's office, Senator, we did not——

Senator ALLOTT. I am really talking about the Solicitor's office, Mr. Barry.

Mr. BARRY. All right. We just—well, incidentally, we always ask for more personnel to carry the load that accumulates, particularly in the Denver regional office which will carry this load because almost all of these claims, with the possible exception of those in Utah, will be administered out of the Denver office.

We asked for additional personnel there but not specifically for this, just simply to handle the increased work load, because for the last 2 years we have had three men in the Denver office, 100 percent of whose time is being spent on the oil shale contests now pending and in a recent court case. What I have said applies only to the old pre-1920 cases.

It appears, however, that we are going to have to ask for more lawyers for this work and we are also suggesting that the Bureau of

Lands Management ask for more technical people to inspect claims, to make title searches and to find the individuals who are the claimants. We do not know the addresses of claimants or where they are or who has title to any particular claim. Finally, we think BLM should have more hearing examiners to preside at the trials.

At present there are only seven hearing examiners to hear all BLM cases and there is only one assigned to the pending contests. So far he has been considering only motions to dismiss or motions to postpone and that sort of thing.

Senator ALLOTT. I do not know whether this would run contrary to the executive department policy but would it be possible for you to submit to this committee by a separate statement the extra personnel that you think would be required and their categories, Mr. Barry, for the purpose of expediting this entire program? This has been with us for a long time, not only in this administration but in the two preceding administrations, and I think it would be helpful to this committee if you could.

Mr. UDALL. Senator, I think we can provide the committee wtih this information and I think this will also give us an opportunity to really focus on what we are going to need during this calendar year to get the right level of effort underway so that we are tackling the main problems that are there and in a vigorous fashion.

Senator ALLOTT. Thank you very much.

(The information requested is as follows:)

The Department has made a thorough analysis of the additional manpower and funding required to carry out a full-scale investigation and adjudication program to clarify title to lands encumbered by outstanding mining claims. The total first-year impact of such a program, by Bureau or office, is as follows:

	Manpower	Funds
Bureau of Land Management [1]	49	$610,000
Bureau of Mines [2]	4	100,000
Geological Survey [2]	3	75,000
Office of Solicitor	11	120,000
Total	67	905,000

[1] Exclusive of $120,000 currently programed for contest actions already pending, BLM also forecasts a gradual reduction in this activity to 16 man-years and $200,000 annual cost by fiscal year 1973.
[2] Exclusive of one man-year and $25,000 in Bureau of Mines and 2 man-years and $50,000 in Geological Survey which can be diverted from related work to claim evaluation.

These requirements are being assembled with the detailed justifications which the Bureau of the Budget will require for a supplemental appropriation requests.

Senator ALLOTT. Now, moving on to your second point, which is the blocking up program, I have just two short questions. Am I correct in my understanding that this is going to be an exchange on an equivalent basis dollar for dollar, considering all of the mineral content?

Mr. UDALL. I think this is the way it would have to be.

Senator ALLOTT. Or just the shale content?

Mr. UDALL. No. It would have to be all mineral values.

Senator ALLOTT. And in the case of the piece of shale that you just held up, where the dawsonite or nahcolite may not be acceptable or recoverable, what would you do in a situation like that?

Mr. UDALL. Well, we are going to have to develop, it seems to me, Senator, a scientific and sound technique for ascertaining values, prob-

ably from cores with core drilling. It may be that if someone wants to block up, that we would impose on the person who wants that benefit, the task of having them do the drilling and furnish us with the information. But since there are these other mineral values present, we cannot dismiss them. So that probably the exchange program, the blocking up program—I am just giving you my own layman's horseback opinion here—is going to work best where you are trying to block up lands in an area that have similar mineral values.

Senator ALLOTT. The point I wished to bring out is that the problem of blocking out oil shale as such is a relatively—and I underscore that word—simple problem compared with the problem of ascertaining values when you get into the questions of intermix dawnsonite and nahcolite; correct?

Mr. UDALL. This is correct, and there is one other thing we might as well get on the table here, too, and that is the difference in the thickness of the beds. In other words, if you take a particular region, there may be a 600-foot thickness here and you move 3 miles down the road and it shrinks; that is obviously measurable and has to be taken into account.

Senator ALLOTT. I think we brought all of this out at the hearing 2 years ago, the thickness of the beds, the depth of the beds under the surface of the earth, and also the richness of the beds. I think that is pretty well understood by everybody.

Now, in this blocking up, what provision do you contemplate for permitting owners of the scattered land to evaluate Federal holdings to be received in exchange that you would have a mutual opportunity to core drill, for example?

Mr. UDALL. I think it would have to be mutual because otherwise you could not really appraise the values and it is the matter of appraisability that is the difficult problem.

Senator ALLOTT. In other words, if a man owns a piece of land you have no right to go on it per se to drill, and certainly he has no right to go on Federal lands and core drill without your permission, and you envision a mutual consent to ascertain values and the drawing of proper rules for this?

Mr. UDALL. That is right, and this is what we will cover in our regulations, I would assume in the usual way.

Senator ALLOTT. Well, I might say there is one exception to this. A man who owns an oil and gas lease in this area, and there are some, has the power to drill, but this would not apply to everything.

Will the Department of the Interior permit the owners of the private acreage to select specific location of the land to be received in exchange?

Mr. UDALL. Yes, that is probably the way the exchange process would work as we envision it, because the nature of the *in situ* process and the nature of either underground or open pit mining will be such that a person or an owner may very logically want to assemble a contiguous tract that is mineable in the most economical fashion. Really economics determine many of these issues. Therefore, he will, if he has a series of claims strung up a particular valley, and that is where many of the patented oil shale lands happen to be, want to consolidate them into a much more contiguous unit where he can get the advantage

of large-scale economics. This is at least the sort of thing we have been talking about up to this point. We would expect him to come to us with his application, setting forth this as his main purpose, and say let us determine what the values are and see whether we can work out a blocking up program that will enable me to make my holdings contiguous and sound in terms of an economical operation.

Senator ALLOTT. Now, it is obvious that I am going to have to permit my colleagues an opportunity here, and I just want to get into one other phase. I am sure you will recall that I have introduced a recording statute for the last several years which, however, applied only to oil and gas leases. Your Department has rendered an unfavorable report upon this, upon the basis that it would cause an excess of work.

Now, of course, if we follow your suggestion with respect to mining, and I frankly believe it is a valuable suggestion, it would cause even more work. But with the modern facilities that we now have, in the BLM in Denver, for example, could this not be taken care of in both respects?

Mr. UDALL. Well, Senator, there has probably been some rethinking on our part. Maybe you should press us again on your legislation. I do not recall what the issue was——

Senator ALLOTT. I will be happy to.

Mr. UDALL (continuing). On this particularly but I think we have to be logical and consistent and if a recording statute in terms of mining claims makes sense, maybe the other does, too. I will indicate to you at least on my own part an open mind at the moment on that.

Senator ALLOTT. Thank you. Now, to move on to the last thing I will try to cover this morning—unless there is more time left—on your point 3, the provisional development of leases for Federal oil shale lands, I presume that these developments that you speak of, these research developments, would go along the lines of the consortium which is now operating at Anvil Points. Is that correct?

Mr. UDALL. Senator, this is a sound assumption in part. We have the feeling that we ought to be open at this point, at the outset, to all manner of different proposals within limits, of course. It is our feeling that the consortium approach is probably superior and we have tried to hint strongly in our press statements and otherwise to the companies who are obviously interested that we do think the consortium approach is superior, for a number of reasons.

No. 1, it makes it considerably easier for us as was the case at Rifle to have a consortium of companies so that we are not having to single out a particular company and everyone else then feels we favored them for some reason or other.

Also, because of other minerals that are present, it appears to us logical that not only petroleum and gas companies but aluminum companies, mining companies that are interested in sodium and in other minerals be included. Particularly in terms of trying to develop a whole new technology, having companies with different experiences and with a different technological background will make it possible to move faster and have all the answers rather than getting only part of the answers as a result of a research or development project.

Senator ALLOTT. Well, with respect to this particular matter of development, I would like to respectfully call your attention to Public Law 87-796, which is the law which transferred the reserves back from the Navy—which you recall very well—dated October 11, 1962, and also to what Senator Mansfield described as one of the most complete legislative records. He said:

Mr. President, I wish to state that in my ten years here I have never seen as good a legislative history as this one developed in connection with any other bill. This is the best legislative history in regard to any bill that has ever been before us on the Senate floor. Mr. President, I hope the bill will now be voted upon.

And, Mr. Chairman, I would like to ask permission, not that the complete legislative record be inserted here but that by reference the legislative record which permits the research facilities at Anvil Points be incorporated by reference which would be taken from the Congressional Record of September 27, 1962. The reprinting would be excessively expensive.

Senator MOSS. Without objection, it will be incorporated into our hearing record by reference.

Senator ALLOTT. Now, one final point on this, and I am quite concerned about this. After you enter into a research and developmental concept with either a company, an individual, or a consortium—and I ought here to say that one of the great things in my opinion that grew out of the Anvil Points arrangement was that no person or any company was barred from that research if they wished to put up their own share of the research, and I think this point should be emphasized and made clear—with large investments in research these companies have to have some assurance that they will obtain some right to produce shale oil.

I offered a bill last year to try and clear up some of these claims by putting on a statute of limitation, in effect a statute of limitations, upon times to file, and one of the prominent economists of this country accused me during the course of the campaign last year of trying to give away all the billions of barrels of Federal oil shale, and I am so happy that you have come here this morning and made an honest man out of me. I appreciate it.

But after you entered into such a consortium, or such a research contract, we are going to have to get at the basic thing of how do we enter into a fair lease afterward? In other words, if Mr. Jones—I was going to say Mr. Smith but I see him sitting down here—if Mr. Jones does enter into a developmental lease with you, is it likely that this will produce anything substantial or that you will get a substantial number until he and other people know what sort of a lease arrangement they can make with you subsequently?

Mr. UDALL. Senator, this is a very crucial question and has to be answered very directly. We do envision, I think we have to envision, that no company, no group of companies, no consortium, whatever you have, is going to make massive investments in research and development unless this ripens into a project whereby they can recover the investment that they made in research and development. I think we consider that the two go together and this is nothing new. It has been done in the Middle East in a way; it has been done with tar sands development in Canada. You could have a two-stage lease, as it were,

an initial lease for research and development with performance conditions, and if the people perform and do their part under the contract, that then it ripens into a lease for large scale development. This, of course, is the thing that we are going to be trying to perfect, both to protect the public interest, to prevent windfall, and at the same time to permit development to move forward.

Senator ALLOTT. Do you think it would be feasible, Mr. Secretary, to hold separate hearings here in this committee on just the lease aspect to try to develop and explore all of the problems and perhaps get some definition and delineation of the directions we ought to go on this, eliminating all the other problems that Mr. Barry has gotten grayhaired about? Do you not think this would be advisable?

Mr. UDALL. Senator, I do at the right time, and I want to indicate to the committee what I think the right time would be. I think this is the most controversial, crucial question. I personally feel very strongly that the Oil Shale Advisory Board and every member on it made a very big contribution in focusing on this as the controversial question. As a consequence, I think the whole problem is illuminated and we at least know what some of the alternatives are.

Once we have put out our regulations, once we have had comments from industry and from others, once we have then made our regulations final, and we are moving on into the development of the new leasing techniques, if they are new, I think this would be a time when it would be useful to us to have the committee get into this picture.

One thing I have learned in my 6 years as Secretary, if I may say so, is that when I have a matter that is highly controversial before me, rather than take it off into the back room and decide it, that the more public discussion there is the better, and the more opportunity you have to discuss alternatives and let everybody be heard, the less chance there is that you are going to make a mistake in terms of the final decision that you come up with.

Senator ALLOTT. I agree with this and this is exactly the reason that I suggested that it might be feasible for this committee to start this study now because I cannot conceive of us developing a rational leasing policy in less than 2 or 3 years, or maybe longer, and I simply close at the moment with this one point, that I cannot envision any great developmental research over there. Perhaps those who already own substantial blocks might do this, but generally I cannot envision any great steps forward in this until we have formulated some basic leasing policy.

Mr. Chairman, I have taken a lot of time and I hope my colleagues will forgive me, but we are slightly interested in this in my own State, as you are, and Senator Hansen is, and I will retire with the opportunity to come back.

Senator Moss. Thank you.

Is there a depletion allowance granted on oil shale, Mr. Secretary?

Mr. UDALL. Well, I found that in my press conference 3 weeks ago this is a more involved question than you would think and it is one that I do not pretend to be expert on because it is an area where the Treasury Department and not my own, has the responsibility. I think that my Solicitor can give you some kind of answer on this. But we have not at this point gone into this in great detail because this is really

a separate, very important question, but one which we have not had to address ourselves to up to this point.

If you want an answer I think——

Senator Moss. Could you respond to that, Mr. Barry?

Mr. Barry. Mr. Chairman, the present allowance for depletion on oil shale is 15 percent of the value of the shale. This is a low value and, of course, necessarily a very small sum of money in terms of the value of oil.

I think that the chairman of the House committee introduced a bill either last session or the session before asking that the Congress change the depletion allowance to apply to the value of the shale oil as it comes from the retort, and to increase the allowance from 15 to 27½ percent. With just that explanation you can see the disadvantage which oil shale development may have.

Not only is it a lower percentage but it is taken at a stage in the operation when the value of the commodity is much lower than that of conventional petroleum.

Senator Moss. Do you look with favor on the proposal of the House committee which would, in effect, equalize the depletion rate between liquid petroleum and petroleum derived from shale, Mr. Secretary?

Mr. Udall. Well, Senator, I want to be quite frank with you on this. We have not really addressed ourselves to this problem. It is a question that I do not think at any time you are going to see a Department of the Interior take a position. I think we would have to sit down with the Treasury people, with the Budget people and others to develop an administration position on this question. We have not had to do so up to this point and at some point I am sure we will.

Senator Moss. In your testimony, Mr. Secretary, you discussed the amount of water that might be required in producing oil from shale but I do not think you made any reference to the problem of water pollution. To what extent would we be involved with the pollution problem?

Mr. Udall. Well, this question, Senator Moss, is very much to the point. One of the major rivers in the country, as this committee well knows, that is in serious trouble today is the Colorado River. Much of the oil shale lies in the Colorado River Basin.

We have problems of shortage. We have upcoming problems of water quality and, I think, my Department will be derelict if we do not see to it that whatever ultimate plans are developed, the quality of water that comes off these watersheds is not diminished as a result of oil shale development.

I think we can achieve this but I think we ought to be very aware of it at the outset. And there are many different methods and ways of seeing to it that we do protect the water quality of the region. But I think we ought to have this as a major objective just as we have the development of oil shale as an important objective.

Senator Moss. Thank you.

Senator Allott. Mr. Chairman, would you yield to me for one question?

Senator Moss. All right.

Senator Allott. Mr. Secretary, you are aware that there is pending S. 932, introduced by myself and for my junior colleague, Mr.

Dominick, which provides for changing the point of application of the depletion allowance to the end of the retorting process and which does not change the depletion allowance. If you are not aware of that, I call your attention to it because I think it should be made a part of the record.

I beg your pardon. This was in the 89th Congress and I will have a bill in this Congress.

[Committee Note: The bill in the 90th Congress is S. 1068]

Senator Moss. I want to give my colleagues an opportunity to ask questions of the Secretary before he must leave and his time is limited. So I will ask them to direct questions now that they want to have the Secretary answer, if that is possible in the time left and we will try to get the answers before Mr. Udall must leave.

Does the Senator from Wisconsin have any questions at this point?

Senator NELSON. No questions.

Senator Moss. The Senator from Idaho?

Senator JORDAN. Yes, thank you, Mr. Chairman.

Mr. Secretary, my State is not directly involved here and I shall be brief and my questions will be of a more general nature. You are having difficulty, obviously, in tearing away the legal underbrush that is involved here and it is understandable. Apparently you are not getting too much help from the courts. One Supreme Court case found that failure to perform assessment work was not ground for cancellation by the Federal Government. Did that not set you back a good deal in your clearing away the legal underbrush?

Mr. UDALL. Well, I think I would have to say honestly that it did, Senator. However, there are other very vital grounds that can be asserted and I think the most important thing is to get the basic law laid down. I think getting these court tests, getting the basic decisions by the appellate courts, if that is necessary, is urgent. Once we can do this, I think that it will move much more rapidly and our task really, as Senator Allott pointed out, is to carefully select out the right test cases so that we can get the case law made that will govern the whole oil shale region.

Senator JORDAN. What in the opinion of the Department constitutes a valid oil shale claim now?

Mr. BARRY. A valid claim for oil shale would have to have been located prior to February 25, 1920, the date upon which the Mineral Leasing Act became law. Since that date oil shale has been available only under the Mineral Leasing Act. The claim would have to be supported by a discovery of oil shale within the limits of the claim and the evidence of such a discovery would have to be of such character as would induce a prudent man to spend his money and his labor with a reasonable prospect of developing a valuable mine. The boundaries would have to be marked, the location notice recorded in the county recorders office, and the claim otherwise maintained in accordance with law.

You touched a moment ago on the question of assessment work. Prior to 1920 the Department of the Interior, the Government, did not have the power to cancel a mining claim for failure to perform annual assessment work. Section 37 of the Mineral Leasing Act states,

however, that oil shale is subject to disposal only as provided in the act except as to valid claims in existence on the date of the act and thereafter maintained in compliance with the laws under which initiated. One of the requirements of the 1872 law is performance of annual assessment work.

Accordingly, in the 1920's and the 1930's, the Department interpreted the statute to permit the Government to contest and nullify claims for failure to perform assessment work. The case you referred to was decided in 1935. The Supreme Court held in that case that the Secretary could not nullify a claim for failure to do assessment work. Of course, that was a setback because thousands of claims had been contested on that ground in the 1920's and 1930's. U.S. District Court in Colorado has recently held that the Supreme Court decision meant the Department has no jurisdiction to cancel claims for failure to do assessment work. Thus when, 30 years after the decision was made in other cases, no appeal having been taken, an application for patent is filed, the District Court held patent could not be denied on the ground that the claim was cancelled years ago. The District Court said it was beyond our jurisdiction to cancel the claims and, in effect, that the cancellation proceedings were totally void. The court held that the applications for patent are in good standing and should be processed as ordinary applications for patent.

Senator JORDAN. I would be interested, and I think it would be helpful for the record, to know what percent of this oil shale resource is privately owned or constitutes valid claims? What percent of the resource is under cloud of title for one reason or another, some legalistic entanglement involved? And what percent is totally devoid of any controversy vested in the Federal Government?

Mr. UDALL. Senator, the rough estimate we have been using, and, of course, until one can define with more precision than we can today what the quantities and values are, this is a rough estimate, is about 80 percent in Federal ownership and 20 percent in private ownership.

Senator JORDAN. You are talking about land area now?

Mr. UDALL. No; we are talking about oil content.

Senator JORDAN. Oil content. Taking into account the richer and poorer and——

Mr. UDALL. That is right.

Senator JORDAN (continuing). Taking the quality of the lands into account.

All right. There is a great area in here of no man's land still involved in legal controversy. You have given me 20 percent recognized private ownership, 80 percent Federal.

Is there not an area in here that is controversial? What percent is in doubt? Obviously, the ratio would have to come off of one or the other of these allocations.

Mr. UDALL. Well, Senator, I think maybe I ought to be more precise. I ought to provide you with a written answer to this later if that is all right, Mr. Chairman.

Senator Moss. Yes; it may be supplied.

Mr. UDALL. But there are many reasons why the question cannot be answered with real precision. One of them is the very fact of the recording statute that we lack. We do not have, we cannot gather

all the information. But just to give you one example, however, the richest, thickest oil shale beds are the Piceance Basin in Colorado and fantastically rich in ores. This is the area where all these dawsonite claims were plastered over it in 1966. So as of a year ago there were some claims that were in dispute but this was an area that was considered almost entirely Federal.

Now there is a cloud over it. We think the cloud is a small one but the claimants probably think it is not. So I suspect the answer is going to be that much of the 80 percent is in one way or another involved in legal dispute.

Senator JORDAN. Thank you. Thank you, Mr. Chairman.

(The information requested is as follows:)

The question regarding the ownership status of oil shale lands would probably be answered best by reference to the Report of the Oil Shale Advisory Board of February 1965. The Board stated that approximately 72 percent of the total oil shale acreage is in Federal ownership, and the remainder is in private or state ownership.

The amount of land which may be classified as oil shale land depends in large measure on the criteria which are used to determine whether land is or is not oil shale land. The criteria used by the Geological Survey require that land contain a 15 foot vertical section of oil shale or a richness of 15 gallons of kerogen per ton before it can be classified as oil shale land.

On that basis the questions may be answered in terms of percentages of the total acreage of oil shale land as follows:

	Percent
Private and State lands	28
Federal lands:	
No mining claims	20
Mining claims (all types)	52
Total Federal	72
Total	100

Since the question was posed in terms of percentages of the "resource" rather than acreages of oil shale, it should be noted that the percentage of the oil shale *resource* which is encumbered by mining claims is considerably larger than the percentage of the total oil shale *acreage* covered by mining claims since many of the recently located claims are situated on the richer and thicker portions of the oil shale basins.

Senator MOSS. The Senator from Wyoming.

Senator HANSEN. Mr. Chairman, on February 2 I made some remarks on the floor of the Senate during which I outlined some of the results of the rather intensive research I have made with respect to oil shale and the need for its development in our country. I think these facts would be pertinent to the committee's present inquiry, and I submit them for the record.

The CHAIRMAN. Without objection, they will be received and printed in the record at this point.

(The statement and information referred to follow:)

ON THE THRESHOLD OF THE FUTURE: AMERICA'S NEW OIL SHALE DEVELOPMENT PROGRAM

Mr. HANSEN. Mr. President, this is the first time that I have asked for permission to speak on the floor of the U.S. Senate. As one of the most junior men of this great place, this will be my maiden voyage, and I beg the indulgence of you, Mr. President, and of those Senators who are here listening to me.

Yet, it is perhaps not inappropriate that a new Senator should be speaking about a new industry that it itself as green as grass. Also, since I come from Wyoming—along with my colleague, the distinguished senior Senator from our State, and my distinguished colleagues from Colorado and Utah—I do claim a particular and a personal interest in the subject of my first Senate speech.

Today, Mr. President, I would bring to the attention of the Senate, and I would hope to the attention of the world, the dramatic events that have taken place in the last several months leading to the development of a great new industry for our country. I am speaking of oil shales and of other highly important minerals that have been found in conjunction with these oil shales.

So far, these gigantic deposits of oil shale have lain in the ground where they have been of benefit to no man. Some experimentation has been carried on but these experiments have been spotty and inconclusive. Over 70 percent of these oil shale deposits lie on Federal lands and they have been withdrawn from any leasing or development since 1930. The withdrawal of these lands by Executive Order 5327 has so far prevented private enterprise from exercising its initiative in developing these great mineral resources.

Last Friday, the Secretary of Interior, Stewart L. Udall, announced a five-point oil shale development program. Point 3 of that announcement is the most important, for there Secretary Udall promised—within 60 to 90 days—to issue the administrative details of leasing procedures. The Secretary indicated that at the present time he contemplates a two-stage program broken into a research and development phase and then finally a fully operational phase.

Private industry, just as we here in Congress, will be awaiting the Department of the Interior's details on the proposed leasing program. The private sector of our country has awaited such decisions for a long time. Throughout this waiting period, some 30 to 40 years, the private sector has always demonstrated that it possesses the necessary components for a successful development of any particular resource. Today, just as many years ago, our private enterprise system is ready with investment capital, with a basic technology, with management and marketing skills, and most importantly with men and women—all of which amount to a vast storehouse of innovative power necessary for a concerted development effort. My interest here today is to see that private enterprise has not waited in vain. My interest is to help define the terms, if I can, by which private enterprise may properly bring to bear its expertise in resource development.

Before I am finished I would hope to point out to the Senate, if but briefly, the great national and international importance of these resources. Once this importance is realized, I believe we will find near unanimity in the view that development should proceed as quickly and as efficiently as possible. The best means with which to meet those ends will, of course, be the nub of the forthcoming discussion over the Department of the Interior's proposed administrative regulations.

I believe that such discussion is clearly within the purview of the legislative branch of our Federal Government. I have called upon the very able and distinguished chairman of the Senate Interior and Insular Affairs Committee to schedule hearings at the earliest opportunity on this matter. The junior Senator from Utah has also made such a request and hearings are now tentatively scheduled for February 21. I am hopeful that the Senate will assume the leadership in asserting and protecting our national interest in the forthcoming development of this great new industry.

Let me discuss, now, in more specific terms, those aspects of this development which are of national and international concern.

First, we should discuss in more detail the nature of the resource itself. Second, I would like to discuss aspects of national security. Third, I would like to discuss the relationship between foreign trade and foreign aid and the unique position which this oil shale resource plays with respect to each. Fourth, no discussion of oil shale development would be complete without some mention of the balance-of-payments problem. Last, I would like to discuss the role of government in the development of this resource. In the weeks, months, and years ahead, the Federal Congress, the executive branch of the Federal Government, and State and local governments must all be prepared to play an important part in furthering this development.

THE RESOURCE

First, then, let me discuss the resource itself.

In terms of sheer size the oil shales of Wyoming, Colorado, and Utah stagger the imagination. By some estimates there are 1.5 trillion barrels of oil located in the Green River formation of Colorado alone. It has been estimated that 280 billion barrels of oil could be recovered from the richer Colorado formations by using present technology. Compare this to the other known reserves of crude oil: 31 billion barrels in the United States. Suffice it to say that the oil shales of Colorado, Wyoming, and Utah represent the largest untapped source of hydrocarbon energy known to the world.

The potential value of shale oil is indeed staggering. Recoverable oil in the shale deposits of the Green River formation has been valued in the trillions of dollars. On October 22, 1965, the then Senator Paul Douglas introduced a bill in the Senate to provide for the retirement of the national debt, "through royalties from the rich oil shale lands owned by the Federal Government." The Illinois Senator stated then that the oil shale lands in public ownership "are so vast and so valuable as to provide royalties sufficient to pay off the entire national debt when they are developed." Then, just last year, Mr. Douglas offered a new proposal, "shale oil for the lamps of learning." This provided that the royalties from oil shale would not only pay off the national debt but also be used to finance a great new national education program. I cite these figures and hypothetical proposals to show how indeed vast this national resource is. But these cited instances point up the basic reality that it does no good to talk of this resource in terms of barrels of oil or in terms of dollars of national debt magnitude. To do so is unrealistic because the resource remains in the ground to this day and the task is still before us. It is up to us in the Government to assist private enterprise in translating those figures from mere figures into dollars. It is up to us to assist in developing a technology which can transform oil shale into shale oil. Only then will this resource be of benefit to this Nation.

Fortunately, we are much closer to an economically feasible utilization of this great resource than ever before. Significant discoveries have been made within the past year of a heretofore little known mineral called dawsonite. Dawsonite is an aluminum carbonate and, if preliminary tests which have been recently conducted by private industry live up to the expectations which we now have, this new mineral may be a new and leading source of aluminum in the years ahead. In addition, great quantities of another mineral, nahcolite, which is a sodium carbonate, have been found in conjunction with the Green River oil shales.

So without going into further detail on the experimental phases of these various new minerals, I would only say that it may be, and I emphasize may, that we have turned the cost corner if all three of these minerals, aluminum in the form of dawsonite, sodium in the form of nahcolite, and oil shale, can be developed in conjunction with one another.

NATIONAL SECURITY

Let me proceed to discuss, then, in further detail why development of both oil shale and dawsonite is required in the interests of national security.

First, let me discuss our national energy resources and the part that oil must play in our total energy consumption. According to the U.S. Bureau of Mines the United States was consuming about 55 quadrillion B.t.u.'s per year in 1964. If this were to be translated to an equivalent amount of oil consumed, it would equal about 25 million barrels of oil per day in 1965. The Department of the Interior estimates that this oil equivalent will rise in 1980 to about 42.3 million barrels per day.

While energy consumption estimates, even up to as short a time as 1980, are tenuous at best, some experts are already claiming that the United States is now, or soon will become, an energy-deficient nation. What this means is that the United States must rely upon the importation of energy in order to run its industry. This increasingly heavy reliance on imported energy is a major threat to our national security. Leaders in the petroleum industry have estimated that at least 10 years' leadtime will be required in order fully to mobilize an oil shale industry. This leads me to state that the trend toward growing energy

deficiencies must be reversed just as soon as possible. This means that it is incumbent upon us to encourage oil shale development immediately.

If we are to speak from a military point of view, the Department of Defense offers the most reliable and indeed the most startling information. The Department notes that jet fuel has accounted for almost all of the total energy requirement increase with other products remaining on virtually a plateau. As of September 22, 1966, the Department, speaking through J. J. Muir, stated:

"In the last and more recent invitations for domestic jet requirements . . . we are finding it difficult to get adequate coverage. While we know some of the reasons for this, such as returned overseas procurement and increased commercial jet demand, we feel it is important and serious."

Next, Mr. Muir points out that the military demand for fuels is not subject to spasmodic increases or decreases which can be tied to any particular military crisis. He says:

"First, is the ever increasing thirst for oil of our new weapons systems. For example, the First Cavalry Division now operating in South Vietnam consumes fuel three times that of a World War II or a Korean division. Also, the planes and ships of the Seventh Fleet operating off Vietnam, and the Guam-based B–52's supported by KC–135 refueling tankers, require many times the fuel of their predecessors.

"Secondly, and the important key, is the fact that modern military forces, whether on alert, training, or combat, consume substantially the same quantities of fuel.

"This is an interesting concept, one not generally understood, and certainly not a finite tool for future forecast—but the record over the past 17 years gives it a great deal of credibility.

"As a matter of fact, we have seen nothing on the horizon that will significantly change the trend . . . Information available today indicates that with few exceptions, military equipment will continue to derive energy from liquid petroleum and its products for some time to come.

"And any phase out of petroleum consuming weapons system should be more than offset by new and larger hydrocarbon hungry systems. Examples of these are the C–141 transports now coming into the system and the super C–5 transports scheduled for the 1970's."

In a word, then, it is clear that the energy requirements of our Military Establishment will be steadily increasing over the years ahead whether we be at war or at peace.

A similar situation obtains with respect to aluminum. The United States consumes about one-third of the world output of bauxite. Bauxite, as you know, is our only source of alumina at the present time. Most significant is the fact that about 90 percent of the bauxite used in this country must be imported.

Aluminum is an important key to the structuring of our entire complex economy. The United States has a greater per capita consumption of aluminum than any other country in the world, and the price of that metal has an effect on the price of steel, copper, magnesium, zinc, titanium, fiberglass, plastics, and so forth. Fortunately, the price of aluminum has remained relatively steady over the past few years, but this happy state of affairs is not due in any part to any policy determinations by our Federal Government. The basic fact remains that as long as we import over 86 percent of this raw material, we will have no control over the price of it. The copper market has not been so fortunate and we have witnessed the volatile rise or fall in copper caused in large part by political or military developments in foreign countries.

Let me speak for a moment of the strategic importance of aluminum. At one time, the use of aluminum in defense materials was about 1 pound in 12. While present estimates of strategic aluminum are not available, it is clear that an adequate supply of aluminum must be readily available for the entire economy in order to hold the line on prices of other metals. Historically, a 1-percent decrease in the price of aluminum relative to the composite price of copper, lead, and zinc, has increased the consumption of aluminum by 1.4 percent. An increase in the price of aluminum caused possibly by action within the raw material producing country could unleash serious inflationary forces. A shortage of aluminum could create demands for other metals needed elsewhere in defense, and thus set up additional inflationary forces.

Under wartime conditions, either a price increase and/or a shortage could occur. Improvements in the general capability of hostile submarines could

well deny the United States the use of Caribbean sealanes. This was the experience in World War II which led the United States to spend over $20 million on four plants in Utah, Oregon, Wyoming, and South Carolina. The Korean war caused the reopening of one of these plants—again at substantial cost to the taxpayer.

In light of the fact that private industry has presented us with the possibility of finding a domestic source for aluminum, it seems incumbent upon us to formulate a national policy which would encourage the rapid development of that resource to the fullest extent.

The possibility that a new source of aluminum has been found in conjunction with a vast energy source makes the prospect even more attractive. We know that smelters are almost always placed near cheap power sources regardless of the distance involved. Now, we are presented with the possibility of processing domestic aluminum materials near a source of domestic power. The social, economic, and employment opportunities stemming from such a possibility are indeed dramatic.

FOREIGN TRADE AND FOREIGN AID

Since the Trade Expansion Act will be subject to review by the Senate this year, it is particularly timely that we should point out the relevance of the possible development of an oil shale and aluminum industry to our foreign aid programs and to our foreign trade agreements. Before the Senate decides whether it will renew the Trade Expansion Act, I believe that we should give careful scrutiny to the following points.

The present administration has often stated its recognition, albeit in general terms, of the importance of minerals and fuels to this country. Only last September Vice President HUMPHREY, in an address to the American Mining Congress in Salt Lake City, referred to minerals and fuels as "the essance of our economic growth and the spectacular rise in our living standards"; and he went on to say:

"All of us then must be impressed with the achievements of the mineral industry in helping to lay the base for our national prosperity and our national strength."

But such broad-brush treatment frequently overlooks the grave international implications of this country's practices and unhappy lack of policy with respect to the world's mineral resources. It is paradoxical in the extreme that our Federal Government in the past few years has seemed more concerned with the development of foreign resources than of our own. The U.S. Bureau of Mines tells us that as of 1964, the total value of direct foreign investments of the United States was over $44 billion. Approximately 40 percent of this, or almost $18 billion, was in mining and smelting and petroleum, with petroleum alone being valued at over $14 billion. The petroleum industry maintains its traditional position as the largest single industrial category of U.S. investment abroad.

The impact of U.S. investment in foreign mineral and fuel producing countries is, of course, tremendous. The Eastern Hemisphere has benefited greatly from this. Its share of the non-Communist oil industry has shown the following growth:

	Percent
Proven reserve:	
1955	73
1960	77
1965	80
Crude production:	
1955	28
1960	34
1965	44
Product demand:	
1955	27
1960	34
1965	45

The income after taxes of the Eastern Hemisphere oil companies was $1,306 million in 1965. The total capacity is 14,200,000 barrels of oil per day of which 8,900,000 barrels of oil per day is produced by only seven companies.

In addition to encouraging the export of American capital to increase reserves and production abroad, the United States, operating under the mandatory oil

import control program, brings significant quantities of foreign oil into this country. Preliminary estimates provided me by the Department of Commerce show that about 900.7 million barrels of oil, valued at about $2,093 million, were imported into the United States in 1965.

I ask unanimous consent that the complete Commerce Department estimates be included at this point in my remarks.

There being no objection, the estimates were ordered to be printed in the Record, as follows:

Petroleum imports, 1962–65

	1962	1963	1964	1965 [1]
	Millions of barrels			
Crude	411.6	412.8	438.6	452.0
Refined	349.2	362.4	388.1	448.7
Total	760.8	775.2	826.7	900.7
	Millions of dollars			
Crude	1,012	1,025	1,080	1,212
Refined	717	757	793	881
Total	1,729	1,782	1,873	2,093
	Value per barrel			
Crude	$2.45	$2.48	$2.46	$2.68
Refined	2.05	2.09	2.04	1.96
Average computed import price per barrel	2.25	2.29	2.25	2.32
Domestic crude price at wells, per barrel	2.97	2.93	2.92	2.92

[1] Preliminary estimates.

Sources: Survey of Current Business, Statistical Abstract, Bureau of International Commerce.

Mr. HANSEN. Mr. President, turning from the question of imports for a moment, we are confronted with a serious decline in our own domestic energy producing capabilities. In contrast to the phenomenal growth of the oil industry in foreign countries, our domestic drilling for oil has fallen off by 41 percent in the past decade and our oil finding success ratio is the lowest it has been in 30 years. Our ratio of domestic reserves has declined accordingly. In 1950, the ratio of reserves to production in the United States was 13.6 to 1. Last year, it was only slightly more than 12 to 1. This steady decline of exploration in this country has reached a point where annual consumption of petroleum products exceeds new reserves found.

In pursuing this course we have enabled many foreign countries to operate without any national debts and we have greatly increased our own balance-of-payments and deficit problems.

The net effect of this combination of circumstances is that our Government has exposed our Nation to the whims and demands of foreign oil producing countries. This exposure is doubly serious in light of the fact that energy, is of course, the key to our complex industrial economy.

We have by our own practices, and by the lack of any comprehensive policy, placed a club in the hands of foreign countries and this club is being used more and more effectively on a daily basis. We see every day headlines such as these in our major national newspapers:

"Venezuela Presents Tax Deficiency Claims of $100 Million."
"Algeria, Syria Demand Increase in Payments From Oil Companies."
"Iran Seeks 17-percent Boost in Oil Shipments."
"Kuwait Asks $56 Million in Retroactive Taxes."
"Aramco Pays Saudi Arabia $66 Million in Retro Taxes."
"Libya Levies $134 Million Retroactive Tax Increase on 16 Oil Companies."
"Oil Conflict in Iraq."

All this indicates to me that the Government of our country must quickly recognize its responsibility toward its domestic resources if it is to remain competitive in the fast-moving marketplaces of this world.

The impact of U.S. investment abroad is equally dramatic with respect to those countries producing bauxite. In 1952, Jamaica produced no bauxite whatsoever but 5 years later the country had become a major producer. These developments were aided and encouraged by the U.S. Government. Greece, Hindustan, and Ghana have all recently received substantial loans directly or indirectly from the U.S. Government to increase their activities in the aluminum industry. Norway and Germany have also received loans. Through such assistance Norway has become the fifth largest producer of raw aluminum as well as being the second biggest exporter. The experience in Norway demonstrates clearly what can be done in a market with rapidly expanding demands once a government policy to go ahead is determined.

The United Nations through its Office of Special Funds Operations has given much encouragement to prospecting within the less-developed countries. Between $15 and $20 million will be spent by that office in the current year on mineral prospecting.

On December 7, 1966, it was reported in New Delhi, India, that the Soviet Union was about to provide India another $330 million in economic aid. That economic mission was primarily for new industrial projects including expansion of a steel plant, aluminum plant, enlargement of iron mines, mineral exploration and development of petroleum resources.

Not all of the competition with respect to the world's resources is any means friendly to our national interest. China has doubled its aluminum production between 1960 and 1965. Its bauxite production increased from 150,000 tons to 350,000 tons in the 3 years 1958 through 1960. Its imports of crude aluminum decreased from 38,000 tons in 1958 to 18,000 tons in 1960.

The latest figures for Vietnam indicate that even while North Vietnam was torn by war it increased its production of bauxite from 9,000 tons in 1955 to 200,000 tons in 1957.

Further, we are hearing every day more and more about the economic feasibility of nuclear power. So far, economies have dictated that bauxite be brought to a cheap power source. But this may change dramatically in the future and we should no be surprised if, as a condition to the purchase of bauxite, the supplying country insisted on the development of a nuclear powerplant with which to process the raw material. Guiana has announced its policy that bauxite will hereafter be processed in the country of origin. In the weeks and months ahead we cannot expect that this ambition will be limited to Guiana, and it now seems unwise in the extreme to permit ourselves to become reliant on foreign countries for both raw materials and production facilities.

With respect to aluminum, it once could be said that the lack of any domestic supply forced upon us the necessity of reliance on imported sources. Importation was thus a matter of necessity and not of policy. We are now, however, at the crossroads and the time is at hand for a bold new policy designed to stimulate the development of our domestic resources through concerted action by the Government and private enterprise.

As I indicated earlier, the international aspects of resource development present a two-sided coin. On the one side we are concerned with foreign aid. The State Department has traditionally taken the position that full and unfettered trade should be stimulated between our wealthy country and underdeveloped nations. For this reason the State Department, exercising its terrific power in policy determinations within our Government, has generally disfavored recent efforts to stimulate our domestic industries.

But such a position presents a striking paradox in several instances. Let me cite, for example, the case with respect to Brazil. During fiscal year 1965 our foreign aid expenditures to Brazil equaled $285,900,000. Of this amount two of the largest items were loans which equaled $218,400,000 and military assistance equaling $14,300,000. On the other hand, a study of the Brazilian budget indicates that imports of petroleum and petroleum products have been steadily increasing into that country. The cost to Brazil for petroleum imports is currently running around $50 million per year. One of the principal reasons why Brazil finds it necessary to import oil is that it has been unable so far to bring to commercal production its known oil shale reserves. This failure is accounted for in large part by the discouragement Brazil has received from our own country.

Brazil has consistently sought technological assistance from the United States but we have been unable to supply this necessary assistance. Our failure in this regard can be laid directly to the do-nothing policy with respect to oil shale development that our Government has had up until the present time.

I am hopeful that the necessary technology will be forthcoming in the near future. I am hopeful also that we will then see the futility of handing large sums of money over to a country such as Brazil only to watch at least a fifth of those American dollars spent to import raw materials into that very country which receives our largess. This folly could be reversed by merely providing our neighbors with technological assistance rather than dollar giveaways. A positive national policy by our own country would affect just such this needed reversal.

BALANCE OF PAYMENTS

Previously in my remarks, I pointed to the rapid expansion of resource development and investment in foreign countries. This leads us logically to the question of balance of payments. That question is one of the major problems facing the present administration. Indeed, the flight of gold is one of the major problems of our country in this entire century.

It is becoming increasingly clear that we cannot solve the problem of the balance of payments by sanctions. Indeed, just within the past few days, Mr. Johnson in his economic report for 1967 saw fit only to say that the United States will "continue to move toward equilibrium as rapidly as the foreign exchange costs of the Vietnam conflct may permit." Compare this to the administration's talk last year, when it spoke of attempting to reach payments equilibrium in 1966. Now, I would say to you and to President Johnson that we cannot continue buying oil and bauxite abroad in face of a rapidly decreasing gold reserve. Despite the seemingly intolerable complexities of the balance-of-payments problem, one basic economic reality is obvious. That reality is that we must strive to increase our exports as we decrease our imports. This means that we must find our own sources of raw material as well as reduce the cost of our finished products.

The U.S. petroleum industry showed a trade deficit of $649 million in 1964, nearly 75 percent more than in 1960. During 1960 to 1964, exports remained level while imports rose by over $300 million. The petroleum industry imported some $1,080 million worth of crude oil in 1964 plus another $590 million of refined products. Projections up to 1975 indicate that the trade deficit in the petroleum industry will continue to rise with estimates up to $1,702 million of trade deficit by 1975.

Earlier, I indicated the dominant role played by just seven companies in the rapid increase of oil production in foreign countries. These seven companies paid $2,451 million to foreign governments in 1965. The percent paid to foreign governments rose from 50 to 65 percent in the 8-year period, 1957–65.

In light of the growing competitiveness, indeed of the growing hostility, on the part of foreign governments whose countries produce vast quantities of petroleum or aluminum minerals, I believe that it is high time our own country, the United States, reassess its position in the world marketplace and take immediate steps to increase our competitiveness for the years ahead. Instead of simply reacting to circumstances as this government has been wont to do in the past, we should now act affirmatively by establishing a comprehensive and thoughtful policy which considers the needs of our industries and provides for the full development of our great natural resources.

THE ROLE OF GOVERNMENT

This now, then, brings me to the last point I wish to make in my remarks here before the Senate. It must be recognized that in order to develop fully, and in an orderly way, this new domestic industry, State and local governments, private industry, and the Federal Government will all have to act as mutually responsible partners.

As was indicated at the beginning of my remarks, I am hopeful that the Senate will conduct hearings on the question of the governmental role in this industrial development in the very near future. First on the agenda of these hearings should be an analysis of Secretary Udall's plans with respect to point 3 of his announced five-point program. The Interior Department's plans for regulation of the research and development phase and later the operational phase of the

oil shale industry should be discussed before their publication. Our Senate hearings should examine these proposed procedures in detail and in depth. We should invite representatives of private industry for their views in order that procedures can be developed which will be fair to all parties, big or small. It will be of no service to announce an oil shale development policy only to find that the details of the administrative procedures inhibit, rather than promote, the entrance of private industry into this new field.

Next, the Congress must concern itself with the need for increased research and exploration of our oil shale and associated mineral reserves. I have asked the Bureau of Mines to advise me of the exploration and study plans presently underway in the oil shale field. Dr. Walter Hibbard has been most helpful in this respect and I am sure that his remarks on what further authorizations and appropriations are necessary for future studies will be of great benefit to Congress.

Next, we must begin to give close scrutiny to the long-range water requirements for such a fantastic new industry. I was greatly encouraged to see in President Johnson's budget request an item for a reconnaissance study of the upper Green River Basin. This water study, which had been requested by Senator Simpson, my predecessor here in the Senate, and myself, will be the first step down the road to a full appraisal of our municipal and industrial water needs. But I am certain that further and broader investigations will be required in order properly to project the amount of industrial and municipal water which will be necessary for this new industry by the year 2000. Again, advice from the Department of Interior should be sought in this matter. I will be prepared to ask Congress for the necessary appropriations once such study plans are firm.

And last, but by no means least, the States of Wyoming, Colorado, and Utah must be called upon for their views and their proposed action in regard to this new industry development. These States have traditionally been vested with policing power over such matters as conservation regulation. The proper regulation by the States of this new industry should prove to be no exception. I am hopeful that the State Legislatures of Wyoming, Colorado, and Utah will begin immediate plans for the drafting of necessary conservation regulations and for the regulation of air and water and land pollution. In this regard, it will be incumbent upon Secretary Udall to solicit the mutual cooperation of the affected states and to arrive at coordinated regulations and policing practices.

The leaders of these three great States should be invited to present their views and their problems before Congress and to receive every assistance possible in dealing with the anticipated needs of local areas. The creation of whole new cities and their attendant municipal services must be anticipated. Proper leadtimes must be provided for in the establishment of new long-range taxation programs and local governmental authority. School, hopsital, sewage, fire, and water districts should be created well in advance of a great burgeoning industry.

The present chairman of our Senate Interior Committee recognized the vast implications of an oil shale development program several years ago. In 1965, Senator JACKSON called for informational hearings before his Interior Committee and introduced those hearings with these remarks:

"All too often in dealing with problems affecting our natural resources, both economic and aesthetic, this Committee is faced with a condition, not a theory. Conditions often demand ad hoc solutions to immediate, limited problems. But as I pointed out earlier, such is not the case here today. We hope to have basic facts and issues presented, and then to be able to delierate on broad, overall policy questions involved in the wisest and best course of action to take with respect to this great natural resource found so abundantly in our public domain."

It is fitting that I should close with Senator JACKSON's remarks, for nothing further can be added at this time.

Now let us get on to the task at hand.

Senator HANSEN. Mr. Secretary, I would like to commend you on a very excellent statement here this morning. I am delighted that you addressed yourself on the question of availability of water and by implication referred to some of the things that were of real concern to us.

I would like also to commend the senior Senator from Colorado for having driven right to what I think is the crux of this issue in dis-

cussing in considerable detail some of the problems that have been concerning us with point 3 of the program.

Upon announcing the five-point development program, the Department of the Interior simultaneously withdrew oil shale lands from both mining location and sodium leasing. I would like to ask, Mr. Secretary, when the withdrawal order of 1930 and then this most recent withdrawal order will be rescinded by your Department?

Mr. BARRY. It will be rescinded when a viable oil shale industry is in existence, at which time the lands will be made available in accordance with whatever laws then exist for the leasing or other disposal of the oil shale.

The Mineral Leasing Act is inadequate in many respects for management of the oil shale. We can go forward with our proposed development program, but we anticipate that we will be asking Congress for legislation in order to have a systematic and proper development of the resource. Then, of course, when Congress provides us with a law that is workable, the withdrawal will probably be lifted.

Senator HANSEN. Thank you, Mr. Barry. In other words, your first stage leases will be issued during the withdrawal. Would this be a proper conclusion to make?

Mr. UDALL. Yes, that is right. In other words, if our new policy is implemented we slowly lift the withdrawal orders as the development moves forward. We just roll it back, as it were.

Senator HANSEN. Mr. Secretary, in first announcing the Department's oil shale development program on January 27, you made no mention of the role to be played by affected States in this development. I would like to ask what efforts will be made by the Department of the Interior to coordinate and to cooperate with the States of Colorado, Wyoming, and Utah in establishing necessary conservation regulations and in beginning to plan for necessary community developments? I know you indicated in your statement something about the size of the water problem.

Mr. UDALL. Yes. Well, Senator, this is a very key point and as a former Governor, it is logical for you to make it. Our relationship with the States is going to be very vital in terms of carrying out this total plan, and particularly when one comes to the conservation of the other resources in the region. The State not only has an interest because there is some State ownership but I would think that the States have a very big interest in terms of what I call the conservation approach.

When it gets to water pollution, the States are obviously going to play a very vital role. When it gets to the problem of protecting the other resources in the region, I think the State may have an even more vital interest than the Federal Government does. And we have invited the States to participate with us in evolving this policy.

It may be advisable for me personally maybe to meet with the Governors as this thing develops and to discuss the mutual problems that we have. I think an intimate working relationship with the States, to sum up, is a very important ingredient of our policy and should be.

Senator HANSEN. Well, I am delighted to hear that statement, Mr. Secretary, because I think that, as you so well know, many of the States have conservation organizations of one kind or another. Not

only do we have conservation organizations insofar as the pristine quality of our landscape is concerned but as well we are deeply involved in trying to see that we make the best and wisest utilization of our natural resources. In this context I would say that, if the Department could cooperate closely with the States, it would seem to me there would be a very favorable public reaction and I should think that the sort of relationship that might thus be developed would be all to the good. We are proud of what has been done in Wyoming and, I think, having participated with a number of other Governors in the interstate oil compact, we have become well aware of the fact that the problems of conservation differ from State to State because we have a whole body of law in one State that is not duplicated in any other State and we have developed these conservation approaches. I certainly would hope that you will continue to give the direction that you indicate here this morning.

There was mention made by you, Mr. Secretary, in the first briefing that you gave to the delegations from Wyoming, Colorado, and Utah, of the experiences of the Provincial government of Alberta and that that might provide some instruction for the administration of oil shale development programs. I would like to point out that, while the Alberta tar sands and this country's oil shale reserves present similar problems, the historical evolution of mining laws in Canada has in no way paralleled the creation of this country's mining law history.

I would consider it extremely improvident for this country now to vest the Department of the Interior with such plenary powers as are now possessed by the Minister of Mines and Minerals for the Province of Alberta. If such powers were given to our own Secretary of the Interior, I believe, of course, this would require a drastic revision by Congress of the Mineral Leasing Act of 1920.

I take it, Mr. Secretary, that you do not envision the need for such a revision. Indeed, you have indicated that there is no new legislation necessary at the present time. That being the case, I would hope that you would agree with me that it would be extremely unwise to depart from our traditional competitive leasing practices set forth in the Mineral Leasing Act of 1920 and to commence on a new course which would require the writing of ad hoc contracts on a piece by piece and a party by party basis.

Would you care to comment on that, sir?

Mr. UDALL. Well, Senator, my reference to the experience of the Canadian Provinces did not envision the type of changes that you were referring to. You are quite right in pointing out that they have had a different history in terms of administering and developing a pattern of developing mineral resources than we have in this country. My references in the press briefing to the Alberta tar sands was primarily to bring out the fact that the contractual relationship between the Province and the companies that are developing the tar sands, at least some aspects of it, might be useful in showing us what different alternatives there were in deciding how you entered into a contract.

I learned some other things by asking questions while I was in the Middle East 2 weeks ago. I think any time that we can look at another country, we can profit from their experience, whether it has been good experience or bad, whether it is something to avoid or some-

thing to take advantage of in terms of what they have done. The phrasing of the contract and the fact that after certain things were performed, then other rights were acquired and the project moves into a second stage, was more the thing that I had in mind.

Senator HANSEN. Thank you, sir. I would like to add for the record that Governor Hathaway of Wyoming has a statement he will be submitting. The Governor's statement indicates the interests of our chief executive in Wyoming in this whole matter of Federal-State relationship insofar as conservation practices are concerned, Mr. Chairman.

Senator Moss. That will be included in the record at the conclusion of the testimony of the Secretary, along with statements of other Governors and Members of the Congress. To illuminate the discussion we had on the recent modification of the withdrawal of oil shale lands, I will place in the record the text of the Executive order of President Hoover, dated April 15, 1930. This will show the length of time that there has been withdrawal of oil shale lands. All of this time we have been trying to work out a policy for development of this resource.

(The Executive order referred to follows:)

EXECUTIVE ORDER [No. 5327]

WITHDRAWAL OF PUBLIC OIL-SHALE DEPOSITS AND LANDS CONTAINING SAME FOR CLASSIFICATION

Under authority and pursuant to the provisions of the act of Congress approved June 25, 1910 (36 Stat. 847), as amended by the act of August 24, 1912 (37 Stat. 497), it is hereby ordered that subject to valid existing rights the deposits of oil shale, and land containing such deposits owned by the United States, be, and the same are hereby, temporarily withdrawn from lease or other disposal and reserved for the purposes of investigation, examination, and classification.

This order shall continue in full force and effect unless and until revoked by the President or by act of Congress.

HERBERT HOOVER.

THE WHITE HOUSE, *April 15, 1930.*

Senator Moss. Senator Hansen, have you completed your questions?

Senator HANSEN. I would like, if I may, Mr. Chairman, to reiterate a statement made by the senior Senator from Colorado, to which I subscribe wholeheartedly and that is to express my keen interest in hoping, Mr. Secretary, that you will provide us with a draft of your proposed leasing regulations at the very earliest time that they are available. I know Senator Allott expressed his keen interest, too.

Mr. UDALL. We will be glad to do so.

Senator HANSEN. Thank you very much.

(The information requested is as follows:)

PROPOSED REGULATIONS TO GOVERN OIL SHALE LEASING AND LAND EXCHANGES ANNOUNCED

Regulations which would permit a limited area of oil shale lands to be leased for research and development, and others to be exchanged, under conditions designed to protect the public interest are being proposed by the Department of the Interior.

"We sincerely hope that these proposed regulations, being published in the Federal Register, will receive the widest possible range of comment from the general public, members of Congress, industry, the scientific and educational community and the three States most directly involved," Secretary of the Interior Stewart L. Udall said. He promised careful consideration of all comments before any rules are officially adopted.

The proposed leasing rules were drafted under authority of the Mineral Leasing Act to implement Point 3 of a five-point overall program announced by Udall January 27 to promote the recovery of shale oil and associated minerals from the rich Green River Formation in Colorado, Wyoming and Utah. Most of this land is Federally owned, and administered by the Interior Department's Bureau of Land Management.

The third point of the comprehensive program calls for procedures to permit the Interior Department to consider applications for provisional developmental leases of oil shale lands. In testimony before a committee of the Senate recently, Udall described this point as "at once the most difficult and most crucial, since it involves the first experimental and limited steps toward opening the shale reserves to actual development."

Known oil shales in the three States are estimated to contain the equivalent of approximately 70 times the nation's proved reserves of crude petroleum. In some locations they are intermingled with substantial quantities of minerals containing sodium and sodium-aluminum compounds.

No more than 30,000 acres in all would be involved in the leasing program under the newly proposed rules. About 11 million acres are classified as containing oil shale land in the three States. About 5.1 million of these acres—some 3.7 million of them Federally owned—contain "15–15" shales—that is, shales at least 15 feet thick which would yield at least 15 gallons of oil per ton.

The richest shales are believed to be in the Piceance Creek Basin of Colorado, where some 770,000 acres contain 25-gallon-per-ton shale in thicknesses of 15 feet or more. About three-fourths, or 580,000 acres, are Federally owned. Thus, 30,000 acres would represent only slightly more than 5 percent of the federally-owned shale lands in this area. However, areas to be designated for leasing will be selected by the Department in order to encourage research on a variety of shale conditions, and will not be limited to the richest areas.

Development leases, the Secretary emphasized, would involve two distinct phases. The first phase—limited to 10 years—would require the contractor to expend research and development funds on relatively small acreages. The aim of the Department would be to encourage a variety of approaches leading to a technology which could support a broadly based competitive leasing program, the Secretary said.

The second phase, reached only when the Secretary finds research work has proved successful, would make available to the lessees acreages large enough to sustain a commercial operation of specified capacity for as long as mineral products are produced in paying quantities. However, under the terms of the Mineral Leasing Act of 1920, no lease may exceed 5,120 acres, and not more than one lease may be granted to any one person, association or corporation.

Leases all would expire at the end of their research periods unless the Secretary of the Interior authorized commencement of the commercial production term.

Private citizens, associations, corporations or municipalities would be eligible to make proposals for leases. Evaluation of their proposals, after "consultation with appropriate Federal, state and local agencies," would be based on a number of specified factors. Among these would be prospects of attaining commercial feasibility of a variety of mining and processing methods, under varying conditions; enhancing chances to make maximum recovery of other minerals involved; improving the competitive opportunities for smaller companies; and limiting potential hazards to the environment and to human safety. Other factors would be the applicant's financial and technical capabilities; his need for leased lands to do the work; the pace of his proposed research and development; the likely effects on competition; etc.

Applicants must disclose their interests in other oil shale lands, and state their need for a lease, their financial and technical capability, their plan of work, including research goals, and the nature, location and cost of plants and equipment they would install. They would have to specify the number of "key persons" to be employed, and their qualifications. Also required will be a schedule of proposed expenditures, and the techniques to be studied.

Additional information to be provided will include a description of steps to be taken to avoid or minimize possible adverse effects on the environment, the applicant's water needs and source of supply, the measures to prevent waste of mineral resources, and plans for a commercial operation if the research succeeds.

There would be a minimum royalty to the Federal Government of 3 percent of the gross value of the mineral products from the oil shale at the point of shipment to market, with a graduated scale of royalties ranging up to 50 percent

or the net income from the property. "The purpose of the sliding scale of royalties is to encourage new ventures in oil shale development, while protecting against the possibility of windfall profits," Secretary Udall said. Royalties would be subject to readjustment every 20 years as required by the 1920 Mineral Leasing Act.

The lessee would be required to submit annual progress reports on all work accomplished and results achieved during the research period. The information will be promptly made available to the public.

The right to use inventions made during or under the research term of the lease will be available to the public without charge in accordance with, and subject to the limited exceptions of, the President's Statement of Government Patent Policy of Oct. 10, 1963. In addition, the lessee would be required to issue licenses at reasonable royalties, permitting use of patents he may own which are necessary to permit others to use inventions resulting from the research.

Before approval, leases would be submitted to the Attorney General for advice on their consistency with the objectives of the Federal antitrust laws.

The Department announced that proposed regulations to govern exchanges of oil shale lands, also are being published in the Federal Register. This would implement Point 2 of the five-point shale program, permitting exchanges of scattered holdings of private lands in the region for Federal land of similar qualities. This will permit consolidation of private holdings for efficient mining operations.

Lands offered to the Department for exchange would have to have a value at least equal to the value of the selected public lands. All exchange proposals would be advertised in local newspapers in order that others who wish may also apply for the selected public lands within 60 days.

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, WASHINGTON

[43 CFR, Part 3170]

OIL SHALE

Basis and Purpose. Notice is hereby given that the Department of the Interior proposes to amend the regulations regarding the leasing of oil shale lands, found at Part 3170 of Title 43 of the Code of Federal Regulations, by revoking those regulations and substituting the proposed regulations set forth below.

Interested persons are invited to submit their comments in writing to the Director, Bureau of Land Management, Department of the Interior, Washington, D.C. 20240, within thirty days of the date of publication in the *Federal Register* of this notice. Persons wishing to present their views orally are requested to communicate with the Director, Bureau of Land Management.

Part 3170 is amended to read as follows:

PART 3170—OIL SHALE

Subpart 3170—Oil Shale: General

3170.0–1 *Purpose.*
3170.0–3 *Authority.*
3170.0–5 *Definition of term "Oil Shale".*
3170.1 *Designation of Available Lands.*

Subpart 3171—Applications for Leases

3171.1 *Qualifications of Applicants.*
3171.2 *Form and Contents of Applications.*
3171.3 *Considerations to be used in Evaluating Applications.*
3171.4 *Time for Filing.*

Subpart 3172—Miscellaneous Provisions

3172.1 *Form of Lease.*
3172.2 *Term of Lease.*
3172.3 *Acreage Designations and Limitations.*
3172.4 *Rentals.*
3172.5 *Royalties.*
3172.6 *Termination of Lease.*
3172.7 *Lease Bond.*
3172.9 *Other Provisions*
3172.10 *Antitrust Consultation.*

SUBPART 3170—OIL SHALE: GENERAL

§ 3170.0–1 *Purpose.*

These regulations govern the availability for leasing of a limited acreage of oil shale lands under the jurisdiction of the Department of the Interior. The objectives are to:

Foster improved technology for the mining and recovery of shale oil and other mineral components of oil shale;

Encourage competition in development and use of oil shale and related mineral resources and develop a basis for subsequent competitive leasing of Federal oil shale lands;

Encourage participation by companies not favorably situated with respect to access to reserves of the minerals present in oil shale;

Prevent speculation and windfall profits;

Provide reasonable revenues to the Federal and State Governments;

under mining operation and production practices that are consistent with good conservation management of overall resources in the region.

§ 3170.0–3 *Authority.*

These regulations are issued pursuant to the Mineral Leasing Act of February 25, 1920 (41 Stat. 445), as amended, (30 U.S.C. 181–287).

§ 3170.0–5 *Definition of Term "Oil Shale."*

As used herein, the term "oil shale" means sedimentary rock containing organic matter which yields substantial amounts of oil or gaseous products by destructive distillation. The term includes all the minerals which are components of the rock, but does not include:

(a) deposits of minerals which may be interbedded in the sedimentary rock series and which the Secretary determines can be mined (i) without removal of significant amounts of organic matter and (ii) without significant damage to oil shale beds; and

(b) deposits subject to lease as oil and gas asphaltic minerals, or coal.

§ 3170.1 *Designation of Available Lands.*

The Secretary will from time to time publish notices in the *Federal Register* designating areas of oil shale bearing lands and deposits for the conduct of particular types of mining, extraction, or processin gactivities which will be made available for leases for research and development and for subsequent commercial operations in accordance with these regulations. Areas will be selected with a view to encouraging research on a variety of mining and processing methods under a variety of conditions of mineral depths, composition, thicknesses and qualities, and taking into consideration sound principles of conservation and environmental protection. A total of no more than 30,000 acres of oil shale bearing lands will be designated hereunder. Oil shale bearing lands, the surface of which is under the administrative purisdiction of a Federal agency other than the Department of the Interior, will not be designated hereunder.

SUBPART 3171—APPLICATIONS FOR LEASES

§ 3171.1 *Qualifications of Applicants.*

(a) Leases may be issued to:

(1) Citizens of the United States;

(2) Associations of such citizens;

(3) Corporations organized under the laws of the United States, or any State or Territory thereof;

(4) Municipalities.

(b) The term "associations" includes partnerships, syndicates, groups, pools, joint ventures and other unincorporated organizations.

§ 3172. *Form and Contents of Applications.*

(a) No form of application is prescribed.

(b) Applications should be in writing and filed in triplicate in the Office of the Director, Bureau of Land Management, Interior Building, Washington, D.C., 20240, notwithstanding the provisions of section 3001.0–6 of this chapter.

(c) The application should provide:

(1) The complete name(s) and address(es) of the applicant(s).

(2) The qualifications of applicant(s) to hold a lease under the Act.
(3) A description of the land for which a lease is desired.
(4) A detailed statement of any direct or indirect interest which the applicant then has in any lease issued or applications pending hereunder, including ownership interests in any holder of a lease issued hereunder.
(5) If the applicant is a corporation, the name and address of each stockholder of record holding more than 10 percent of the corporation's stock.
(6) If the applicant is an association, the name and address of each member who has an interest of more than 10 percent in the association.
(7) A statement of the applicant's interests in non-federally owned oil shale lands and the reasons why the applicant needs federally leased land for the proposed research and development. The statement should include a description of the location and acreage of such lands, and the best available information on the depth, quantity, composition, quality and thickness of mineral deposits present in such land.
(8) A detailed statement of the applicant's financial capability to conduct the proposed research and development.
(9) A detailed statement of the applicant's technical capability to conduct the proposed research and development.
(10) A description of the applicant's plan of research and development during the research term, specifying:
[1] The goals of the research plan;
[2] The nature, location and cost of plants and equipment to be utilized;
[3] The number of key persons to be employed and their qualifications;
[4] The schedule of expenditures;
[5] The mining and processing techniques to be studied;
[6] The possible adverse effects on the environment and the measures to be taken to avoid or minimize such effects;
[7] The acreage required for the research;
[8] The depth, quantity, composition, quality and thickness of shale deposits required for the research;
[9] The quantity of water required and the expected source;
[10] The measures to be taken to prevent waste of the mineral resources of the leased land.
(11) A description of the reserves the applicant then owns or controls of oil and other minerals of the kind believed to be present in the lands applied for.
(12) With respect to the commercial operation sought to be developed if the research plan is successful:
[1] The general nature of the commercial operation, the commodity(ies) or product(s) expected to be produced, and the approximate service life and capacity of the plant to be constructed.
[2] The expected annual unit and dollar value of production of each mineral product to be produced. If the proposed commercial operation does not include extraction of component mineral products from the oil shale, a description of the prospective market.
[3] The expected capital and annual operating costs.
[4] The quantity of water required and the expected source.
[5] The expected hazards to the environment and the measures proposed to avoid or minimize them.
[6] The quantity of land and the depth, quantity, composition, quality and thickness of mineral deposits required.

§ 3171.3 *Consideration to be used in Evaluating Applications.*

After consultation with appropriate Federal, state and local agencies, evaluation of the research and development proposals will be made on the basis of the following considerations:
(a) Selection of proposals showing greatest promise of:
(1) Ascertaining the commercial feasibility of a variety of mining and processing methods, under a variety of conditions;
(2) Enhancing opportunities for maximizing multiple mineral recovery;
(3) Enhancing the competitive opportunities of smaller companies;
(4) Limiting any potential hazards to the environment;

(5) Limiting any potential hazards to human safety.

(b) The financial and technical capabilities of the applicant to conduct the proposed research and development, and the projected commercial operation.

(c) The pace at which the research and development is proposed to be conducted.

(d) The applicant's need for leased lands to conduct the proposed research and development, and the projected commercial operation.

(e) The effects on competition of the proposed research and development and the projected commercial operation.

(f) The applicant's need for reserves of the minerals proposed to be produced under his proposal.

§ 3171.4 *Time for Filing.*

No application will be accepted if filed later than five years from the date of publication of these regulations in the *Federal Register*. [The exact date will be inserted when the final regulations are published.]

SUBPART 3172—MISCELLANEOUS PROVISIONS

§ 3172.1 *Form of Lease.*

No form of lease is prescribed.

§ 3172.2 *Term of Lease.*

(a) Research Term. The research term of any lease issued under these regulations shall be designated by the Secretary, but in no event may exceed 10 years.

(b) Commercial Production Term. The Secretary will extend the term of such lease upon completion of the research term to permit commercial production for so long as mineral products are produced from oil shale in paying quantities from deposits on the land, if he has determined that:

The lessee conducted research activity during the research term substantially in accordance with the plan submitted in his application, or any modification thereof which was approved by the Secretary.

(2) The lessee has, in the course of the research term, developed a mining and processing method, which:

[1] Is commercially feasible;

[2] Provides for optimum recovery of minerals to be produced;

[3] Can cmoply with requirements determined by the Secretary to be necessary to prevent or minimize pollution of air and water, scenic or esthetic damage to surface resources, to fish and wildlife, and hazards to human safety.

(3) The lessee has compiled with all the terms of the lease.

§ 3172.3 *Acreage Designations and Limitations.*

(a) No lease issued hereunder may exceed 5,120 acres.

(b) Upon the issuance of any lease hereunder the Secretary shall designate the part of the leased lands upon which the lessee will be permitted to conduct operations during the research term.

(c) At the time for the grant of any extension of the term of lease as provided in section 3172.2(b), the Secretary will determine the quantity of mineral deposits needed for commercial production, allowing reasonable reserves. The term will be extended only with respect to the area which contains the quantity of mineral deposits so determined.

(d) No person, association or corporation (including a municipality) may take, hold, own or control an interest in more than the total maximum acreage of land included in any lease hereunder, except insofar as natural persons are permitted to hold greater interests under 30 U.S.C. sec. 184(e), by virtue of their 10 percent or lesser interests in corporations or associations holding leases hereunder.

§ 3172.4 *Rentals.*

Leases shall provide for the payment, in advance, of an annual rental of 50 cents for each acre or fraction thereof.

§ 3172.5 *Royalties.*

(a) Leases shall provide for the payment of royalties on production during their commercial production terms.

(b) The royalty rate on production shall be 3 percent on the gross value, at the point of shipment to market, of the mineral products from the oil shale, except as provided in subsections (c) and (d) of this section. Such royalties

shall be due and payable monthly on the last day of the calendar month next following the calendar month in which produced.

(c) If the total annual royalty payment on production as computed in accordance with subsection (b) of this section is less than the payment would be if computed in accordance with subsection (d), then the lessee shall pay, by March 1 of the succeeding year, an additional amount equal to the difference between the royalty paid and the royalty as computed in accordance with subsection (d).

(d) The annual net income royalty rate shall be a percentage of net income from the production of mineral products from oil shale to the point of shipment to market.

The net annual income royalty rate is:

Ten (10) percent of that part of the net income which is no more than ten percent of investment.

Thirty (30) percent of that part of the net income which exceeds ten percent and is no more than twenty percent of investment.

Fifty (50) percent of that part of the net income which is more than twenty percent of investment.

As used in this section, "net income" means taxable income, computed without allowance for royalty and depletion. "Investment" means the original cost less depreciation of capital assets used in the aforesaid production and processing of oil shale. The term "investment" does not include oil shale obtained pursuant to a lease issued hereunder.

(e) Lease royalties shall be subject to readjustment at 20-year periods succeeding the issuance of the lease. Lessees will be notified of the proposed readjustment of royalties or notified that no readjustment is to be made. Unless the lessee shall file either a notice of objection and offer to negotiate the proposed readjustment of royalties, or file a relinquishment of the lease within 30 days after receipt of the notice, he will be deemed to have agreed to such readjusted royalties.

(f) The Secretary will, prior to any readjustment under subsection (e) of this section which would reduce the rate of royalty on my lease, publish a notice of intention to make such reduction in the Federal Register, inviting written comments by interested persons, to be filed within 60 days of the issuance of the notice. The Secretary will not readjust such royalties prior to the expiration of such 60-day period.

(g) Leases shall provide for the payment of royalties during their research terms, on minerals and mineral products sold by the lessee. The royalty rates shall be the same as those applicable during the commercial term.

§ 3172.6 *Termination of Lease.*

Each lease issued hereunder shall terminate at the end of its research term unless, prior thereto, the Secretary has authorized the commencement of the commercial production term.

§ 3172.7 *Lease Bond.*

A bond of not less than $100,000, conditioned on performance of the obligations imposed by the lease, the Act, and these regulations will be required prior to the issuance of an oil shale lease. The right is reserved at any time before or after the issuance of the lease to require an increase of the amount of the bond in any case where the Secretary deems it proper to do so.

§ 3172.9 *Other Provisions.*

(a) Protection of the Environment and Human Safety. The lease will contain such provisions as the Secretary deems necessary to prevent or minimize pollution of air and water, scenic or esthetic damage, damage to surface resources, and to fish and wildlife and hazards to human safety.

(b) Prevention of Damage to Other Mineral Resources. The lease will contain such provisions as the Secretary determines necessary to protect other mineral resources which may be involved.

(c) Diligence in Pursuit of Plan of Research. The lease will require that the lessee pursue diligently both the plan of research upon which his lease was issued and operations during the commercial production phase.

(d) Disclosure of Information Developed During the Research Term.

(1) The lease will contain provisions requiring the lessee:

[1] To submit annual progress reports during the research period, in sufficient detail to disclose fully all work accomplished and results achieved.

[2] To submit, within 120 days after completion of all work under the research plan, a final report summarizing the state of the art and

covering conclusions and recommendations derived therefrom. The report shall include a complete and detailed disclosure of all materials, processes, and equipment involved, including all the technical and financial data needed to enable any qualified person to carry out the work performed under the lease. Where appropriate, the recommendations shall include proposals for further improvements which would advance the future state of the art based on knowledge acquired in the performance of the work under the lease.

[3] To make such other reports and supply such information regarding the progress of the research as the Secretary may specify from time to time.

[4] To permit access, by persons designated by the Secretary, to the leased premises, all facilities thereon, all other facilities in which any part of the research is conducted, and all books and records which directly relate to the plan of research being conducted.

(2) The lease will provide that no report required under the lease may be copyrighted and the lessee, without additional compensation, therein grants to the Secretary the full right to publish, reproduce and use, and to have others to do so, for any purpose without limitations, the reports and any information obtained by the Secretary hereunder. The Secretary will promptly publish the reports received and make the other information he has obtained available to the public.

(3) The lease will require that the lessee agree not to publish, or to make available to others besides representatives of the Secretary, the results of the research work under the lease or any information concerning the same, without prior approval in writing from the Secretary.

(e) Patents. The lease will contain provisions that the United States will acquire title to all inventions made in the course of or under the research term of the lease, and requiring the lessee to issue licenses at reasonable royalty rates, with respect to such patents as he may own, which are necessary to permit others to practice inventions made in the course of or under the research term of the lease, except that the lease may contain provisions granting greater patent rights to the lessee, in such cases where a proper showing of exceptional circumstances is made, in accordance with the Statement of Government Patent Policy issued by President Kennedy on October 10, 1963, 28 F.R. 10943.

(f) Assignments and Relinquishments. The lease will contain provisions governing assignments and relinquishments.

(g) Cancellation of Leases. Upon failure of a lessee to comply with the provisions of the Mineral Leasing Act, or of the regulations issued thereunder, or of the lease, and continuation of such default for 30 days after service of written notice thereof by the Secretary, the Secretary may institute judicial proceedings for the cancellation of the lease as provided in section 31 of the Act. Failure to give notice with respect to any particular cause of forfeiture shall not be deemed a waiver and shall not prevent the cancellation and forfeiture of the lease for any other cause of forfeiture, or for the same cause occurring at another time.

(h) Additional Provisions. The lease will contain such additional provisions as the Secretary deems appropriate.

§ 3172.10 *Antitrust Consultation.*

Prior to the issuance of a lease, the Secretary will forward a copy to the Attorney General, requesting his advice as to whether the issuance of the lease would be consistent with the objectives of the Federal antitrust laws.

STEWART L. UDALL,
Secretary of the Interior.

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, WASHINGTON

[43 CFR, Subpart 2244]

EXCHANGES

Basis and Purpose. Notice is hereby given that the Department of the Interior proposes to amend the regulations regarding exchanges of privately owned lands under the Taylor Grazing Act, found at Subpart 2244 of Title 43 of the Code of Federal Regulations, by adding the proposed regulations set forth below.

Interested persons are invited to submit their comments in writing to the Director, Bureau of Land Management, Department of the Interior, Washington, D.C. 20240, within thirty days of the date of publication in the *Federal Register* of this notice. Persons wishing to present their views orally are requested to communicate with the Director, Bureau of Land Management.

A new section 2244.1–7 is added, as follows:

§ 2244.1–7 Exchanges of Oil Shale Lands

(a) Policy. Exchanges of public lands containing oil shale deposits may be consummated pursuant to Section 8 of the Taylor Grazing Act, 48 Stat. 1272 (1934), as amended, 43 U.S.C. 315g (1964), where such action will promote economic recovery of shale oil and associated minerals and is otherwise in the public interest. Except as otherwise provided in this subsection (2244.1–7) such exchanges will be made pursuant to section 2244.1.

(b) Criteria. Exchanges of public lands containing oil shale deposits may be effected under the regulations in section 2244.1 only where each of the following requirements are met:

(1) The offered land is oil shale land having similar geologic and physical characteristics and of a value equal to or exceeding the value of the selected public land.

(2) The exchange will result in the consolidation of the offeror's lands so that they are susceptible of being managed as an economic unit for the recovery of shale oil and other mineral products.

(3) Consummation of the exchange will not result in impairment of proper utilization and management by the United States of its lands, including the land it is to receive in the exchange.

(4) The applicant enters into a written agreement with the authorized officer that he will manage and utilize the selected lands and all neighboring oil shale lands owned or controlled by him at any time in such a manner that (a) there is compliance with all applicable Federal and State statutes and regulations relating to control of environmental pollution, and (b) there is adherence to a coordinated plan of sound conservation practices in the management and use of such lands, including the avoidance of waste.

(c) Application. Application must be made in accordance with section 2244.1–2. Upon the filing of an application, and prior to the making or issuing of any classification decision, the authorized officer shall direct publication of a notice of application in a designated newspaper of general circulation in the county or counties in which both the offered and selected lands are situated. The notice, which shall be published once a week for three consecutive weeks, shall set forth the legal descriptions of the offered and selected lands, together with such other data as the authorized officer may deem pertinent, and shall provide for a 60-day period from date of the notice during which other private exchange applications may be filed for the selected lands pursuant to section 8 of the Taylor Grazing Act. Where more than one application has been filed for the selected lands the authorized officer shall take the following additional elements into consideration in determining which, if any, of the exchange offers will best benefit the public interest:

(1) the relative values of the offered lands;

(2) the location of the offered lands in relation to the public lands; and

(3) the willingness of any of the applicants to enter into a written agreement with the Secretary specifying a time schedule and rate of investment reasonable in the circumstances and a plan of mineral operations that will permit optimum recovery of shale oil and other mineral resources from the selected tract and all neighboring oil shale lands owned or controlled by the applicant.

STEWART L. UDALL,
Secretary of the Interior.

Senator Moss. The Senator from North Dakota?

Senator BURDICK. I do not have a question but I have an observation. I would like to add my voice to a note of concern raised by the chairman and others on this committee. Is your statement you say:

You may recall from the map which was reproduced in your 1965 hearing record that the private lands in the richest oil shale area of Colorado tend to stretch out into very narrow ribbons—usually following stream valleys.

I do not know anything about oil shale mining, and little about that area, but it would seem to me that you give a physical set up here that might be given to pollution of fresh water streams and, I would hope that your Department would keep that high on the priority list when you have your regulations promulgated.

Mr. UDALL. Well, Senator, it seems to me we have a great opportunity here. We must take a lesson from the traditional way that mining and mineral exploration developed in the West, where in the early stages you went in in a very single-minded way and you took out what you wanted. If you ruined the countryside and polluted the river, that was just part of the price of progress.

Well, the modern approach is to have respect for all resources, to try to have a balanced program, and I think that we have a great opportunity here to show how to do it right. I am pleased that everyone that I have talked to, and there has been no dissent, seems to say, "Yes, we can do it this way." I think this is one thing, as Senator Hansen has suggested, that we ought to work closely with the States on, so that our goals are the same.

It would be most unfortunate if the development of oil shale resulted in pollution of streams. This resource is so rich, if we develop the right kind of economics, it can and should aspire to be a clean industry in the sense that it does a very minimum of damage to the other resource values that are present.

Senator HANSEN. Mr. Chairman, if I could interrupt for just one moment, I would just like to say in the context of your statement, Mr. Secretary, that there has just been brought to me Enrolled Joint Memorial No. 4 from the State of Wyoming that I would like to read:

ENROLLED JOINT MEMORIAL 4

JOINT MEMORIAL Expressing the sentiment of the Wyoming Legislature with regard to the development of oil shale and associated minerals in the State of Wyoming

Whereas the economic stability, prosperity, and security of the State of Wyoming, of the rocky mountain area, and of the Nation will be greatly enhanced by the industrial development of oil shale and associated minerals: Now, therefore, be it

Resolved by the Thirty-ninth Legislature of the State of Wyoming, That we recommend to Governor Stanley K. Hathaway that he appoint an oil shale advisory board which shall advise him on how best to protect the public interest in Wyoming lands and how best to stimulate and promote the development of an oil shale and associated mineral industry in the State of Wyoming.

WILLIAM S. SWANTON,
Speaker of the House.
RICHARD R. JONES,
President of the Senate.

I think this certainly attests to the firm conviction that is evident in Wyoming.

Senator Moss. Thank you.

Mr. Secretary, you discussed the likelihood that the Department would want to move on to testing nuclear energy for *in situ* retorting of oil shale, perhaps to follow the Gasbuggy project that is now underway. Have any concrete steps or arrangements or estimates been made on that as yet or is this still just in the talking stage?

Mr. UDALL. Senator, I think it is probably accurate to describe this as being in the planning, early planning stage. I think this is some-

thing in which the Atomic Energy Commission people probably are going to have to provide much of the leadership in terms of timing. Much of this will come out of their budget rather than our own, of course.

I can say, on the basis of my talks with Dr. Seaborg the other day, that they are very enthusiastic and very anxious to move as rapidly as you can lay out an orderly program.

I think probably something like Project Bronco is a couple of years away or it may be three, but if Gasbuggy goes well, I think this will encourage everyone to move on to the next stage and see what can be done in oil shale.

Senator Moss. You indicate that probably 20 percent of the oil shale is in private ownership now and that under this blocking up program I would assume there is a likelihood that larger blocks will come under private ownership control.

Do you envision that there might be some acceleration if the private landowners want to get the cooperation of AEC, to try to develop the *in situ* process earlier?

Mr. UDALL. No. My own feeling would be because of the public interest factor that the AEC would want to carry out its initial programs on Federal lands in order to do the maximum that it could to help the total effort here, to develop the technology, develop a process, rather than to give an advantage to any particular individual or company or group of private owners.

Now, the pattern you have in Gasbuggy includes my Department, the AEC, and a natural gas company, In that instance the patents and everything else will be fully protected because what the AEC wants and what we want is that if this proves possible and feasible, that we don't give it to one monopoly, one company or small group of companies. It must be available to everybody so that the whole country gets the advantage of it. I think this is the thing that we want to keep our eye on in terms of the development aspect.

I would add one other factor, Senator, as far as Project Bronco is concerned. Many of the private holdings are said to be quite thin or shallow. This is understandable because many of the patented mining claims were made on visible outcrops. It is our operating theory, on the other hand, that atomic explosions will be most useful where the deep deposits are. The Piceance Basin is undoubtedly the place to begin in terms of the richness of the deposits that are there. The economics will be more favorable in that region than to use these expensive explosions elsewhere.

Senator Moss. Do we know enough about the technology of this yet for you to tell me whether, using the nuclear energy on the oil shale, the kerogen, would eliminate and preclude any extraction of dawsonite or other mineral there? Would this nuclear method wipe it out?

Mr. UDALL. We don't have the final answers on this but I think the preliminary indications would be that it would not if you do these correctly.

Senator Moss. There are some people who are interested in this area who believe they have a patented process now for the use of nuclear energy to extract oil. Is there any conversation going on with the AEC about the use of this patent?

Mr. UDALL. I would rather you ask the AEC people the question on this, Senator. I am not really qualified to give you much of an answer.

Senator Moss. Do you have further questions?

Senator ALLOTT. The Secretary has only 5 minutes. I have not begun to cover what I want to ask, but I would, if I may, just take up one thing that has not been quite wrapped up, and it grew out of the statement of the Senator from North Dakota.

We are all concerned, of course, with water pollution, but actually one of the major problems that will arise from the conventional—now conventional—methods of extracting shale oil comes from the disposal of the residue, and I know my own State is giving this great consideration. I have actually seen some conservation practices that have been put into effect on a developmental basis to see what can be done on this.

I don't suppose anybody has the complete answer at this time, but this also is very much a part of what you are talking about when you say in your statement, or in substance, that your leases will contain firm assurances that good conservation practices will be observed in the commercial operation, is it not, Mr. Secretary?

Mr. UDALL. Senator, you again have a key point here and this is what we meant when we talked about some of the research that the Bureau of Mines must do in modern mining methods. The truth of the matter is that we are just on the edge really of what we think can be very dramatic changes in terms of modern mining methods to make it possible to do things that we have not been able to do heretofore.

The automated equipment that is used in coal mining is one example. You might very well evolve continuous systems, for example, that would take it in, retort it, take it back and deposit it in the same area rather than to have to spread it over the whole landscape. Learning how to solve the problem of spent shale from a conservation point of view is something that I think we can master.

Again, this brings me right back to the point I stressed earlier, that we have time to do it. That is one of the reasons that I think it is important to begin a lot of our research now so that when we are ready to go with a program, a big large-scale program, whether it is 8 years or 18, that we have the answers in terms of conservation of the other resources.

Senator Moss. Maybe we don't have an excess of time. The Wall Street Journal this week reported that domestic production of crude oil and liquid natural gas would have to rise from about 9 to 13 million barrels daily by 1980. So that is almost a doubling, unless we are going to start oil importation. We have to move on with this resource.

Mr. UDALL. Well, Senator, to me the other very good thing in terms of the national interest that can be done here, if we do our job right, is that we can control and phase in oil-shale development so that it fits the national interest.

This is something that I think may prove very important in terms of the economics of the energy industry and the petroleum industry in the future, that it is possible here if we are wise enough to do it that way to phase it in so that we do not have disruptions and gluts and all the sort of things that make for disorder in the economic picture.

Senator Moss. Thank you.

Senator ALLOTT. Mr. Chairman, as I have indicated, the time is short.

Mr. Secretary, at some time convenient to you would it be possible for you to return so that we could continue the exploration of your statement?

Mr. UDALL. I would be quite willing at any time, Senator. I think this is a very vital subject and needs to be thoroughly aired and I am at the pleasure of the committee.

Senator ALLOTT. Thank you very much.

Mr. UDALL. I have to catch a plane. That is why I——

Senator ALLOTT. I understand.

Senator Moss. Thank you very much, Mr. Secretary, Mr. Luce and Mr. Barry, for being here this morning. You have been most helpful. As indicated by Chairman Jackson, we hope to maintain closest dialog and to follow carefully these developments as they move along. So we will look forward to having you back before the committee in the not too distant future. You are excused now. Thank you.

Mr. LUCE. Mr. Chairman, the Secretary referred in his statement to a prospectus of oil shale resource development, being an elaboration of our points 4 and 5 of our five-point oil shale program. I don't believe this prospectus was ordered admitted to the record and I would appreciate it if it would be. I have copies of this prospectus of research and development over a 10-year period for the committee if the members wish to have it.

Senator Moss. The prospectus is of considerable interest and although it is lengthy, I think it should be printed in the record. So without objection this will be inserted in the record as an appendix to this hearing.

Now I request that there be printed in the record at this point a statement of the Governor of Wyoming, a statement of the Governor of Utah, a statement by Senator Bennett of Utah, and do we have any others? Other statements that have been filed by any Members of Congress or the Governors of any of the States will be included.

(The statements referred to follow:)

STATEMENT OF HON. STANLEY K. HATHAWAY, GOVERNOR OF THE STATE OF WYOMING

Mr. Chairman, I regret that I could not be present today to appear before your Committee, but the pressing business at the close of this session of the Wyoming State Legislature prevented me from making such a trip. I did want, however, to express before your Committee the great interest which Wyoming has in the development of oil shale and associated minerals.

Secretary of the Interior Udall's announcement on January 27 of a five-point oil shale development program signals, we hope, a recognition by the Federal Government to bring our vast oil shale reserves into commercial production as soon as possible.

In order that Wyoming may take its proper place in furthering the orderly development of this natural resource, our State Legislature by unanimous consent adopted a resoltuion recommending the appointment by me of a Wyoming State Oil Shale Advisory Board. That resolution was signed by me on February 18 and this Oil Shale Advisory Board will be appointed at the earliest opportunity. Among other things, I will ask that the Advisory Board submit recommendations to me guiding myself and the Legislature in the area of conservation regulations and the proper policing of land, air, and water pollution.

In announcing the five-point program, Secretary Udall failed to make any mention of the role that affected states would play in the development of an oil shale industry. Affected states will, of course, be required to exercise their traditional police powers as well as provide for the many needs of rapidly growing communities. Wyoming will welcome the opportunity to coordinate with the other affected states in establishing proper conservation regulations. In addition, Wyoming will not be unmindful of the requirement that taxing entities

must be formed and that community facilities and services must be provided in close coordination with the various stages through which an oil shale industry must pass before achieving its maximum growth.

The known deposits of the Green River Formation cover vast areas of southwestern Wyoming. The withdrawal of the federal lands over this formation has, of course, prevented the development of oil shale up until this time. The most recent withdrawal of lands from sodium leasing and further mining location will also serve to prohibit development unless these withdrawal orders are rescinded at the same time as the Department of the Interior announces its final leasing regulations. Wyoming, of course, would be strongly opposed to a continued withdrawal of these lands after the 90 days that Secretary Udall has announced for his regulation publication timetable. To further bar the staking of mining claims an oil shale lands will greatly inhibit the future development of Wyoming's many mineral resources in this area.

Wyoming recognizes the great significance of water in the proper development of its oil shale reserves. In this regard it asks that Congress give full attention to the possible demands on the waters of the Upper Colorado River system. Such demands should, of course, be projected to 1980 and beyond for we are led to believe that significant lead time will be required before full commercial production of oil shale is to be realized. Wyoming will vigorously request that its share of the Upper Colorado River water apportioned to it under the Upper Colorado River Compact be protected for such future mineral development needs.

In summary, Mr. Chairman, let me say that Wyoming stands foursquare behind the immediate development of an oil shale and associated minerals industry. My state asks only that it be given a fair opportunity to show its good faith in the future planning by all levels of government for this industry. We stand ready to coordinate and to cooperate with any and all government authorities. I would hope that such proper planning followed by development will now proceed without delay.

Thank you.

STATEMENT OF HON. CALVIN L. RAMPTON, GOVERNOR OF THE STATE OF UTAH

Prior commitments have made it impossible for me to personally appear at this hearing and I appreciate the opportunity of presenting this statement through Senator Frank E. Moss.

We are making available for lease to private industry our State owned deposits of oil shale and will continue to do so. We believe that the demand for energy will be such that conventional oil and gas resources will not meet our needs during the 1970's. Consideration of economic and national defense indicate need for development of a domestic, synthetic fuel program. We believe the program recently announced by Secretary of Interior could be a vital first step. We urge that the program be implemented to allow private industry to develop both the state owned and the federally owned oil shale reserves.

We believe that the blocking up program announced as part of the Secretary's oil shale program should include the right of the State of Utah to exchange on an equal value basis scattered oil shale lands for blocks of federal land. The State then in turn could make these blocked lands available for development by private enterprise.

At present, The Secretary has also suspended action on Indemnity Selection applications of the State of Utah. We believe the Secretary should permit the State to acquire oil shale lands from the Government pursuant to these selections.

STATEMENT BY HON. WALLACE F. BENNETT, A U.S. SENATOR FROM THE STATE OF UTAH

OIL SHALE—A GREAT POTENTIAL

Mr. Chairman and members of the Committee, I would like to thank the Committee for this opportunity to present my views to this distinguished committee as it begins hearings on the Federal oil shale program and policies.

It has been my privilege to testify before this Committee before regarding Oil Shale and to explain my views on this very important subject which has so

much great potential economic impact to the areas involved and which also may have a great bearing on our National Security.

Since the last hearings held in May of 1965 the Interior Department has come forward with a so-called Five Point program which would foster the oil shale development in Colorado, Wyoming and Utah.

I was generally pleased with the announcement that the Interior Department has finally acted to take the first step toward unlocking one of the richest oil deposits in the world.

I hope, however, that after almost 40 years of confusion and delay we are not merely getting into a situation where the Department is "beginning to study how to start to commence," as has been said of the Interior Department and oil shale.

Mr. Chairman, I have felt for a long time that there have been three obstacles to early progress toward oil shale development.

1. The lack of clear-cut and workable leasing regulations that could permit and foster development.

2. Uncertainty as to the validity of many of the mining claims which were filed many years ago and which are clouding the picture today.

3. Delays and problems confronting the economic development of oil from oil shale deposits.

Of these items the third has been making the most progress toward solution while the other two have been bogged down in bureaucratic red tape.

Now it appears that some of that tape might be cut as result of the new policy decision handed down in January. However, before any concrete statement can be made or before this Committee can decide exactly which direction the Interior Department plans to go a study must be made of the regulations which the Secretary of Interior promised (in Point Three) within 60 to 90 days when we will see the administrative details of leasing procedures.

I am sure that Congress, private industry and all concerned with our national security will await the Interior Department details on the proposed leasing program with a great deal of interest.

Although it remains to be seen I will be particularly interested in just how many Federal strings will remain attached to the land in question and in knowing whether the Administration has chosen to inhibit rather than to promote the cooperation of private industry into this very important field.

In addition, I am wondering about the question of state indemnity selections which play such a major role in the Utah land picture. I hope that the Secretary, as result of these new policy statements, will come forward when the regulations are printed and expedite the indemnity selections that the State of Utah has requested.

It is my feeling that the government should immediately make certain areas available to private concerns for development. A logical beginning would be an area where there is intermingled state, Federal and privately held fee land.

Oil companies and others have requested or applied for leases on more than 100,000 acres of Federal oil shale lands. In Utah, practically all of the oil shale lands owned by the state—some 160,000 acres, were under lease at the end of 1963.

The opponents to an immediate leasing program maintain that we have not traveled far enough in the research and development area. They say that more research is required before we will be able to open up this industry. Private industry claims it has the methods and that all it needs to get going is someone to cut the red tape. I maintain that we should allow private industry to prove its claims and let us not hide behind a curtain called "lack of research and development."

Mr. Chairman, in conclusion I would like to say that I hope, at long last, that we are on the road to clearing up some of the confusion that has been created by changing attitudes in this entire oil shale area.

The subject has been studied almost to death by almost every branch of the government. One of the major problems has been the failure by the government to act as quickly as it should have so that the development of this resource would not have to commence under the pressure of shortages or merely to conditions of the day. I would hope that we can proceed in the orderly and equitable development of this industry in an indepnedent and positive manner based on careful and comprehensive policies that will give oil shale a chance.

Thank you, Mr. Chairman.

Senator Moss. Our next witness is Capt. Howard Moore, of the U.S. Navy, who is director of the Naval Petroleum and Oil Shale Resources.

We are pleased to have you with us, Captain Moore, and we will ask you to proceed.

STATEMENT OF CAPT. HOWARD MOORE, U.S. NAVY, DIRECTOR OF NAVAL PETROLEUM AND OIL SHALE RESOURCES; ACCOMPANIED BY LT. COMDR. HUGH CRISP, AND EUGENE BOWLER

Captain MOORE. Mr. Chairman, may I have a couple of the members of my staff?

Senator Moss. Would you identify them and have them sit with you, sir?

Captain MOORE. Lt. Comdr. Hugh Crisp——

Senator Moss. Glad to have you here.

Captain MOORE (continuing). Mining engineer and petroleum engineer; and Mr. Eugene Bowler, petroleum engineer.

Senator Moss. Mr. Bowler, happy to have you.

You may proceed as you care to do, Captain Moore.

Captain MOORE. Mr. Chairman, I have a prepared statement, if I may read it.

Senator Moss. It will be perfectly proper for you to read the statement if that is the way you would like to begin.

Captain MOORE. Mr. Chairman and members of the committee, I am Capt. Howard N. Moore, U.S. Navy, Director of the Naval Petroleum and Oil Shale Reserves. I appreciate this opportunity to appear before the committee to present the position of the Navy Department in regard to the development of oil shale as a commercial energy source. In particular, I will make reference to the five-point program recently announced by Secretary of Interior Udall for economic development of this valuable natural resource.

It is perhaps appropriate first to explain the basis for the Navy's role and interest in oil shale. Between 1916 and 1924 some 145,000 acres of public land were set aside by Executive order for the exclusive use of the Navy as oil shale reserves. Two of these reserves are located in Garfield County, Colo. and a third is located in Carbon and Uintah Counties, Utah. The total acreage comprising the naval oil shale reserves is approximately 2 percent of the federally owned oil shale lands in Colorado and Utah.

Congress, by statute, placed these oil shale reserves in the custody of the Navy with the specific mandate to maintain them for future use in the event of a national emergency. These reserves, like the naval petroleum reserves, may not be produced commercially until the Secretary of the Navy, with the approval of the President, finds that production is needed for national defense and is authorized by a joint resolution of Congress. The statutory basis for the Navy's control of the oil shale reserves is now codified in title 10, United States Code, sections 8421–8438.

For some years the Navy has consistently supported and encouraged efforts being made by other branches of the Federal Government and private industry to advance technology to the point that shale oil

could become competitive with other types of fuels. It is obvious from the standpoint of national defense that if the oil shale reserves are to make a significant contribution, there must exist at that time a viable oil shale industry. It is unlikely that sufficient time or resources will be available during a full scale emergency for development of such an industry. In addition, the vast amount of liquid fuels which may be made available through a going oil shale industry will greatly decrease, if not eliminate, any wartime requirement to import conventional fuels by sea. This is of great importance today because present trends indicate the United States is becoming a crude deficient nation and may in the future be forced to rely more and more upon imported fuels to meet even peacetime demands. For these reasons, the Navy fully supports Secretary Udall's five-point program as a sound basis upon which the first steps may be taken toward the orderly development of oil shale on public lands. I will attempt to specifically relate each of the points included in the program to operations on the naval oil shale reserves.

POINT I. ACTION TO CLEAR TITLE TO THE PUBLIC OIL SHALE LANDS IN COLORADO, WYOMING, AND UTAH

Today, the private right to develop the public oil shale lands can only be acquired under the terms of the Mineral Leasing Act of 1920. Large numbers of unpatented mining claims covering the oil shale lands presently make leasing of these lands rife with potential legal difficulties arising out of disputed ownership.

The naval oil shale reserves are now relatively free from title disputes. We are working with the Department of the Interior to clear the few disputed titles remaining on reserve lands and excellent progress has been made to date. The primary interest of the Navy with this part of Secretary Udall's program is that settlement of these disputed claims on public lands will remove an obstacle to the orderly development of an energetic oil shale industry. Not until this industry has been developed will the naval oil shale reserves become a meaningful asset.

POINT II. PLAN TO PERMIT BLOCKING OF OIL SHALE LANDS INTO WORKABLE UNITS

Mr. C. E. Reistle, chairman of the board of Humble Oil & Refining Co., in his speech before the 95th Annual Meeting of AIME (American Institute of Mining, Metallurgical, and Petroleum Engineers) on March 1, 1966, gave some basic indication of the economic parameters limiting the development of a commercial oil shale industry. He said:

> There are two major methods that are being studied for getting oil out of the shale: (1) mining and retorting and (2) in situ retorting. Work is going forward on both methods; one or both may ultimately prove to be economically feasible. Using the mining and retorting method, a minimum shale oil plant is believed to be one which will produce at least 50,000 barrels of oil per day. Such an operation involves mining, crushing, and retorting 80,000 tons of shale per day. Capital investment in such a plant, including upgrading facilities, would be in the order of $100,000,000.

Projecting Mr. Reistle's figures leads one to conclude that an economic unit of shale for commercial retorting would have to include

reserves of about 1 billion tons of minable shale of 15 gallons per ton or better richness; or viewed from a different angle, recoverable oil reserves of at least 365 million barrels.

Our studies to date indicate support for the view that the huge capital investment will, from the standpoint of economics, require that any regulations promulgated take this factor into consideration. Although the Navy is not directly concerned, it does recognize the importance of permitting the blocking up of Federal oil shale lands into economically attractive units, and so would endorse it.

POINT III. PLAN TO CONSIDER PROVISIONAL DEVELOPMENT LEASES

We now support utilization of the Anvil Points facilities on Naval Oil Shale Reserve No. 1 by the Colorado School of Mines Research Foundation as a means of making these facilities available for experimental retorting. Under an agreement specifically authorized by existing law, shale from the reserve is now being used by private industry at the Anvil Points plant.

Private industry has already expended some $2.7 million in this undertaking, and a $4.5 million expansion of the basic research program there is currently underway.

Senator ALLOTT. Mr. Chairman, would you permit me to make a point clear which Captain Moore has not quite made clear. This paragraph you just read does not make clear that this shale from the naval reserve can only be used for purposes of research and not production. That is correct, is it not?

Captain MOORE. Yes. The law prevents any commercial use of the shale to date.

Senator ALLOTT. Your paragraph does not make that clear and I wanted to be sure that was in the record at this point.

Captain MOORE. Thank you, sir.

This program indicates the feasibility of the approach suggested by Secretary Udall's third point. If the regulations and provisional development leases issued contain the requirements outlined in his announcement, it appears to me that research and development programs will be assured at the same time the holding of the great bulk of these lands for purely speculative purposes will be prevented.

POINTS IV AND V. AEC ASSISTANCE AND FUNDS FOR RESEARCH

The cost of mining and handling large volumes of shale by surface retorting processes and the problem of disposing of spent shale on the surface make the development of some efficient type *in situ* retorting process highly desirable. The use of atomic explosions underground is one approach to this problem. The atomic explosion itself will be expensive, and as yet there is no evidence to indicate that *in situ* retorting of oil shale is physically practical. In this connection several questions need to be studied:

(1) Can currents to carry oxygen to the combustion chamber be maintained?

(2) Can permeable channels or fractures through which the retorted oil can flow to wells be opened and maintained?

(3) Can the size and location of the combustion zone be satisfactorily controlled?

We would assume that small scale, conventionally fired *in situ* retorting experiments first would be carried out to assist in finding the

answer to these questions. We believe the shale beds on the naval reserves are too shallow to be safely or productively utilized for atomic experiments. However, some of the older mine workings on Naval Oil Shale Reserve No. 1 might be utilized for any limited underground retorting experiments which might be required prior to engaging in major atomic undertakings elsewhere.

It is possible that an atomic device will not prove practical for use in the *in situ* retorting of shale oil, and certainly not in all locations. As previously alluded to, one of the major problems to be solved in *in situ* retorting is the creation of an extensive fracture system through which fluids can flow. Oil shale is a dense, impermeable rock in its native state. Conventional hydraulic fracturing techniques known to the oil industry today may not be applicable because they create a few large fractures, and what will be needed for *in situ* processing of oil shale is a highly fractured, broken rock zone. The Bureau of Mines is studying explosive fracturing methods whereby a liquid explosive is pumped into the rock, following small fractures or fissures back into the formation, and then detonated. Preliminary results from this process look promising. The Navy has modestly supported this research with funds for several years and has offered to provide a location on Naval Oil Shale Reserve No. 2 in Utah for field tests of this process in an oil shale formation.

In connection with anticipated research, the matter of spent shale disposal is of considerable interest to us. Unless vast piles of spent shale are to spoil the landscape as a result of oil shale mining and surface retorting, a research effort must be undertaken leading toward some practical means for the economic utilization or disposal of spent shale.

In conclusion, I would like to state that my office stands ready to assist this committee, the Department of the Interior, and industry in carrying out this oil shale program in any way consistent with legislation controlling the naval oil shale reserves.

This is the end of my prepared statement, however, members of my staff and I will attempt to answer any questions you may have on this matter.

Senator Moss. Thank you, Captain Moore, for a very fine statement. It answers one or two questions I had in my mind about the extent of the naval reserve holdings. I understand it is about 145,000 acres.

Captain Moore. That is right, sir. We only have approximately 12 billion barrels of recoverable oil on shale reserve No. 1 and about 3.8 on Naval Shale Reserve No. 2 in Utah. It is relatively small compared to the whole basin.

Senator Moss. Has the mineral entry been forbidden also on the naval reserve?

Captain Moore. Yes. Our interpretation of the law, Senator Moss, is that when withdrawn, it be withdrawn for exclusive use of the Navy. At least in 1962 administration over it was given, by the legislation to which Senator Allott referred, for all purposes to the Secretary of the Navy, so we think that the dawsonite claims and nahcolite claims that are filed are not valid with respect to the reserves.

We don't know of any valid ones there to date.

Senator Moss. Well, are there some that have been filed that will have to be contested legally to determine it?

Captain Moore. There are approximately 87 claims. The Department of the Interior has by administrative action rid itself of 70-

some-odd. There are approximately 6,000 now in litigation, and the same group that I think the Solicitor mentioned recently. I think the remaining claims cover about 870 acres.

So it is a small part.

Senator Moss. And the Navy has continued to cooperate with, and to some extent participate in, research and extraction of oil from shale, but made no effort to produce any oil for any military or commercial channels?

Captain Moore. We are precluded by law from doing so until there is a national emergency.

Senator Moss. Well, we may have had one or two in the last few years but you have not produced any.

Do you have any questions, Senator Allott?

Senator Allott. Yes. Captain, I want to congratulate you on your statement because I think you have pointed out some of the questions which other people have not pointed out to date and which have not been highly developed.

No. 1, I assume it is your point of view—it has been mine for a long time—that the development of a viable oil shale industry is a necessity for the national defense and the national welfare.

Captain Moore. It certainly is, Senator.

Senator Allott. And I assume also, although you don't say this specifically, that the time is now, because the leadtime for the development of such processes, whether they be, you say *in situ* or by retort are going to require a long leadtime and the investment of vast amounts of money.

Captain Moore. Yes, sir.

Senator Allott. You have estimated from the figures given by the chairman of the board of one oil company that it will cost a hundred million dollars capital investment to establish one 50,000-barrel retort in this area.

Now, this fact—and this is the same figure that has been used by others—alone is of necessity going to influence any leasing policy developed by Congress, is it not?

Captain Moore. I would think so.

Senator Allott. In other words, you can't take a little dab of oil or a little dab of land and lease it and expect someone to make a hundred million dollars investment in order to develop this land.

Captain Moore. No, sir. The only way he could profit at all, a small man, would be to supply a larger retort from his land.

Senator Allott. One last question for you, sir.

There have been some very optimistic and perhaps rose-colored statements this morning about nuclear *in situ* development, and of course we all hopefully look forward to this, but you say on page 3 of your statement that there is no evidence to indicate that *in situ* retorting of oil shale is physically practical.

Now, the only point I want to make is that the present point of time, in this given area, we are literally like a baby taking its first step, are we not?

Captain Moore. Yes, sir.

Senator Allott. And that the nuclear experiments, Gasbuggy and others, that are now on the drawing board—and I know you are acquainted with others in this area, although not in the oil shale—are only first steps toward trying to develop such a process.

You are acquainted with the Rulison project, are you not?

Captain MOORE. Not fully, sir.

Senator ALLOTT. Are you acquainted with the one in the Rangely area—the Dragontail project?

Captain MOORE. I have read something about it but I am not acquainted with all of them, Senator. I would rather not talk about them.

Senator ALLOTT. The only one that has been discussed here has been the Gasbuggy project, which is in a formation that is so tight that you could literally use this stone to sharpen your knife on, and the only point I want to make—and I am glad you point this out—is that we have not even scratched the surface in developing this, and that it is going to be a matter of years before we are able to do it.

You have also brought out at one point, I don't know whether I can lay my hands on it, about the control, conventional control, of producing oil by *in situ* retorting.

Does this not suggest the possibility that in formulating a lease policy in this area, the lease policy may have to be governed more, or the lease policy would have to consider—let's put it that way—the formation itself rather than the conventional land descriptions upon which we have formulated oil and gas leases?

Captain MOORE. If you mean, Senator, that burning the oil shale can't be controlled, from what I have read of technology, I don't think there is any question but what it can be controlled. From what I have read on this subject, what I was referring to is that it is not yet known that the burning in a—we'll say a capsule or in a chimney—can be controlled to make it efficient in that one unit.

I have not heard anybody express any great——

Senator ALLOTT. Let me put this question in another context for you. It is true that you can control the size and the length of a chimney by nuclear explosion, and this is the concept that is now being considered. But isn't it just as true that in considering such a concept, you may be also talking about leaving a great percentage of the oil available in the ground because the chimney will be roughly a circular pattern? So this brings me back to my question. We might have to consider the formulation of a leasing policy based upon formations and structures, rather than the conventional legal descriptions with which we have granted oil and gas leases.

Captain MOORE. I think that is true, Senator.

Senator ALLOTT. I am sure you will join with me in saying, that it would be unthinkable that we hurry hastily into any method of development which would leave large amounts of this valuable resource in the ground.

Captain MOORE. Certainly, sir.

Senator ALLOTT. I have heard it said, and I may have the wrong figure—perhaps you can correct me—that in general, over the United States, of the liquid petroleum formations we have tapped, we have had to leave about 25 percent, on an average, in the ground.

Is this approximately right or do you know?

Captain MOORE. I will ask one of my staff members.

I think it is low but I will ask.

Mr. Bowler says that, after secondary recovery, we leave about 25 percent in the ground.

Senator ALLOTT. So if we are talking about 600 billion barrels as the Secretary did earlier, it would be unthinkable that we would leave 150 billion barrels of that in the earth unrecoverable, untappable, unusable, if by thought and planning we could extract it in such a

way that we could lower that 150 billion barrels to 20 billion or 30 billion or 40 billion.

Captain MOORE. That is true, but there is going to be some loss in any method. Even the room and pillar method leaves a large percentage.

Senator ALLOTT. This is correct, but even in that particular method, it is now contemplated that they would go back and extract the pillars and utilize them.

But the point I am making is that I think it would be unthinkable if we barge ahead like a bull in a china closet without realizing that, in addition to the other conservation measures that we have to practice—water pollution held to the minimum, landscape despoilation held at a minimum—one of the other great conservation practices that we have to consider here which has not been mentioned this morning is the leaving of a valuable or a significant part of this in the ground. You would agree to this?

Captain MOORE. Yes, sir.

Senator ALLOTT. Thank you.

Captain MOORE. And, Senator, I emphasized it in my paper, but maybe not strongly enough. There should be more than one method of extraction. These 200-billion-barrel claims that the private operators have are on thin land and atomic explosions, I don't think, are ever going to extract these.

Naval oil shale reserves are on thin veins and maybe someday we will be able to extract oil from them with atomic explosions but there should be simultaneous——

Senator ALLOTT. Yes, and as a general rule, these do not lie in the richest deposits.

Do I understand from your statement, and I think I do, that the naval reserves do not extend into Wyoming?

Captain MOORE. No, sir. Colorado and Utah.

Senator Moss. The Senator from Wyoming, any questions?

Senator HANSEN. I don't have any questions. I just might observe that I share the concern of the senior Senator of Colorado in your stressing the importance of this leadtime.

I bring up very properly, I think, that if we are to have an industry developed that can assist us in times of national emergency the time is now to start work on that undertaking. We may well be deprived of the opportunity later on, and I would just like to commend you, sir, for stressing that point. I think it is most important.

Senator Moss. Thank you very much Captain Moore and gentlemen. We appreciate your coming before the committee and giving us this testimony.

Captain MOORE. Thank you.

Senator Moss. We will endeavor to hear one more witness before we recess the hearing.

John S. Kelly, Director of the Division of Peaceful Nuclear Explosives of the Atomic Energy Commission, will be our witness now.

STATEMENT OF JOHN S. KELLY, DIRECTOR, DIVISION OF PEACEFUL NUCLEAR EXPLOSIVES; ACCOMPANIED BY J. KEITH DAVY, ATOMIC ENERGY COMMISSION

Mr. KELLY. I have Mr. Davy, of my staff, with me.

Senator Moss. Mr. Davy, we are happy to have you.

You may proceed.

Mr. KELLY. I have a prepared statement which I will read if that is appropriate.

Senator MOSS. All right; if you wish to.

Mr. KELLY. Mr. Chairman, I am happy to appear before this committee today with respect to the Department of the Interior's five point oil shale development program announced by Secretary Udall on January 27, 1967. As you know, point four of that program involves the cooperation of the Atomic Energy Commission in research and development activities designed to investigate the capability of underground nuclear explosions to break oil shale for subsequent retorting in place. The AEC will be glad to continue its cooperation with the Department of the Interior in this very worthwhile undertaking.

The AEC has been working for a number of years with agencies of the Department of the Interior, primarily the U.S. Bureau of Mines, on studies and proposed applications of nuclear explosives for peaceful purposes as part of our Plowshare program.

These joint cooperative studies have been concerned with the potential of our developing Plowshare technology for utilization in increasing the recovery of this Nation's natural resources. We have been particularly concerned about such resources as oil, natural gas, and copper, which occur under conditions where conventional recovery methods are not economical or do not exist. One aspect of the jointly funded AEC-Interior research effort, which began in 1963, involves an attempt to determine whether nuclear explosives can be used to advantage in breaking up oil shale followed by restoring the broken shale in place. Results of these experiments are encouraging and lead us to believe that the use of nuclear explosives may provide an economical, efficient, and practical means for recovering and utilizing our vast, though latent, oil shale resources. These experiments have primarily involved aboveground retorting of suitable size material by the U.S. Bureau of Mines and site investigation and definition activities of the oil shale deposits with the U.S. Geological Survey and the U.S. Bureau of Mines. I will defer to the Department of the Interior as to the significance of the results of this work to date.

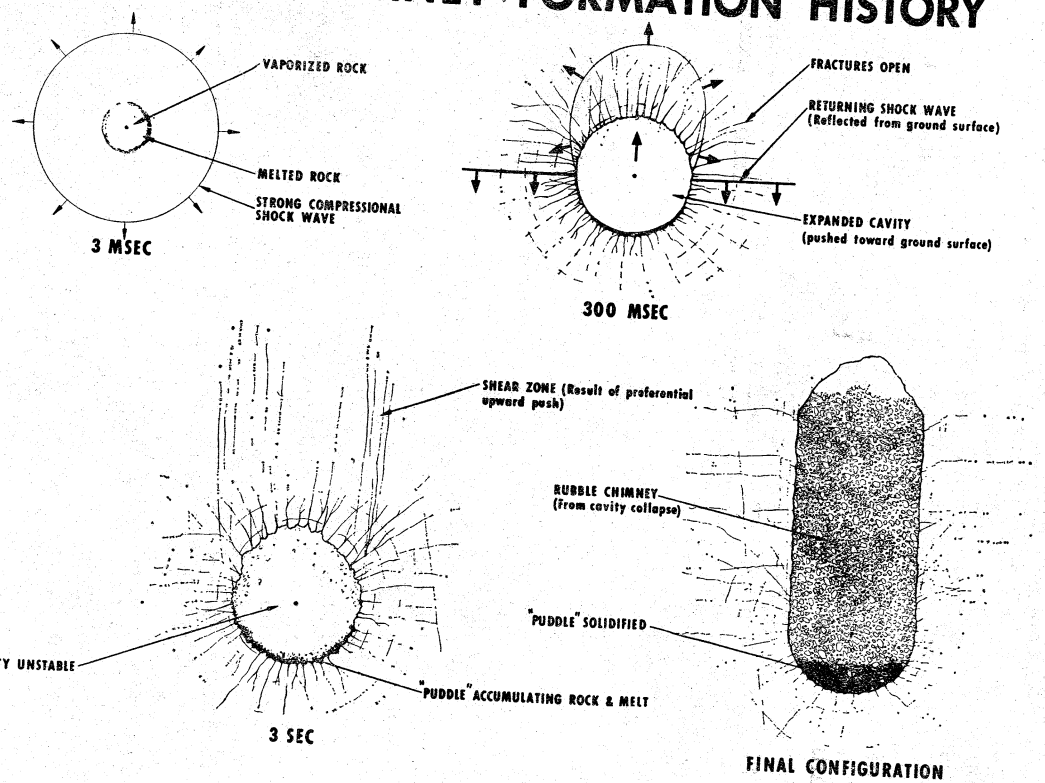
As you will recognize, the role of nuclear explosives in the development of a technology for the recovery of oil from shale is related to the ability to break and fracture large masses of rock. In short, the nuclear explosion acts as an underground rock crusher after which we hope that in-place retorting techniques can be applied and the resultant liquid oil pumped to the surface.

A nuclear explosion initially generates a shock wave, heat, and pressure which vaporize the rock to form a cavity that grows until the pressure inside the cavity equals that of the surrounding material. As the cavity growth stops and begins to cool, pressure inside the cavity decreases and the fractured rock, in most cases, begins to fall to the floor from the ceiling and walls, resulting first in the formation of a crudely hemispheric room. However, this spallation or collapse of the fractured rock continues progressively upward until a stable configuration is reached, usually in the form of a tall cylinder or chimney of broken rock.

I have a chart attached to this statement which illustrates these steps.

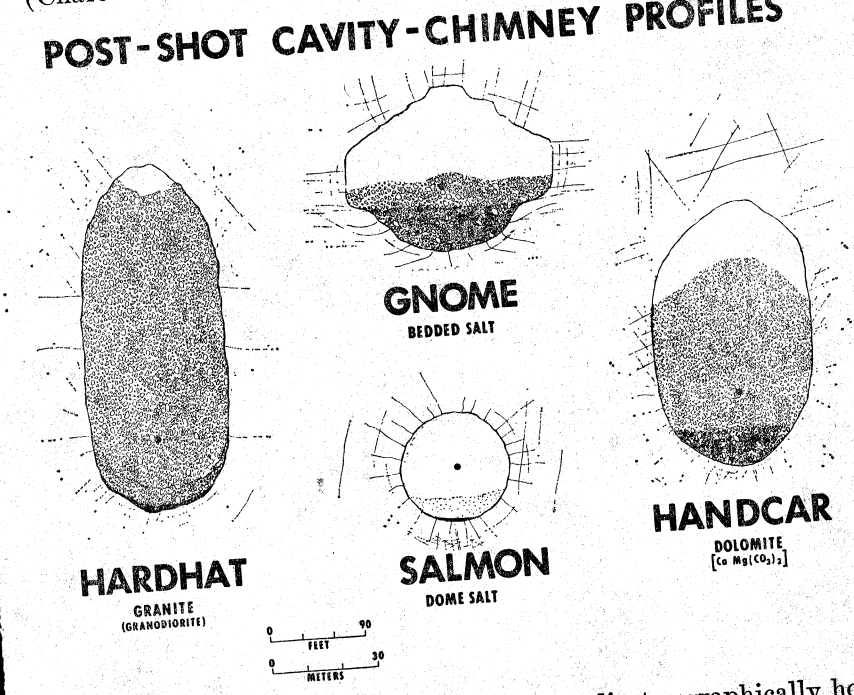
(Chart 1 follows:)

CAVITY-CHIMNEY FORMATION HISTORY



Mr. KELLY. The second chart depicts some of the resultant chimneys formed in different types of rock. The size of the chimney generally depends on the size of the explosion, the depth at which it occurs, and the kind of rock.

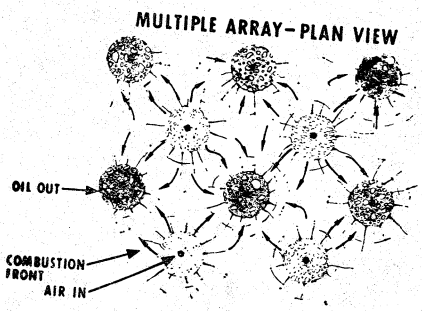
(Chart No. 2 follows:)



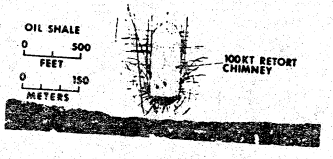
Mr. KELLY. I have another chart which indicates graphically how the nuclear in place retorting of oil shale might operate.

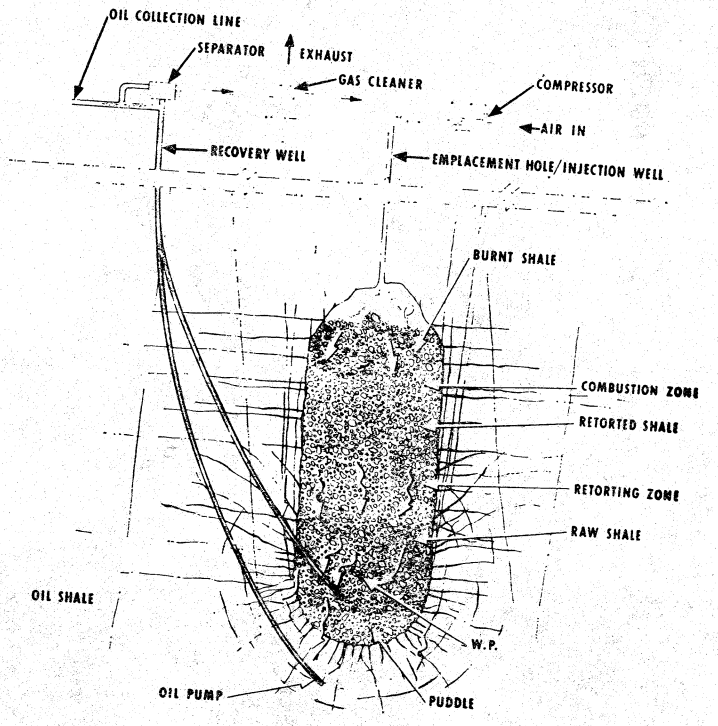
(Chart No. 3 follows:)

IN-SITU RETORTING-OIL SHALE



SURFACE RECOVERY PLANT





Mr. KELLY. It shows the chimney created by the nuclear explosion, the injection of compressed air necessary to support combustion, the advance of the combustion zone through the rock fragments which decomposes the kerogen and the recovery of the petroleum products at the bottom of the chimney.

The geological medium or rock type in which the explosion occurs is, of course, an important factor in determining what will result. There has never been a nuclear explosion to date in oil shale; however, we have conducted many nuclear explosions in several other types of rock and have successfully extrapolated the results from one type of rock to another. We have experience to date in six types of rock including alluvium (deposits of unconsolidated sand and gravel), tuff (cemented volcanic ash), salt, basalt (solidified lava flow), grandiorite (granite), and dolomite (carbonate rock). The latter is chemically similar to oil shale.

A seventh rock type in which we expect to gain experience soon is the gas bearing sandstone occurring in the pictured cliffs formation underlying the San Juan Basin of northwestern New Mexico where we plan to conduct Project Gasbuggy, which has been referred to earlier, in cooperation with the El Paso Natural Gas Co. and the Department of the Interior. The Gasbuggy experiment is a test of whether nuclear explosions can liberate large amounts of natural gas held in geologically tight underground formations which have a low permeability. Information obtained from Gasbuggy will be of considerable value to us in planning for a specific oil shale experiment utilizing nuclear explosives.

The staff of the AEC and the U.S. Bureau of Mines only very recently began a detailed feasibility study regarding the use of nuclear explosives in oil shale in connection with some 25 companies in the oil and gas and related industries represented by the CER Geonuclear Corp. of Las Vegas, Nev. A list of these companies is submitted for the record.

(The document referred to follows:)

COMPANIES CURRENTLY PARTICIPATING IN OIL SHALE COMBINE ORGANIZED BY CER GEONUCLEAR CORP.

Ashland Oil & Refining Co.
Atlantic Richfield Co.
Cameron & Jones, Inc.
Cities Service Oil Co.
Continental Oil Co.
El Paso Natural Gas Co.
Equity Oil Co.
Getty Oil Co.
Humble Oil & Refining Co.
Marathon Oil Co.
Mobil Oil Co.
Murphy Oil Corp.
Pan American Petroleum Corp.
Shell Oil Co.
Sinclair Oil & Gas Co.
Sohio Petroleum Corp.
Sun Oil Co.
Superior Oil Co.
Tenneco Oil Co.
Texaco, Inc.
The Cleveland-Cliffs Iron Co.
The Oil Shale Corp.
Union Pacific Railroad Corp.
Western Oil Shale Corp.
Wolf Ridge Minerals Corp.

Mr. KELLY. It is expected that the feasibility study report can be completed and a report published later this year. Such a report, when completed, may form the basis for any formal proposal the CER combine would wish to make to the Government. In the event such a proposal were made, a very precise evaluation of the technical, safety

and other factors of a specific project would be undertaken by the Department of the Interior, the AEC, and AEC contractors, including the Lawrence Radiation Laboratory at Livermore which is operated by the University of California.

I would like to thank you for this opportunity to appear to discuss the AEC's Plowshare program as it relates to the oil shale industry. I will be happy to try to answer any questions you may have.

Senator Moss. Thank you, Mr. Kelly, for your very fine paper and illustrations attached to the mimeographed copy which gives an explanation.

Secretary Udall said that in his opinion the question of using nuclear explosives for retorting oil shale *in situ* was in the early planning stages. Is that about the way you would describe it?

Mr. KELLY. Yes, sir; I think that is a very apt description of the status.

Senator Moss. I understand from your statement there has not actually been any underground test made at all in oil shale rock.

Mr. KELLY. That is correct. We have fired in six other types of rock but not in oil shale.

Senator Moss. The only real experience you have is to extrapolate from one type of rock over into the type that contains the kerogen; is that correct?

Mr. KELLY. That is correct.

Senator Moss. Is the rock generally quite dense in which kerogen occurs or does this vary?

Mr. KELLY. Yes. I believe that would be categorized as a dense rock compared to some of the ones that we have conducted tests in.

Senator Moss. The Senator from Colorado was commenting that the rock in which Gasbuggy project is being worked is very tight, a very dense type of rock. Is this more dense than the kind that we find in the oil shale area?

Mr. KELLY. I would guess that they were comparable but I would have to look this up and give you a more precise answer.

(The information requested appears on p. 71.)

Senator Moss. Has there been any determination yet made as to where the location would be for the first actual test of an underground explosion in oil shale?

Mr. KELLY. No site has been selected. This is something that has been discussed and some criteria have been developed for what would be an appropriate site but no particular point has been selected.

Senator Moss. Has there been enough advance discussion or planning from which you can give us any rough kind of timetable when you would expect that you could carry out the first experiment?

Mr. KELLY. Well, I think that Secretary Udall's estimate of 2 to 3 years is probably pretty good. It depends a little bit on how the results of the Gasbuggy experiment turn out which we hope to conduct next summer or early fall.

It depends also on how fast the industry wants to go, and a host of problems like this that we can't accurately anticipate.

Senator Moss. But this is under active work by the AEC now. You are actively working on this, developing the plans for this test——

Mr. KELLY. Yes, sir.

Senator Moss (continuing). Of *in situ* retorting.

Mr. KELLY. Let me say the nuclear explosion merely crushes the rock and the *in situ* retorting is an operation that follows the nuclear explosion.

Development of the retorting process is primarily being done by the Bureau of Mines.

Senator Moss. Would the same energy that fractures the rock and develops the chimney also furnish the heat that would extract the kerogen from the fractured rock?

Mr. KELLY. No, sir.

Senator Moss. That has to come in addition to this?

Mr. KELLY. There is tremendous heat released by the nuclear explosive. The temperatures are far too high for retorting and they are far too localized for retorting.

What probably would be done is to actually locate the explosive below the shale formation so that the heat energy would be expended in inert rock and allow the chimney to progress up through the shale and then to artifically, probably chemically or electrically, ignite the heavy carbon fractions and inject oxygen to sustain the combustion for retort.

Senator Moss. Thank you.

The Senator from Colorado.

Senator ALLOTT. I have two or three areas I would like to ask you about, Mr. Kelly, if I may.

The first relates to the formation in the Piceance area. It is my understanding, I am sure I am correct about this, that in the tests in that area, they have run across large amounts of water which are saturated with sodium bicarbonate or baking soda as it is ordinarily called.

Isn't it a fact that these are more susceptible than ordinary water to the absorption of nuclear activity?

Mr. KELLY. I don't know the answer to your question right offhand. I don't know of any reason why they should be, but I think this is something I would have to ask one of our laboratory people about.

Senator ALLOTT. I wonder if you would do that?

Mr. KELLY. Yes, sir.

Senator ALLOTT. And supply a short statement for the record.

(The information requested is printed on p. 71.)

Mr. KELLY. Yes, sir.

Senator ALLOTT. Assuming this is true—and I have been told that it is, that sodium particles are more apt to absorb the effects of radiation than ordinary water—but assuming this is true, have you considered the effect that such an explosion would have upon underground streams?

Mr. KELLY. Yes, we have. Let me go back to your question on the sodium a moment ago.

What you may have been referring to is the fact that sodium 24 is a highly radioactive substance and ordinary sodium, if bombarded by neutrons, would be artifically transformed into sodium 24 which is radiocative. If one fired a nuclear detonation in such water so that the neutrons reached the sodium in the water, you could artifically activate that sodium and make it radioactive.

However, in no case would one fire a nuclear detonation in water. You have to arrange the detonation, its point of explosion, under conditions such that it would not reach the water, and I believe that one can do this by judiciously selecting a detonation site.

Senator ALLOTT. Roughly what temperature would be generated at the source of the explosion?

Mr. KELLY. Oh, the initial temperature released by a nuclear explosion is in the order of a few million degrees.

Senator ALLOTT. Two?

Mr. KELLY. A few.

Senator ALLOTT. A few million? Fahrenheit or centigrade?

Mr. KELLY. Either one. It would be high enough that it would be in the range of several millions Fahrenheit or about half that by centigrade.

Senator ALLOTT. All right.

On chart 1 you envision a typical double chimney and what would you envision the height of that chimney to be?

Mr. KELLEY. Well, that depends on the type of rock, the depth of burial.

Senator ALLOTT. We are talking about shale.

Mr. KELLY. All right.

Senator ALLOTT. I am only talking about shale.

Mr. KELLY. I guess one of the experiments that has been conducted which is fairly similar to this shale, in at least its physical characteristics, was a shot in granite and it was 5 kilotons and the point of detonation if I recall correctly was about 900 feet underground and in that case the chimney height was about 300 feet.

Senator ALLOTT. Well, I am not trying to trap you, but I am sure you see the point I am making which is that if you fired this, even under the oil shale bed, and your explosion reaches into areas with soda water, you take a chance of contaminating that particular supply or source of water.

If that water is not in a closed basin and later reaches a major drainage area, then you are dabbling with the prospect of contaminating water supplies.

Has this been given any thought?

Mr. KELLY. Yes, sir. If you notice on that same chart, down at the very bottom of that chimney there is a very dark area, and most of the radioactivity that is produced by the nuclear detonation winds up in an insoluble fused rock. It is imbedded in the fused rock which collects at the bottom of the chimney, and so even if water after the fact somehow got through there, the radioactive materials in this fused rock zone would not be readily available to the water.

There is some small amount of radioactivity, mostly in the form of gases and very small particles that would permeate the chimney.

If water got into that, these particles could be picked up and to some extent follow the flow of water. One would have to be extremely careful so as to prevent a flowing water source from passing through this chimney or, in other words, be very careful to make sure the chimney did not extend into an underground acquifer.

Senator ALLOTT. The very area we are talking about that has been discussed most this morning as a possibility for nuclear test is ex-

actly this kind of a site where you do have underground waters of considerable volume, and I just want to raise these questions because other people will ask them.

Have you given consideration as to what might happen when you expose a large amount of oil shale to heats of several million degrees, whether it is Farenheit or Centigrade, containing a large amount of hydrogen, as to what effect this would have upon the force of your explosion?

Mr. KELLY. Yes, sir. This has been considered and in fact we did an experiment on our test site, the Handcar experiment in November of 1964, and our carbonaceous rock with some of those kinds of elements just to make sure that there were no extraneous effects such as a hydrogen explosion.

I might point out that the very intense temperatures only occur in a very small zone, the inner circle on this upper left hand figure of my chart 1, which only extends out for a few meters.

Senator ALLOTT. In your dolomite explosion, using that as an example, on chart 2, what was roughly the cross section of your rubble structure? What would be the diameter of it?

Mr. KELLY. This is Project Handcar. Its dimensions across are roughly 140 or 150 feet and its height is roughly twice that.

Senator ALLOTT. Now, moving on to your third chart which very graphically displays the method your propose to utilize—your multiple array with your various explosions with holes drilled for air injection—this is very similar to the method that was employed in Spain or Sweden for the extraction of oil from oil shale, there where holes were drilled close to each other and artificial heat units were introduced into the bottom of the hole and the oil was pumped out of another hole.

Are you acquainted with that method?

Mr. KELLY. Not with those particular ones in Spain.

Senator ALLOTT. I am not sure whether it was Spain or Sweden.

Mr. KELLY. I know there has been a fair amount of this kind of research going on; yes, sir.

Senator ALLOTT. I think that is all I have, Mr. Chairman.

Senator Moss. The Senator from Wyoming; any questions?

Senator HANSEN. I am quite impressed with the problems that you have been discussing, Mr. Kelly.

I was just wondering if you have any idea when Projects Rulison and Dragontail will be budgeted and what you think they should be budgeted for?

Mr. KELLY. Well, Dragontail and Rulison are both gas stimulation type projects similar to Gasbuggy as opposed to oil shale.

I think the budgetary problem is one that depends in part on how much it turns out when you get the Dragontail proposals and Rulison evaluated as to how much the cost is, for the Government part of it. If it is relatively small you probably can get it soon. If it is larger, it is going to come later.

Senator HANSEN. What is the status of the cancellation or the deferral of the present Plowshare projects in Nevada?

Mr. KELLY. Well, that was a cratering shot designed for the development of a nuclear excavation technology for digging canals, highway cuts, harbors, and that sort of thing.

I don't think its deferral should be related or would be related to these kinds of things. In that cratering situation one does break the surface of the ground. Fairly significant amounts of rock are thrown into the air and accompanied by some small amounts of radioactivity, and this, of course, is a much more controversial process than the gas and oil applications in which it is not contemplated that the surface of the ground would be broken at all.

Senator HANSEN. In your mind, then, this will not inhibit or hold up any future development insofar as the oil shale is concerned?

Mr. KELLY. Yes, that is right. These are quite different and they are much less controversial and there are fewer reasons for deferring this sort of thing than there would be in the excavation type.

Senator HANSEN. I was interested in some of the testimony—I have forgotten whose now—this morning to the effect that it was not yet known what effect an atomic explosion might have on the recovery of these other associated minerals, such as dawsonite. I noted that the Secretary said quite forthrightly that in his opinion the Peceance area in Colorado would be the logical place for an atomic explosion.

Do you think that it might be indicated that a little testing some-place else where dawsonite was not associated with the oil shale would be indicated in order to see if this type of approach would serve to help in the recovery of a lot more shale without disturbing the miner-. als that might be adversely affected insofar as their recovery is con-cerned by an atomic explosion?

Mr. KELLY. Offhand I would think so, sir. We clearly support the Secretary's objective of trying to develop technology for recovering the kerogen and the dawsonite and I don't know that the two are in-compatible.

On the other hand, I don't know that they are not, either.

Senator HANSEN. Thank you, Mr. Chairman.

Senator Moss. I have just one more question.

Do you have one more, also, Senator Allott?

Senator ALLOTT. In the Gasbuggy situation I understand, of course, that the actual control of the explosive would be entirely under the Atomic Energy Commission.

Mr. KELLY. That is correct.

Senator ALLOTT. Do you know to what extent the Department of the Interior controls the rest of the experiment or is that under the control of the private companies who are financing it?

Mr. KELLY. Well, the Atomic Energy Commission has the respon-sibility of conducting the detonation and for assuring that it is done safely and that sort of thing. The Department of the Interior rep-resents the Government on evaluation of the gas formation and the change that takes place in it.

Of course, the industry likewise, for that is the part they are really interested in, too.

Senator ALLOTT. Well, I will ask the Department of the Interior that question.

Mr. DAVY. I would like to say, sir, that they do have control as a signatory to the contract; there is a division of work or labor, as you might say, which gives the Department of Interior a very substan-tive roll in this project.

We feel that the Government must have, on its own, not through someone they contract with, the ability to receive and then analyze the data. So I think the answer to your question, sir, is, Yes, the Department of Interior has a role wherein they will provide the reservoir evaluation and provide the expertise, as it were, with regard to the oil and gas business and we will try to provide the expertise as far as the nuclear explosive is concerned.

Senator Moss. I wanted to ask one question about the probability of radioactive contamination of the oil that is ultimately extracted in this *in situ* process.

Mr. KELLY. Having never actually done the experiment, it is hard to be very definite about this. Our theoretical analysis and studies do not indicate any way that the radioactivity would become intermixed in the oil.

As I indicated earlier, most of the radioactivity would be collected in the form of fused rock at the bottom of the chimney which would probably be located outside of the Kerogen bearing area.

The small amount that is distributed within the chimney is in the voids and floats around and when one is burning the rock, and burning the carbon fractions in the rock the liquid vapor comes out and it is not clear that these airborne gases in the voids would mix with that oil at all. If they did, certainly there are ways that they could be separated and taken out.

Senator Moss. Thank you, Mr. Kelly and Mr. Davy. We do appreciate your coming here and giving the Committee the benefit of your testimony.

You see the Senator from Wyoming, the Senator from Colorado, and the Senator from Utah stayed right on to listen to all of this.

(Following the hearing the following additional information was received from Mr. Kelly:)

ATOMIC ENERGY COMMISSION,
Washington, D.C., March 1, 1967.

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

DEAR MR. VERKLER: During the hearings on February 21 and 22, 1967, regarding the Department of Interior's five-point oil shale development program, I agreed to submit further information in response to questions I was asked following my prepared testimony.

Senator Moss inquired as to whether the rock in which it is planned to conduct the Gasbuggy project is more dense than the kind of rock found in the oil shale area. I answered that I thought they were roughly comparable, which is in fact correct. Generally, the bulk densities of the rock in both areas ranges from 2.2 to 2.4 grams per cubic centimeter. The bulk densities of some of the types of rock in which we have already conducted nuclear explosions are as follows: Granite and Dolomite, 2.7; salt, 2.2; Tuff, 1.85; and Alluvium, 1.7. Also, the Committee may be interested in noting, as pointed out by an official of the U. S. Bureau of Mines, that although density is partly a function of porosity, it is also a function of the type of minerals or other substance composing the rock. Rather than density, it is the porosity and the permeability that affect the flow and storage of fluids. The Pictured Cliffs sandstone (Gasbuggy) has an average permeability of 0.14 millidarcy, and an average porosity of 11 percent. The Green River oil shale has a porosity and permeability so small that it cannot even be measured accurately.

Senator Allott raised the possibility that sodium in the groundwater in the Piceance area might be more susceptible than ordinary water to the absorption of nuclear activity. Sodium in the water should not present a special problem

since in the oil shale application it is our intent to design the experiment (Project Bronco) so as to minimize the probability of getting radioactivity into the overlying aquifers. It will be necessary, of course, to determine the competency of the rock between the shot point and the aquifer, and to understand the local hydrology. Our only similar experience was in our Gnome experiment in December, 1961. Gnome was a 3-kiloton nuclear explosive detonated in a salt formation 1,200 feet beneath the earth's surface, about 25 miles southeast of Carlsbad, New Mexico. The groundwater above the salt formation was high in salt content, but no radioactivity was detected in the groundwater following the shot (ether from neutron activation or leakage from the cavity) because of the surrounding competent medium.

With regard to water contamination, it is perhaps useful to note the Atomic Energy Commission's experience with groundwater at our Nevada Test Site (NTS) where hundreds of underground nuclear explosions have been detonated. The NTS groundwater provides the water supply for approximately 7,000 AEC and contractor personnel who daily live and/or work at the Site. Water use includes drinking, cooking, washing, and all normal pursuits for which water is necessary. Radiation levels of the water are low enough so that contamination is not a problem.

Finally, with regard to another question of Senator Allott as to the extent the Department of Interior controls the non-nuclear portion of the Gasbuggy project, I am enclosing a copy of a letter to the AEC dated December 1, 1966 from the Secretary of the Interior.

Thank you for the opportunity of providing this further informaiton for the record.

Sincerely,

RICHARD HAMBURGER,
JOHN S. KELLY,
Director, Division of Peaceful Nuclear Explosives.

[Enclosure]

DEPARTMENT OF THE INTERIOR,
Washington, D.C., December 1, 1966.

Dr. GLENN T. SEABORG,
Chairman, U.S. Atomic Energy Commission,
Washington, D.C.

DEAR DR. GLENN SEABORG: Field work will begin soon on Project Gasbuggy, a joint Government-industry experiment to determine the feasibility of using nuclear explosives to stimulate production of natural gas from a reservoir of low productivity in the San Juan Basin, which has been approved by the Congress. Therefore, it is appropriate to clearly define the roles of the Department of the Interior in relationship to the Atomic Energy Commission.

As you know, there has been an active cooperative effort over a period of many years between the Atomic Energy Commission and agencies of the Department of the Interior, especially the Bureau of Mines and the Geological Survey. This cooperation has been especially active during the past few years in Plowshare applications research. Because of this, in July 1964 the Bureau of Mines was designated as the coordinating agency within the Department and was given the responsibility to conduct liaison with organizations outside the Department on all matters pertaining to Plowshare projects involving hydrocarbon production or storage. The proposed Gasbuggy experiment certainly will concern the Bureau of Mines, the Geological Survey, the Bureau of Land Management, the Bureau of Indian Affairs, and the Office of the Solicitor. Perhaps other Departmental agencies also will be affected.

We visualize the respective roles of the various Departmental agencies in the proposed experiment as follows:

The Bureau of Mines will continue to coordinate work within the Department and to conduct liaison with agencies and organizations outside the Department. In addition, the Bureau's technical personnel will participate actively in pre-shot and post-shot natural gas reservoir evaluations.

The Geological Survey will continue to provide geologic and ground-water hydrologic services and, with the Bureau of Land Management, assist in matters pertaining to use of Federal lands for the experiment. The Office of the Solici-

tor and other agencies will provide such review and assistance as may be necessary.

It has been a pleasure to work actively with the Atomic Energy Commission and its contractors, such as Lawrence Radiation Laboratory, on Plowshare research and we are looking forward to continuation and intensification of that cooperation. We hope that you concur with the areas of responsibility suggested herein and shall be pleased to receive your comments.

Sincerely yours,

STEWART L. UDALL,
Secretary of the Interior.

We will recess the hearing now and it will be resumed at 10 o'clock tomorrow morning.

(Whereupon, at 12:40 p.m., the committee was adjourned, to reconvene at 10 a.m., February 22, 1967.)

FEDERAL OIL SHALE PROGRAM

WEDNESDAY, FEBRUARY 22, 1967

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

The committee met, pursuant to recess, at 10:03 o'clock a.m., in room 3110, New Senate Office Building, Senator Frank E. Moss, presiding.

Present: Senators Jackson, Moss, Burdick, Allott, Jordan of Idaho, and Hansen.

Also present: Jerry T. Verkler, staff director; Stewart French, chief counsel; James H. Gamble, professional staff member, and Darryl A. Hart, assistant minority counsel.

Senator Moss. The committee will come to order. We will continue with our hearing on the proposal of the Secretary of the Interior for the development of our oil shale resources.

Our first witness this morning is Joseph L. Fischer, chairman of the Oil Shale Advisory Board to the Secretary of the Interior and president of Resources for the Future.

We are pleased to have you with us, Mr. Fisher, and you may go right ahead, sir.

STATEMENT OF JOSEPH L. FISHER, CHAIRMAN, OIL SHALE ADVISORY BOARD TO THE SECRETARY OF THE INTERIOR, AND PRESIDENT OF RESOURCES FOR THE FUTURE, INC.

Mr. FISHER. Thank you very much, Mr. Senator.

I am very pleased to have this chance to present my views on certain aspects of oil shale development policies, particularly the recent five-point program set forth by the Secretary of the Interior. I served as chairman of his Oil Shale Advisory Board, which made an interim report to the Secretary in February, 2 years ago. I must add, Mr. Chairman, that since that time I have followed oil shale questions only in a general way and, therefore, I am not up-to-date on the very latest technological, legal, and other developments.

I did notice that in a recent issue of Oil & Gas Journal, after noting that our Oil Shale Board had not helped very much, it did say this: "Udall ended up adopting something like the middle ground espoused by the Commission Chairman."

I think that is an accurate statement.

Although certain differences among the Board members were clearly revealed in the report, our Oil Shale Advisory Board did find good consensus on a number of important matters including these: Careful protection of land, water, wildlife, and scenic resources in the oil shale

country; prevention of speculation and windfall profits from commercial development of the resource; encouragement of competition in the development of oil shale and associated minerals; and assurance that Government, at appropriate levels, would share properly in any revenues that resulted. I continue to believe that these, along with the development of the oil shale for future use of the American people, are the essence of the public interest in the resource. Therefore, I was pleased to note that the Secretary of the Interior reiterated these points in his release of January 27, this year, announcing the five-point program.

The difficult and undoubtedly the most controversial part of the Secretary's program, I believe, is his third point dealing with contracts and lease arrangements for research and development and for subsequent commercial-scale development of oil shale. I want to spend my few minutes talking about this third point. This is the point that Senator Allott went so quickly to in the hearings yesterday as the most difficult part.

This was also the matter over which the Oil Shale Advisory Board split and on which its several members expressed their individual opinions in the interim report issued 2 years ago. Generally speaking, the Board members were arrayed across a spectrum from those who wished to get on rapidly with commercial development of the industry to those who wished to postpone that until much more could be learned through research and development activities rather closely supervised by the Federal Government. My own position has been characterized as being somewhere near the middle and I think this is a reasonably accurate statement.

Throughout I have thought that we should move toward an active development of the oil shale industry, with careful safeguards for conservation and other elements of the public interest, so that this great resource could make its contribution to the American economy and the well-being of all Americans. I still envisage two stages: first, a period of imaginative and intensive research and pilot plant experimentation in the mining, handling, and retorting of the shale; and second, a controlled entry into commercial scale development of the industry under private auspices. This seems to be rather closely in line with what the Secretary has now proposed in his third point.

The first research and development phase can be undertaken through contractual arrangements between the Government and private companies or it might be done by granting the private companies permits or research and development leases on small tracts of public land for limited periods of time for specific research and development work, and certain types of research might be done advantageously by the Government or jointly by Government and private companies.

There should be, of course, performance requirements and, even in the small scale research and development phase, careful protection from the conservation and local community viewpoints. The primary object this research and development phase should be to open up the possibilities for development. Underground *in situ* techniques should be given special attention because of the inherent advantages of doing the crushing and retorting underground without disturbing the topography. Use of nuclear explosions to fracture the rock under-

ground and perhaps even provide the heat for extracting the liquid kerogen is one possibility that ought to be explored. The prospects of mining and utilizing the aluminum-bearing dawsonite, which is associated with kerogen shale, should also be probed thoroughly.

The second phase—still dealing with point No. 3 of the five-point program—would be the firming up and would follow the research and development phase. This would involve the leasing of tracts of oil shale land of adequate size to support commercial size operations, still with greatest care taken to preserve the various elements of the public interest which I discussed earlier.

In fact, the studies relating to water supply, disposal of overburden, effects of mining operations upon wildlife, scenery, and wilderness, community problems of all sorts, and other matters should be analyzed well ahead of the beginning of commercial development. Also commercial development should be approached in such a way that no competent enterprise would be excluded from trying to obtain a lease and get into the business. There would be an advantage for those companies which already had undertaken research and development activities; they would have the experience on which the Government, to a considerable extent, would have to rely before actually leasing any of the public lands. In my statement in the Interim Report of the Oil Shale Advisory Board I went further than this and said that some advantage might be given to companies undertaking research and development in the ultimate leasing of commercial-size tracts so as to encourage competent firms to come forward and do the necessary and antecedent research and development. One way of achieving this would be to announce well ahead of time that the Government would expect to offer for lease bids a few commercial-size tracts as soon as the research and development phase indicated that this second step would be warranted, and that it would limit the first round of bids to companies that had actually undertaken significant research and development work. This is an attempt to address my remarks to what I think to be the vital point raised by Senator Allott and characterized by the Secretary as the ripening of research and development into commercial scale activity. I think this is at the very heart and center of the problem we face.

Well ahead of the second phase of commercial-size leasing the Government should make clear the conditions that would be attached to the leases. The Government should also be in good communication with those industrial firms, whether from the oil industry or some other industry, that are interested. In particular, the conservation requirements should be made explicit as early as possible. The royalties that would be collected by the Government on each barrel of oil produced obviously would be a matter of great importance, as would the level of taxation that would bear on the producers. Precedent exists on these points for both onshore and offshore oil leases on public lands, and in the matter of depletion allowances for tax purposes. It is not entirely clear, to me anyway, at what point in the mining-processing continuum the value of the product for depletion allowance purposes would be calculated nor what its level would be. This should be straightened out well ahead of time.

Regarding the other points in the Secretary's program, I have little to add. Obviously the sooner the clouded claims difficulties are

settled, the better. The "blocking-up program" makes good sense to me. Clearly the several bureaus in the Department of the Interior that would be concerned will have to have the funds and capacity to develop the basic information that will be required and to work up the conservation and other requirements that would go along with any lease program.

In conclusion, I believe that the five-point program is a good one at this stage. It is recognized, of course, that a careful mixture of clarity and firmness on one hand with flexibility and reasonableness on the other, will be necessary. The two-phase approach, first of research and development and then later of commercial scale development, seems best to me in terms of conservation of land and water resources in the oil shale region, in terms of assuring the public adequate returns on its property, and in terms of making it possible for private enterprise to get on with developing the resource in an orderly way.

Thank you.

Senator Moss. Thank you, Mr. Fisher. This discussion of the two-phase development is, of course, the heart of this present inquiry, I believe. At least it is one of the sticky points about which we must make some decisions.

Mr. FISHER. Yes, sir.

Senator Moss. Your suggestion that perhaps we should have private companies take a lease on a small section and do the research and development work and then be eligible to bid on a larger commercial block of land sounds reasonable. I am wondering how the eligibility might be made sufficient by elastic. Suppose a private company, in doing its research and development work spent $10 million, another one did research and development work, and only spent $1 million. Do they have a varying eligibility then in bidding for the larger block later?

Mr. FISHER. Well, this would be a hard administrative determination and I do not have an answer to it. It is a problem. I would think there would have to be some cutoff point expressed in terms of research and development money spent or results achieved and any company that had done that or more would be given a special leg-up on the commercial leasing.

Senator Moss. In any event, the point is an intriguing one. I think, obviously, the way to induce private industry investment and know-how is to give them a degree eligibility so that there is a possibility of recovery of investment once the process has been perfected. How to get to it is the thing that I am still turning over in my mind.

Mr. FISHER. Yes. I do not see it clearly in administrative terms either. I could imagine a minimum figure in terms of research and development money spent. It is conceivable, I suppose, that any company might be allowed to engage in the lease bidding but a percentage preference would be given to those who had done a certain amount of research and development and, I think, in the end it would have just to be an administrative determination of what that minimum amount would be which would qualify a company for what I called a moment ago the leg-up advantage.

Senator Moss. Do you envisage the possibility that there might be a company now or in the near future which felt that it had done research and development work already and was not prepared to move right into phase 2 and, therefore, should they be able to proceed into phase 2?

Mr. FISHER. I am not knowledgeable sufficiently of what the different companies may have been doing in the last couple of years, particularly, really to answer that question. I think time would have to pass in any event so that the Department could work out and be reasonably sure of the kind of conservation and other conditions it would want to specify in any leasing. In the interim, even those companies that have made what they would regard as good progress in research and development might want to continue.

Senator Moss. I take it, from your testimony, that although you caution that all safeguards must be developed on conservation and these other matters, that nevertheless you think the time is here to be pushing ahead with the development of the processes for the extraction of oil from oil shale?

Mr. FISHER. Yes. I think the five-point program is a good one and will move us forward toward a sensible development of what potentially is just a tremendous resource for the American people. And I would, myself, wish us to be somewhat more positive, even aggressive, than we have been in the past, but never forgetting the safeguards that will have to be brought forward and made a part of the development.

Senator Moss. Thank you. I do appreciate your testimony and we all appreciate your fine service as Chairman of the Oil Shale Advisory Board. It is valuable, indeed, to have your counsel before this committee. Some of the other Senators may have some questions. Senator Allott?

Senator ALLOTT. Yes, thank you.

Mr. Fisher, I would like to ask you about your thoughts on this: The Secretary made five points in his announcement, the first being the action to clear title, the second the blocking-up program, the third, the provisional development of leases, the fourth, *in situ* retorting, and the fifth, governmental research. Now, looking forward to the future as development of oil shale becomes a viable part of our economy, can you see, even if we proceed at a rapid pace, any possibility of the creation of a going oil shale industry in the next year?

Mr. FISHER. Well, no, I cannot really see it within the next year.

Senator ALLOTT. The point I want to make is, I think that at the very, very best we are looking ahead 3 to 5 years under the most absolute favorable circumstances, are we not?

Mr. FISHER. I would think so; yes.

Senator ALLOTT. So that we should not take anything in your statement to mean that there should be any letdown or slowing down process in going into these five points that the Secretary has suggested here, because, even if we go into these five points full blast, we are still several years away from a viable industry.

Mr. FISHER. That is my belief; yes.

Senator ALLOTT. I wanted to be sure that it was, because I think this is true.

Now, I do agree with you that no competent enterprise, as you say on page 3, should be excluded from trying to obtain a lease and get into the business. Then you qualify that or make a suggestion as to those who are undertaking research and development. I would just suggest there that the amount of money invested in such research and development might not necessarily by the sole criteria for preference.

Mr. FISHER. There might be others; yes.

Senator ALLOTT. There might be others. In other words, I think the experience and what they have been able to develop might be the real criteria rather than the amount of dollars that have been spent. The Government, for example, is notorious in spending lots of dollars and coming up with very little, as you know.

What in your opinion, and I am exploring your ideas, would happen to a company, for example, which did not do its experimental work on Government property but rather did its research and experimental work on its own property? Would it be given an equal opportunity with the company or companies that had done their work on Government porperty or in conjunction with a Government contract for research?

Mr. FISHER. Well, we are probing the heart of the matter and these are just my reactions as you ask the question.

Senator ALLOTT. Yes, I am just probing your mind to find out what you are thinking about.

Mr. FISHER. Well, my own preference, as we are discussing it, would be not to penalize companies in any way that have made good research and development progress on their own properties, that this is as valid and as important as what might be done by another company on Government properties, and therefore, indeed, such work on the private land ought to be encouraged to the full.

Senator ALLOTT. Then, in your thinking, in getting additional leases or developmental leases, they should roughly stand in the same situation?

Mr. FISHER. Yes.

Senator ALLOTT. Dependent upon what they really have accomplished in their own field.

Mr. FISHER. That is right.

Senator ALLOTT. Would you be thinking somewhat in terms of a two-stage leasing program in which a preference would be given to those companies which have already developed, either on their own property or privately, methods of extraction and so forth, as compared to those who have done it on Government property and then perhaps in the second stage opening it up further to other companies which have not done this?

Mr. FISHER. Yes. That expresses more clearly what I had in mind in my statement, when I said that the first round of bids for the first year or two, or something like that, the bidding would be limited to those companies that had done significant research and development work on their own property or on Government property, conceivably elsewhere in the world. But the point of this is to draw companies with good research and development capacity from whatever industry into the research and development phase. I think in order to do that, one has to bait the hook to some extent and give them at least some

reasonable advantage in the subsequent phases of development of industry.

Senator ALLOTT. Well, I assumed this was perhaps an implication to be derived from your statement. I also assume, from your statement, that you would agree with me that Federally owned oil shale is a resource that should not be opened up merely for speculation.

Mr. FISHER. Absolutely.

Senator ALLOTT. I read the papers from time to time and in them I see advertisements to participate in valuable Government oil and gas leases. You would not, I take it, favor a situation in which just leases could be taken and then interests in them advertised for resale in small blocks or something like that merely for speculation? You are thinking only in a developmental sense, are you not?

Mr. FISHER. That is correct.

Senator ALLOTT. Now, just one other point that I would like to explore briefly with you. There was an error made in the record yesterday by one of the witnesses, that a bill introduced by Congressman Aspinall sought to change the depletion allowance for oil shale, and you say it is not entirely clear at what point in the mining processes continuum the value of the product for depletion allowances purposes would be calculated nor what its level would me. The last bill introduced by Congressman Aspinall and the last bill introduced by me S. 932 in the last session—I have not reintroduced it yet this year, I will—did not change the depletion allowance for shale. It was still left at 15 percent and I think the record ought to be made perfectly clear in view of the obvious indication of the testimony yesterday.

The purpose of these bills is to move the application of the point of depletion from the raw shale as it comes out of the ground, and that is what the Federal statute provides now, over to the point of the first retorting. Of course, this is not a law yet but obviously the value of the raw oil shale ore is minimal and a depletion allowance applied there would be sort of inconsequential. It is not like sand or gravel which immediately upon extraction has a value by itself and when it is used that way, but rather applied to the first retorting. Is this in conformity with your thinking?

Mr. FISHER. I have not myself gone deeply into this question. My understanding, too, is that at present the allowance is 15 percent on the—I guess the crushed shale—but before retorting. I think the only point I would like to make here is that in this interim period you estimated at perhaps 3 to 5 years it would be highly desirable for this matter to be either left as it is or changed or made clear through the bill or in some other way so that the companies interested in major investments in the industry would know what they were dealing with by way of depletion allowance.

Senator ALLOTT. Well, I agree with you, but I am sure you, with your last statement, would also agree that there is a vast difference between the application of a depletion allowance at the time the shale comes out of the mine or is crushed and the time it goes through the first retorting, and it makes a completely different picture as far as the creation of a viable oil shale industry is concerned.

Mr. FISHER. Probably more significant than the percentage.

Senator ALLOTT. Probably so.

Mr. FISHER. And, if I may add this, if the *in situ* process succeeds, just offhand it would seem to me that the percentage of depletion allowance would then have to be applied on the liquid product as it was pumped out of these chimneys to make this consistent with how this feature of the tax laws would apply to shale that was mined by more conventional methods and then shipped to a plant and retorted. How to make these consistent is another thing that I think ought to be straightened out ahead of the commercial phases of industrial development of the industry.

Senator ALLOTT. Well, I do not think, personally, this constitutes any great problem. The real problem, I think, comes in its application. You do not have anything out of the ground in the *in situ* process, assuming it works, until you pump something out, and then your depletion allowance would apply. But in the case of what so far has been the conventional methods of mining the shale and retorting, you do have a problem, and it makes a lot of difference.

Thank you very much, Mr. Fisher.

The CHAIRMAN (presiding). Mr. Fisher, I assume that you would agree that, of course, it is important that we try to find out before we get into an extensive leasing program what the costs are going to be in connection with the processing of the shale. It is rather difficult to make any policy decision unless you have that information.

Mr. FISHER. Yes.

The CHAIRMAN. Do you see at this time a need to change the provisions of the Mineral Leasing Act?

Mr. FISHER. I have not really thought deeply about this, Senator Jackson. It is another whole subject and I would be glad to think about it and write to you.

The CHAIRMAN. It does go to the equities, of course.

Mr. FISHER. Yes, it does.

The CHAIRMAN. There is a great argument what the Government royalty should be, what the return should be to the Government.

Mr. FISHER. Yes, that is right.

The CHAIRMAN. I think it is important that some thought be given to this problem, because sooner or later we will have to face up to it.

Mr. FISHER. Yes. I agree. In the Advisory Board Report we referred to this problem and made some few sentences about it, but we did not go deeply into it there either. We confined ourselves to questions that were more solely concerned with oil shale. I certainly agree that, from certain points of view, some provisions of the Mineral Leasing Act do not appear to be as relevant or useful today as they did several decades ago.

The CHAIRMAN. That is especially true until we get some idea of the cost of recovering the oil from the shale.

Mr. FISHER. Yes.

The CHAIRMAN. And, of course, when the value of the byproducts involved in this undertaking are better known, we will be in a more knowledgable position to make an evaluation. I think it is important that there be as much competition as possible in this effort to come up with a most efficient, the most effective recovery process. This is just commonsense, that you do not try to limit any one approach. You should bring in as much of a diversified approach as possible.

Mr. FISHER. Yes. I certainly agree with that, and I think in what I call the first phase, the research and development phase, which would be a negotiated phase between the Government and companies with a willingness and capacity to do imaginative research and development, every effort should be made by the Government to stimulate a variety of approaches and exploratory work, just as has been done, for example, by the Atomic Energy Commission over the years with private companies.

The CHAIRMAN. Well, one of the best things we did in the atomic energy reactor program was to invite proposals from industry. In that case, with Government help and with various approaches being made, different types of reactors were developed. I think this has paid off handsomely to the American public.

Mr. FISHER. We have the advantage of a very rich and diversified technology in this country and we ought to take full advantage of that by setting in motion a variety of approaches to this problem. On your point about the costs, I think that is vital in the end, of course, before any investment decisions will be made. I hope that in negotiating research and development activity with the companies the Government could encourage and even insist that they include not only the engineering, scientific, and technical work, but also as much as possible keep cost records on any pilot plant operations, and even provide them with some standard treatment for overhead and items of that sort. Then, at the end of what I would hope would be a rich and diversified research and development phase, it would be possible, within some limits of probability, to project from the pilot operations costs of commercial scale operations a basis by which you might at least begin to compare different techniques.

The CHAIRMAN. I know very little about the technology or the state of the art of this business, but if one can draw from the experience that we have had in other programs it would appear that while research and development prototype facilities will reveal certain information, I think what you suggest makes a lot of sense. It is my impression that you probably will really not get a good cost picture until you have built and operated a large-scale facility. There is a vast difference between trying to extrapolate, no matter how detailed the data, from a prototype facility and comparing it with a full scale operation.

Mr. FISHER. That is right.

The CHAIRMAN. We learned in the nuclear power program that the prototype reactor will reveal certain technical shortcomings but when you build a large-scale facility, you really begin to get the facts that you need to have as far as costs are concerned. That is something I do not think one can avoid doing. Would you agree?

Mr. FISHER. Oh, yes. That certainly is true, although to make the decision on the first full-scale operation, you have to project on the basis of technical and cost information on a pilot scale, even though you know you may go wrong.

The CHAIRMAN. I do not oppose prototypes. Do not misunderstand me. I was adding that caveat. We had the same thing in the saline water program. I think there is a danger sometimes that one jumps to conclusions, beacuse of a prototype operation, that the costs are going to be such and such. That was my point of observation.

Senator ALLOTT. Would the chairman yield on that?

The CHAIRMAN. Yes.

Senator ALLOTT. I would like to agree with the chairman on this, because I think it would be dangerous, and in fact in this field I think we have some illustration of it. It would be dangerous to try to extrapolate very far from a pilot plant to a full-size commercial plant and base your decisions as to what you are going to do, how you are going to treat these people, and what leases you are going to give, on that basis. I think it would be a very dangerous thing to do. I agree completely.

The CHAIRMAN. Senator Jordan?

Senator JORDAN. Thank you, Mr. Chairman.

Mr. Fisher, I am interested in one sentence in your statement, where you are speaking of certain criteria to observe in the second phase, commercial leasing, and you say, "In particular, the conservation requirement should be made explicit as early as possible." My question to you is: Has Resources for the Future arrived at any conclusions as to what these conservation requirements might be?

Mr. FISHER. Senator, we have not conducted any research on this question in oil shale. We have, I think, a couple of studies going forward on the similar question in the coal industry. One of these is a grant from us to the University of West Virginia, and there is one other. There might be some transfer of findings, but essentially it is a problem of how to deal with the overburden that is removed and any alteration of the landscape and the different ways of doing it and different levels of treatment.

Senator JORDAN. Problems that might arise out of water pollution or air pollution.

Mr. FISHER. That is right.

Senator JORDAN. And you mention the prospect of mining and utilizing the aluminum-bearing dawsonite. You want to explore fully the possibility of recovery of other minerals in the shale in addition to the oil?

Mr. FISHER. Yes.

Senator JORDAN. This, I assume, will be one of your——

Mr. FISHER. Yes. I would think in any pattern of research and development work that might take place in the first phase over the next few years, the Government would do well to make certain that the other values, conservation values and other mineral values, also be investigated. That this be part of the full package.

Senator JORDAN. Thank you.

The CHAIRMAN. Senator Hansen?

Senator HANSEN. I appreciated your very excellent statement. I would like to ask, in connection with the question just posed by Senator Jordan, would you agree that the conservation requirements which may be indicated may have to reflect the different processes that likely could be developed in order to exploit fully these resources we find underground? If we are talking about *in situ* recovery of oil, I should suspect that we might anticipate little change in the character of the land generally. However, if we talking about, and if on the basis of pilot plant operation it appears as though the removal of the overburden will be indicated and that we will actually have to take out

of place the oil shale and crush it, and that sort of thing, then I think we have an entirely different situation confronting us. And your thought, as I understand you, would be that, consistent with whatever sort of treatment is indicated, you would hope to apply realistically some good conservation practices so as to preserve, as best they can be, those values that we all appreciate as being important?

Mr. FISHER. Yes. I agree completely with that. Depending upon the process that might be used, the conservation problems are different.

Senator HANSEN. Yes.

Mr. FISHER. And this would have to be thought through in this way. It was brought out yesterday morning that, if it is done *in situ*, the problem then is not disturbance to the topography but the problem then may become watching very carefully where radioactive substances go.

Senator HANSEN. Yes.

Mr. FISHER. And it would vary with the process, yes.

Senator HANSEN. I would like to commend you, Dr. Fisher, on providing us with an excellent legislative history of the important role played by the Oil Shale Advisory Board, and thank you for placing the interim report to the Secretary of February 1965 in proper perspective for us. I have no further questions.

The CHAIRMAN. I, too, want to compliment you, Mr. Fisher. I think you have made a very helpful contribution here to this effort that we are trying to make of getting points of view and getting a better understanding of some of the problems that we face in this all important area. I want to thank you and compliment you.

Mr. FISHER. Thank you very much.

The CHAIRMAN. Our next witness was to be Mr. Richard Eckles, coordinator of natural resources, State of Colorado. His statement will be presented by Mr. Russell Cameron of Denver.

Senator ALLOTT. Mr. Chairman, if I may, I would like to point out that Mr. Cameron is a member of the governor's oil shale advisory board in Colorado. He is an outstanding engineer and has had great experience in government. In the area which we have under exploration here I think he will be of great help to the committee.

The CHAIRMAN. We are delighted to have you, Mr. Cameron, and now you may proceed in your own way.

STATEMENT OF RICHARD ECKLES, COORDINATOR OF NATURAL RESOURCES, STATE OF COLORADO, AS PRESENTED BY RUSSELL CAMERON, OF DENVER

Mr. CAMERON. I might mention in preface that my company has just completed the engineering for a large prototype oil shale retort for construction in Brazil, and at the conclusion of Mr. Eckles' statement which I will read, I would be glad to answer any questions that the committee might have on technology and economics of oil shale which is the field in which I am most knowledgeable—or at least that some feel I am most knowledgeable.

On behalf of the deeply interested and concerned citizens of the State of Colorado, Governor John A. Love wishes to express appre-

ciation for the opportunity, through me, to comment on the five-point oil shale development program announced by Secretary of the Interior Stewart L. Udall on January 27, 1967.

We compliment Secretary Udall on his announcement and regard it as a beginning step favorable to the development of our great oil shale reserves. We also are particularly pleased that it contains strong recognition of two facts: (1) that mounting energy demands in the United States make it imperative that sizable amounts of oil from oil shale begin to flow in the 1970's; and (2) that immediate action on many fronts is essential to clear away obstacles to oil shale development.

We are also pleased and proud that so much of the five-point program is consistent with the recommendations made by Colorado in early 1964 in response to the Secretary's request for suggestions looking toward the formulation of a program. For your more leisurely perusal we attach to this statement copies of Governor Love's 1964 letter to the Secretary containing those recommendations.

Although 3 years have passed—and been lost—we are satisfied that the positions taken by us in 1964 are still sound. We are anxious, however, to make a refined and updated set of recommendations for your consideration promptly after Secretary Udall does what he certainly must do soon; that is, issue detailed descriptions of how each of the five points of the program will be implemented and carried out.

During the last 3 years we in Colorado—and interested industrial concerns—have not simply been champing at the bit but have been doing all within our power to lay the groundwork for a sizable oil shale industry. Tens of millions of dollars have been spent in private research. I might add parenthetically here that it is our estimate that since the Government ceased its activity at Rifle, private industry has spent about $50 million in oil shale research. This would be about the last decade.

The applicants have done all in their power to break the legal log jam affecting oil shale mining claim patent applications.

Preliminary attention has been given to the complex problems of financing the schools, roads, and community services which inevitably must be provided for what will be mushrooming oil shale communities. Much thought has been given to zoning and city planning so that oil shale communities will be model cities and not cancerous blights. This has been largely done by the local communities. Both Garfield County and Rio Blanco County have set up zoning regulations, employed consulting firms, and are taking many forward steps in this direction.

Colorado has taken a position of strong leadership in the fields of natural resource conservation and the abatement and prevention of air and water pollution. There are problems in all of these areas of great importance to the proper development of oil shale but there is no need to postpone progress until the development by the Department of the Interior of a comprehensive national policy. We are convinced that these matters—as matters of great local concern—can be and should be handled at the local level where the problems are and where the people directly affected reside. We intend to do all that is needful in these matters and are satisfied of our ability to do so.

Mr. Eckles asked me to point out in particular that Federal authorities who are considering these same problems should get in contact with our local agencies in Colorado, which already have programs in effect for this and have made great progress in defining the standards necessary for the proper control of stream and air pollution and landscape restoration.

Some problems, however, cannot be solved by thinking, planning, and legislation alone. Some problems require immediate and costly implementation now if oil shale development is to occur a decade from now. As a personal aside, I was quite surprised at Secretary Udall's comment that we will not need oil from supplemental sources in this century. This does not coincide with my own studies nor with the studies of many other major oil companies with which I am familiar.

A prime example of this kind of problem is the absolute necessity for the immediate development of the water essential not only for industrial requirements but for domestic use in the supporting communities. Water development in our semiarid West is possible—and will be done—but it will require huge sums of money and substantial leadtime for the construction of the reservoirs and diversion works which will inevitably be required.

Again I would like to make a reference to Secretary Udall's testimony in which he mentions, I believe, 20,000 acre-feet per year of water required for a million-barrel-a-day industry. I know he defined this as only process needs. But a study which our company made for the State of Colorado in 1959 indicated about 10 times this amount of water would be required for all of the community and industrial needs of a million-barrel-a-day oil shale industry.

The CHAIRMAN. You say 10 times?

Mr. CAMERON. Yes, sir. I am sure Secretary Udall's reference was correct to certain process needs, but obviously we have to provide water for the population, for auxiliary industry, for many other needs.

The CHAIRMAN. You are bringing in the indirect requirements?

Mr. CAMERON. I am including all of those; yes, sir.

The necessary time to solve this kind of problem is irretrievably escaping us day by day. The necessary capital cannot and will not be available unless and until certainty exists that an oil shale industry will be permitted—not just possible, not just encouraged, but permitted.

This certainty can only exist if there is prompt and full implementation of a strong and purposeful intent on the part of the Department of the Interior and the administration to remove existing impediments and pursue a program which both protects the public interest and offers reasonable incentives to private capital to participate in this essential venture.

As stated earlier, the five point program announced by Secretary Udall is a long step in the right direction. May we ask your invaluable assistance in guiding the remaining steps along a path which will accomplish the goal we all agree must be reached. We in Colorado pledged to continue our best efforts in this great endeavor.

Thank you.

The CHAIRMAN. Thank you, Mr. Cameron, for the statement. We are glad to have it and the letter will be included at the conclusion of your formal remarks.

Senator Allott?

Senator ALLOTT. Mr. Cameron, just a few questions.

I assume from this statement and the letter from the Governor referred to, that in the opinion of the State of Colorado, a lot depends upon the spelling out, the detailing of the program which the Secretary announced recently, and that in order to make real progress, we have got to find out what the program is going to be. In other words, if we are going ahead, we have got to have a more distinct spelling out of where we are going.

Mr. CAMERON. Yes, sir.

Senator ALLOTT. I would like to ask you a question or two. I think the implication of this is widespread. My recollection is that Brazil suffers a balance-of-payments deficit of some $300 or $350 million a year on account of oil imports alone. Is this correct?

Mr. CAMERON. Yes, sir. And it is rising. The deficit is.

Senator ALLOTT. Of course, we are all aware of the great inflationary problems in Brazil and the headaches it has caused not only them, but us in trying to develop Latin America. So the develoment of a viable oil shale industry in Brazil could, in itself, have a far-reaching effect or a considerable effect upon the balance-of-payments problem of Brazil.

Mr. CAMERON. Yes, sir. That is correct. The large oil shale reserves which we hope can be convertible to oil reserves in Brazil could completely satisfy their needs for oil for centuries to come.

Senator ALLOTT. In general, are those reserves comparable in richness to the ones in the Colorado-Utah-Wyoming area?

Mr. CAMERON. In general, they are not as rich in many areas. However, it appears from our present studies that they are susceptible to mining methods which make them quite economical to mine and retort.

Senator ALLOTT. Mr. Cameron, you have been carrying on work of this nature in Brazil for 10 years?

Mr. CAMERON. Yes; more than 10 years.

Senator ALLOTT. From my own knowledge, I know that you have been carrying it on for 10 years, but your work has not been confined to Brazil alone, has it?

Mr. CAMERON. No, sir.

Senator ALLOTT. In this field.

Mr. CAMERON. Our company was organized about 12 years ago and I had previously been associated with the Bureau of Mines Rifle operation as well as had many others on our staff. We began a research program in Brazil, conducted pilot plant work there, and certainly, with our assistance to the Brazilians, the Brazilians have developed what appears to be a feasible process for their shale. We have also done comparable work in the United States.

Senator ALLOTT. Is this plant now under construction in Brazil what you would call a production plant?

Mr. CAMERON. It is a large prototype plant.

Senator ALLOTT. A large prototype?

Mr. CAMERON. It will process about 2,000 tons a day, this one unit. It may very well be a size that in batteries can become a commercial plant, say a dozen of these retorts. It may be that we will find that

it is possible to scale up this size to something larger. This will depend upon our experience in operating it.

Senator ALLOTT. Now, one of the problems in this whole field has been the actual extraction of the shale and you have done some work in a type of extraction of shale itself, I understand, that is different from this—different from anything that has been mentioned here. Could you describe it briefly?

Mr. CAMERON. Yes. We have been fascinated by the possibilities that the nahcolite and dawsonite in these deep oil shales might give us a leg up on getting shale oil produced economically, in getting an industry started on an economic basis. We have not been able to conceive of how dawsonite and nahcolite could be extracted by any *in situ* method which leads us to the necessity for considering mining of these deep oil shales as a means of recovering these valuable minerals.

When you direct your attention to mining these oil shales, the first thing, of course, you have to consider is the cost and the economics of the procedure. You also have to give consideration to the recovery of all of the valuable minerals that are there and all of the shale that is there, as the Secretary and others have pointed out. So we have given some consideration to a block caving concept of mining whereby we would, say, sink a shaft to the level of one of these richer bands or richer layers of oil shale containing nahcolite and dawsonite. This horizontal layer would be mined in such a way that the openings that were left would offer access to a 1,000- or 1,500-foot layer of shale above this zone for a block caving operation.

Now, I might explain this block caving concept briefly. It merely is one in which you open a room large enough that you begin to cave a ceiling—cave the material above you—so that if you have a means, an entry whereby you can continue to withdraw this rock that is caving above you, and remove it to the surface for processing, this procedure can continue. The more rock you withdraw that is caved from the roof, the more the roof caves and ultimately this 1,200-foot section, let us say, that might be above this zone would be caved into the openings where it could be removed and processed.

Now the disposal of spent shale—disposal of the waste from this operation—would be of some concern. Our feeling is that you could put the waste back on the top of your caved area and that, as the oil shale was removed, you would put the spent shale back into the hole created by removing the 1,200 feet or so of shale.

Now, if you were in a 2,000-foot-thick section, and, let us say that there were 500 or 600 feet of oil shale below you, you would go down and mine out again another opening there and cave this material down into that opening and remove it. So you could remove all of the 2,000 feet of oil shale, process it, and put the spent shale back in the hole. The mining of this rich nahcolite-dawsonite area might provide the revenue for the cost of developing the system. This is a system that is practiced at Climax, as you well know, Senator, which is the largest underground mining operation in North America and uses this block caving system quite economically and quite successfully.

Senator ALLOTT. Thank you very much, Mr. Cameron. I brought out this point because I think it merits being a part of the record. My

purpose is to show the type of thinking and investigation and research and engineering that is going into the mining and development of oil shale.

There is just one other thing. The Secretary in his statement indicated that we had enough liquid petroleum reserves in this country to go on through the end of this century and I think he said at about the same cost. I placed in the record, and I have it in my hands here, the hearings of May 12, 1965, in which I inserted a statement and a record which shows that in this country our demand rate had increased in just a few years 47 percent more than our reserves increased. It is a fact that from the standpoint of national interest, the demand is increasing at a far greater rate than the reserves are increasing, and the costs of the new reserves being brought in are far more expensive than they have been in the past. Is that not so?

Mr. CAMERON. I believe that is so; yes, sir.

Senator ALLOTT. Thank you very much.

The CHAIRMAN. Senator Moss?

Senator Moss. I am very interested in your personal testimony as well as the statement you read for us, Mr. Cameron. In this description of mining oil shale, which sounds very intriguing, I wonder if you have also done any experimental work on this *in situ* operation we have been referring to off and on here—attempting to extract the kerogen oil without taking the rock out?

Mr. CAMERON. Yes, sir; we have. We have studied *in situ* retorting for many years and my company is one of the participants among 25 in this cooperative effort between industry and Government to conduct a test using nuclear means of breaking up the shale.

Senator Moss. Has there been any research and development on that done in Brazil where you have been working recently?

Mr. CAMERON. No research and development recently really. We have made studies of the possibilities of it and did not come up with any very good possibilities for *in situ* operation. I might say that I am somewhat skeptical of the possibility of developing an acceptable *in situ* method. When I say I am skeptical, this does not mean that I do not feel that a great amount of research should not be aimed at *in situ* methods, because it has obvious possibilities for being more advantageous than mining and retort. In my opinion the experience to date does not give us too much encouragement. One of the reasons for this definition—of wondering whether there is an acceptable method—would be the percentage of recovery of oil that might be obtained from an *in situ* method. I think that if we look at the recovery of oil from petroleum reservoirs and even with the best of methods in many reservoirs we cannot get more than 50 percent of the oil. In some reservoirs we can get more. But in many reservoirs we cannot get nearly half of the reserve that is there, and oil shale, as we see it now, looks even more difficult and possibly quite expensive.

Senator Moss. What is your percentage of recovery on the removal of the rock in the crushing and retorting process?

Mr. CAMERON. I think that that method probably will ultimately remove a very high percentage. Being from Utah, you well know that out at the Utah copper pit, in the early stages this development was mined by one method in which high grade ores were recovered. As

time went on, by converting to a different method, almost all of the values that are there are being recovered. And I look at the development of oil shale much on the same basis. We would start mining high grade sections, such as the nahcolite-dawsonite that I mentioned, then go to some other method for the ultimate recovery of the remaining values. I look for a very high recovery there. I do not think that the problem, and it is a problem, created by the necessity to dispose of waste is an insurmountable one. I can assure you that industry as well as the State of Colorado, and I am sure the State of Utah as well, is giving a lot of thought to doing this on an acceptable basis.

Senator Moss. Thank you. Very interesting testimony. I appreciate it.

The CHAIRMAN. Senator Jordan?

Senator JORDAN. Mr. Cameron, I find your testimony very interesting and informative. I am interested in your estimate of the water requirements for recovery of oil from shale that the Secretary has, as you point out, indicated yesterday to be some 20,000 acre-feet per million barrels production a day. You say it will take probably 10 times that much water. That will be 200,000 acre-feet per million barrels production. At what level do you expect this resource can be developed in, we will say in numbers that we can understand, and in million barrels per day, when we get into full operation?

Mr. CAMERON. This is a question which has several bounds on it. For one thing, a million barrels a day is not going to run into any market limitations in my opinion, since a million barrels a day is now less than 10 percent of our current demands. There certainly appears to be enough oil shale to produce several million barrels of oil a day and several million barrels of oil a day certainly may be needed from oil shale by the end of this century. So I have to give you sort of an "iffy" answer. I would say it is in the several million barrels a day as a possibility, and water requirements will not necessarily be in multiples a million-barrel-a-day industry. I can see the possibilities here since my figure of, say, 200,000 acre-feet per year includes the requirements for the people who serve this industry, that as time goes on the technology will become more efficient and there will be fewer people required per barrel produced. We might be able to operate 30 or 40 years from now an industry with the same number of people for 5 million barrels a day as presently for a million barrels.

Senator JORDAN. Water needs would not necessarily increase in the same ratio for additional production?

Mr. CAMERON. Correct; but it is a significant demand for water.

Senator JORDAN. And conceivably if the water supply cannot be found, it might operate as a limitation on the amount of oil that could be recovered?

Mr. CAMERON. Certainly it could, and I think in order to develop an industry most economically, we would like to not be limited by water, at least in our initial stages. We would like to have ample water there. And that is the reason that I feel the States' determination that the development of water supplies for an oil shale industry should precede the development of that industry are such that we will have an ample water supply.

Senator JORDAN. Thank you.

The CHAIRMAN. Senator Hansen?

Senator HANSEN. I have been very interested in the testimony here this morning, Mr. Cameron. I am delighted that the Senator from Idaho went into this question of water. It is a concern that has been of real interest to me. I have only one further comment to make. It is that I hope your suggestion that the Federal authorities will go to the States to find out what has been done, what projections have been made in the way of conservation practices that could well be implemented, will be followed up. I think that, if the Federal Government recognizes the good sense in taking this approach, it might be very worthwhile and undoubtedly a number of techniques that would be useful would be disclosed to the Federal Government that might be very helpful. I commend you for that observation. I have no further questions.

The CHAIRMAN. Thank you very much. Thank you, Mr. Cameron. We appreciate having your statement.

(The letter previously referred to follows:)

STATE OF COLORADO,
Denver, March 27, 1964.

The Honorable STEWART L. UDALL,
Secretary of the Interior,
Washington, D.C.

MY DEAR MR. SECRETARY: Your news release of November 5, 1963, invited suggestions looking toward formulation of a program for the orderly development of the federally-owned oil shale deposits in Colorado, Utah and Wyoming. It is my pleasure to respond to your invitation in behalf of the State of Colorado and its citizens.

You have suggested that we consider carefully the relationship of oil shale, as an energy source, to coal, petroleum, natural gas, hydro-power, atomic energy and other sources of energy, both domestically and in relation to international affairs. To the best of our abilities we have done this and, in addition, have conducted a serious canvass of interested citizens and of industry over the last several months. Based upon our investigations we earnestly ask your consideration of the following:

1. The earliest possible development of our oil shale resource is essential to assuring a solid long-range supplement to our domestic petroleum supply. Although we do not fear that our country is running out of oil or other energy sources, it is becoming increasingly apparent that the combined effect of all of the national and international factors affecting the supply of and the demand for energy may, in as short a term as ten years hence, be such that our national security and economy will demand the then immediate availability of significant production from oil shale.

The problems which now obstruct the development of our oil shale deposits are many and complex, but they are not insoluble. It is apparent, however, that a prompt and vigorous start must be made to achieve even such a long range goal as a respectable capacity to produce oil from oil shale not later than 1975. To decide to wait until all of the problems have been identified, studied and solved would, because of the constantly changing effect of other economic factors, be tantamount to a decision *not* to foster the development of oil shale and in fact to discourage it.

While we do not counsel hasty and ill-considered action, we are convinced that the immediate removal of certain major obstacles to oil shale development could assure that operations would permit an industry be commenced in due course. Thereafter, we can address ourselves to the solution of lesser problems.

2. It is our judgment that the two largest impediments to making a start are: (a) the present unavailability of the publicly-owned deposits, and (b) the extreme delay by the Department of the Interior in processing oil shale patent applications.

As to the latter problem, we are now making a parallel study and hope to present our views to you in the near future. It is sufficient to say here that leaving such an important block of lands in limbo is not conducive to prompt development and is not in the public interest.

It is to the unavailability of the publicly-owned deposits that we primarily address ourselves in this letter. As you know, the thickest and richest deposits of oil shale and a very large percentage of the total reserves lie in the public domain.

It makes obvious sense, in a situation where present technology is relatively primitive, that the pioneering in research and development will better be conducted in higher grade areas. The improvements in technology which will inevitably result will then make economically available the lower grade deposits.

It follows clearly that the first step which must be taken is to make a reasonable portion of the public domain lands available to industry for further exploration, research and development at the earliest possible time on terms that are reasonable and fair to industry and also serve and protect the public interest.

3. An impediment to prompt action, whether it be under existing laws and regulations or in the formulation of new laws and regulations, is the limited amount of technological background in oil shale development available to both government and industry to provide guidelines for an appropriate leasing policy. The obvious dilemma is that without such experience it is difficult to formulate a sound leasing policy, and without a leasing program we cannot obtain the necessary experience. It is believed that the program we hereafter recommend will provide a solution to this dilemma consistent with the full protection of the public interest in these lands.

4. In formulating any leasing policy appropriate recognition of the public interest is of paramount importance. Although not an exhaustive list, it is essential that a sound leasing program give full consideration to:

(*a*) An appropriate compensation to the public, through payments of lease bonuses, rentals and royalties, by private industry;

(*b*) Full recognition of the importance of the development of this supplemental energy source as a national and hemispheric defense measure and as a significant stimulus to our country's economy;

(*c*) Full recognition of the importance of maintaining strong and healthy industries in the fields of conventional oil, gas, coal and other energy sources;

(*d*) Appropriate but subordinate recognition, via an appropriate import control program, of the value to our international position of a reasonable foreign oil import program; and

(*e*) The additional employment opportunities inherent in a multi-million dollar industry, and the hundreds of collateral manufacturing, service and supply functions required to sustain it, are of tremendous national interest—and particularly to the presently depressed mining communities of the nation.

In addition to the foregoing specific matters it is obvious that the stimulation and improvement of the various technologies used in oil shale development cannot fail to add materially to the value and utility of the nation's other great energy sources.

5. It is submitted that all of the foregoing matters can be reconciled by your enunciation and prompt implementation of the following suggested program:

Executive Order No. 5327, dated April 15, 1930, withdrawing oil shale deposits from disposal should be revoked at the earliest possible time, at least as to the tracts of land involved in the First Phase of the suggested leasing program outlined below.

The Existing Law relating to oil shale leasing provides an adequate basis for the First Phase of the leasing program.

The Existing Regulations, with a minimum of alteration, provide an adequate basis for the First Phase of the leasing program and should be amended, not revoked.

The First Phase of the leasing program should be the simultaneous offering of a limited number of representative but high-grade tracts of oil shale lands for lease under competitive bidding procedures.

The Lands so offered should be carefully selected to assure that they are not subject to the cloud of unpatented mining claims, and should be in reasonably compact blocks. Such lands should be selected with a view to the experience

value to both government and industry likely to arise out of operations conducted thereon; but should be large enough to permit the lessee to conduct full scale commercial operations. It is suggested that some of the tracts lie in each of the three states and that you consider, but not be bound by, the nominations of prospective bidders in selecting the tracts to be offered.

The Determination of the number of such tracts to be offered can either by made arbitrarily, in which case we recommend that no less than ten or twelve 5,120-acre tracts be offered; or the number can be controlled by economic forces if a much wider selection of various size tracts is offered with an announced minimum acceptable bid for each tract.

The advantage of offering only a limited and specified number of tracts is that the bonuses offered will no doubt be at the highest level; but this same factor may, in practical effect, limit participation to a few companies.

The advantage of a much wider offering of tracts subject to minimum acceptable bids, particularly if some smaller tracts are included, is that consistent with realistic protection of the public interest a much wider participation in the program is possible, including participation by smaller companies and independents. There is no doubt of the desirability of broad participation.

The Competitive Bidding Procedure could proceed as follows:

(*a*) Announcement of the legal description of the tracts to be offered, the minimum bid acceptable for each tract, the order in which the tracts will be offered for leasing at the time bids are opened, the form of the lease to be issued, the times and places of bid submission and opening, and the other usual matters now contained in announcements of bidding for offshore lands or lands on known geologic structures;

(*b*) Prior to the bidding interested persons should have access to the tracts to be offered to conduct exploratory drilling and make such other evaluation as they wish to perform;

(*c*) Each bid submitted would be a sealed bid of the amount of cash bonus the bidder is offering for a lease. In the form hereafter mentioned, on the entire tract for which the bid is made, together with his deposit of a certified check for 20% thereof. No aspect of the lease other than the cash bonus would be involved in the bidding;

(*d*) Any interested person, company or associations making joint bids would be entitled to submit a separate sealed bid on any or all of the tracts offered. To avoid undue hardship, checks submitted in connection with earlier opened bids could by reference become the deposit for subsequent bids. No person, company or association, directly or indirectly, could participate in more than one bid on each tract and the usual requirements concerning unlawful combinations should apply;

(*e*) At the opening of bids, which should occur about six months after the announcement, all bids relating to the first tract to be offered would be opened and the highest qualified bidder offered a lease upon payment of the remainder of the bonus offered;

(*f*) If the successful bidder of the first tract offered had also submitted bids on other tracts, his other bids woul be returned to him unopened before the second bid opening takes place; and

(*g*) Successively, bids would be opened on the remaining tracts with each successful bidder in turn being excluded from subsequent bidding.

The Lease Form should be substantially the same as is now prescribed in 47 L.D. 426 with the following amendments or special terms:

(*a*) *Royalty.*—Initial rate of 5% of the market value of shale oil produced as a result of the initial retorting of oil shale or produced at the well head by *in situ* operations. Royalty to continue at the 5% level for the first twenty years of the lease, after which time the royalty would be the same as then established by law or regulation for leases then granted. The point in the oil recovery process at which the market value for royalty purposes should be determined is the crude shale oil resulting from conventional retorting techniques, prior to hydrogenation or other upgrading or refining processes.

(*b*) *Term of Lease—Ten years* and as long thereafter as production of oil from oil shale is maintained or the lessee meets the continuing diligent performance of development and production requirements specified by you to be performed to hold the lease.

(c) *Development Requirements*—Commencing not later than the third year of the lease and continuing for a three-year period lessee should be required to expend no less than $1,000,000 annually (or some equivalent acreage charge if lease sizes vary) on or for the benefit of the leased premises in research, experimentation and development leading to a program for the commercial extraction of oil from the oil shale under the leased lands. Expenditures of the same type voluntarily made in the first two years should be allowed as a credit on any succeeding year's requirement. Thereafter during the primary term the lesesee should be obliged to proceed with reasonable diligence toward the same objective.

Recognizing that the First Phase of the leasing is in large part an experimental beginning designed to encourage the development of an industry, every care should be taken to prevent lessees from holding lands in idleness. At the same time, however, the lease requirements should not be so onerous as to preclude strong competition in the bidding or to preclude considerable flexibility to the lessee in the type and location of the research, exprimental and development work required.

Our suggestion that the royalty be set at a 5% rate is not in the nature of an incentive to encourage activity. It is largely based upon advice to us, from persons believed to be knowledgeable, that the present and at least short-range future economic structure of an oil shale industry (i.e., at least until 1985) requires that the royalty level be at about that rate. This royalty level is consistent with historic royalties for mining ventures.

The Second Phase of our suggested program should commence simultaneously with the First Phase and should involve serious and thoughtful consideration of an improved law and companion regulations. It is suggested that this work, including all necessary studies and hearings, should easily be completed by early 1967. It is probable that by then only a limited amount of experience would have been gained from lease operations under the First Phase so that in mid-1967 (or earlier if possible) a second limited competitive bidding program should be offered, hopefully, but not necessarily, based on improved laws and regulations.

The Third Phase to follow should be a continuation of the step-by-step philosophy, including a continuation of improvements in the law and regulations looking toward a fairly definitive policy and program no later than 1970. Before this time there should be available important and usable experience factors and data which should aid in formulating a good and workable system.

Suggested improvements in the law and regulations (which need not be accomplished to permit the First Phase to proceed) should include:

(a) The right of lessees of leases issued under the First and Second Phases to exchange their leases for the more modern forms sure to result from improved laws and regulations.

(b) Clear recognition of the right of lessees to unitize or pool leases under a common plan of development and operation. It is apparent that either mining or *in situ* operations of the magnitude which will be required can best be conducted under such a plan and that the commitment of large reserves to a single plant or pipeline is essential to permit the very large financing that will be required. Unitization is also historically one of our most effective conservation devices. In this connection we believe that Colorado can be encouraged to adopt suitable oil shale conservation and mine safety laws which will remove fear of anti-trust violations and permit continuation of the fine relationship which exists between our conservation and safety agencies and the United States Geological Survey and the Bureau of Mines.

(c) Without respect to what is done about the acreage limitation, a lessee should not be limited to one lease. It is essential that some flexibility in this matter be possible so that rearrangements of holdings may be made to reach the most efficient development and operating patterns of ownership.

(d) The acreage limitation should at least be enlarged to permit a lessee to hold 5,120 acres in each state. In fairness to our sister states of Utah and Wyoming, the door should be opened to encourage prompt development in every state. Generally, there does seem to be merit in increasing the acreage limit above 5,120 acres at least as to tracts having lower grade reserves. In fact, once a reasonable number of operators have affirmatively entered the picture, there may be no reason not to permit a sizable increase in the acreage limit. In operations of this magnitude, the economic forces

inherent in the size of investment required and the laws of supply and demand are the most effective regulators in any event.

(e) Leases should contain appropriate force majeure provisions allowing a suspension of obligations in the event of unusual occurrences.

It is our hope that you will proceed at the earliest possible time to declare as your policy the program herein suggested. We shall be blad to meet with your representative to discuss our suggestions in more detail and intend to participate in any public hearings you may choose to hold.

Respectively submitted,

JOHN A. LOVE,
Governor of Colorado.

The CHAIRMAN. Our next witness is Capt. Albert S. Miller, U.S. Navy (retired), former Director, Naval Petroleum and Oil Shale Reserves. We are pleased to have you with us again. Captain, you may proceed in your own way.

STATEMENT OF CAPT. ALBERT S. MILLER, U.S. NAVY (RETIRED), FORMER DIRECTOR, NAVAL PETROLEUM AND OIL SHALE RESERVES

Captain MILLER. Thank you, Mr. Chairman. Mr. Chairman and members of the committee, my name is Albert Stanley Miller. I am a retired captain of the U.S. Navy. From 1954 to 1960, I was Director, Naval Petroleum and Oil Shale Reserves in the Office of the Under Secretary of the Navy, the same position that Captain Moore now holds. During my tenure of office, I became greatly interested in oil shale as a potential source of energy for national defense purposes. It was my thought that an oil shale industry, no matter how small, should be developed in order that, in time of need, the "bugs" of the processing of the oil shale into oil would be ironed out and the perfected process would be available for use by the armed forces. Thus, we would avoid the fiasco which took place at the outbreak of World War II when a crash program came into being to produce synthetic rubber.

Since my retirement from the Navy on June 30, 1960, I have become a consultant in private industry, and I have tried to follow the efforts to develop an oil shale industry. At this point, I would like to observe that, as a former Director, Naval Petroleum and Oil Shale Reserves, I concur heartily in what has been said here yesterday by Captain Moore as to the need for a viable oil shale industry for our national security and economic development. The members of the committee will recall that the same basic position was set forth at your 1965 hearings by Capt. K. C. Lovell, who was my successor in office.

Now I would like to make a few comments on the program of the Department of Interior which is before you.

First, the Secretary speaks, in point 3 of his press release of January 27, of a two-step leasing program. The first part would be, in the Secretary's words, "Access to necessary acreage of oil shale lands for testing purposes." Then, and only then, would "larger tracts for commercial development" be made available.

Mr. Chairman, several companies have pioneered, at their own expense and on private lands, oil shale development. They should have the answer to this question: Is this announced two-step leasing procedure a fixed pattern which must be followed by everyone, one step

at a time, or could one who has developed a demonstrated expertise on fee lands, through his own efforts and expenditures, embark upon step 2 forthwith?

Several companies can be considered as "pioneers." Three that come to mind are the Union Oil Co. of California, the Oil Shale Corp., and the Standard Oil Co. of Ohio. The pioneer has expended considerable sums in developing oil shale deposits in privately owned lands. It does not make sense that the pioneer should have to make a rerun, so to speak, in order to prove his accomplishments. Would the Secretary recognize the pioneer's efforts and accomplishments and make a realistic arrangement with him for the test of truth; namely, commercial production? Of course, it is assumed that the pioneer would provide satisfactory proof to the Secretary that he has, in fact, made these accomplishments.

Mr. Chairman, I want the record to be clear. I speak as an individual who has been interested in developing an oil shale industry for many years, since 1954 to be exact. I do not speak for any company or any industry. I cite the above example as one possible soft spot in the Secretary's program. I emphasize that these pioneers should neither be excluded from participation in the Federal program nor should they be required again to expend their money and time in making a rerun, on public lands, of their achievements.

It would be manifestly unfair to exclude the owners of fee-deposits from full participation in the Federal program or to penalize them for pioneering enterprise. The cost of retorting a ton of oil shale, regardless of oil content, is approximately constant. The main advantage of using Federal lands is that there are more barrels per acre in these lands than there are in most private lands. Thus, the return for money expended in retorting is greater as oil content increases.

As one who has followed oil shale development for many years, I submit, Mr. Chairman, that we are reaching the stage in oil shale that appears to have been reached in the conversion of saline water. You will recall that at your recent hearings authorizing the appropriation of some $457 million in Federal funds for participation in the proposed conversion plant with a capacity of 150 million gallons per day utilizing nuclear energy, Assistant Secretary of the Interior Frank Di Luzio appeared before you and expressed the vigorous position that study, as such, of saline water conversion had reached a point of no return and that what was needed was commercial scale production before further progress was likely to be made.

So it is with oil shale development. I am convinced that the state-of-the-art has advanced to the point that what the Secretary of the Interior should do is to encourage commercial scale production so that we would really know where we stand.

This is the test of truth.

And now, Mr. Chairman, I would like to turn to another point. In addition to the program of the Secretary of the Interior, is there any way that the Congress can help in establishing an oil shale industry? You are aware of the assistance that other countries have given to new industries. Captain Moore has indicated that a plant producing 50,000 barrels per day would require capital investment in the order of $100 million. This is a large amount for the private sector of any

industry to provide. Congress can assist private industry in getting such a project started not by participation financially since that involves regulation but by making it attractive, perhaps in the area of limited tax relief. I provide no suggestions as to the how; I merely submit that some assistance from the Congress clearly is indicated.

And this brings me to my closing remarks. I think the Secretary is to be commended on his policy position that oil shale shall be developed in the historic American tradition—through private enterprise and private initiative, and that we will not be burdened with outright Government participation in the production of oil from oil shale. The history of the development of the mineral resources of the vast public domain of our country irrefutably shows the wisdom of such a course.

This committee is and can be the key factor in the carrying forward of this great tradition and in the establishment of a going oil shale industry on a sound economic basis.

That concludes my statement, Mr. Chairman.

The CHAIRMAN. Thank you, Captain Miller. You have had very valuable, direct experience in this field. The committee certainly welcomes your comments. You have raised several points here that I know will be most helpful to us.

Senator Allott?

Senator ALLOTT. Yes. Captain, first of all, I think you deserve recognition for the part—the very active part and helpful part—you played when you were in charge of the Naval Reserves. I want to express that now publicly.

Captain MILLER. Thank you, sir.

Senator ALLOTT. We appreciate it very much. One point, only, I want to question you about. You pointed out that the cost of retorting is approximately the same regardless of the richness of the shale that is run through the retort. This is correct?

Captain MILLER. That is right, sir. That is my understanding.

Senator ALLOTT. Now, in that event, the point you make, and I think it needs underscoring, is that the future leasing policy of the Federal Government ought to be set out as soon as possible. You have also pointed out that the shale lands which are privately owned do not consist of the richer deposits of shale.

Captain MILLER. That is right.

Senator ALLOTT. Generally, so that as I get your point, then, a company or companies who develop their own oil shale lands without any guidelines or indication or legislation from the Congress as to what future leasing policies will be might develop its own relatively unrich shale lands and find itself tomorrow, figuratively speaking, in competition with a company which was the beneficiary of a subsequently announced leasing policy which places it in a completely unfair competitive position with the company which has already done the work and done the exploration and done the pioneering.

Captain MILLER. That is very much a possibility, sir.

Senator ALLOTT. And for this reason, you take exception to a rigid two-point leasing policy and think that it would actually tend, as I personally believe it will tend to do, to slow down the total development because what any individual company will do will depend to a

great extent upon what the leasing policy of the Federal Government is going to be.

Captain MILLER. That is right, sir.

Senator ALLOTT. Thank you very much. And I do appreciate your testimony this morning.

Captain MILLER. Thank you, sir.

The CHAIRMAN. Senator Moss?

Senator Moss. Captain Miller, I, too, appreciate the fine work that you have done in this field and appreciate your testimony here today. I take it from your statement that you are convinced that the state of the art is already advanced to the point that we should be moving directly to large scale production. Does this mean that you hold out little or no hope for the *in situ* retorting process?

Captain MILLER. I am not very enthusiastic on the possibilities of *in situ* production.

Senator Moss. So your reference to the state of the art is the method of taking the rock out and crushing it?

Captain MILLER. The conventional method, mining, crushing, retorting.

Senator Moss. Is there a rough estimate now on the cost of production of a barrel of oil by the retorting process, taking care of all these problems of restoring the rock and so on?

Captain MILLER. Let me put it this way, Senator. The Government spent in the neighborhood of $17 million at Rifle, another $6 million in basic research at Fort Laramie Station. They did not complete the job with that expenditure of money. That is the reason for the operation at Rifle today. The Union Oil Co. took 2 years and their own money and built a plant that processed the shale and got all the answers they wanted. The cost figures I do not have. At one time it was stated at an American Mining Congress meeting in Denver that they had gotten the cost down to below a dollar a barrel. How far below, I do not know. But they, in 2 years, found out the answers and tore the plant down and said at that time if they had the same depletion allowance that petroleum has, they would be competitive. That was a statement made by the president when they closed down.

Senator Moss. So it is in the relative range of difference between the depletion allowances?

Captain MILLER. That was the statement made.

Senator Moss. Thank you very much.

The CHAIRMAN. Senator Jordan?

Senator JORDAN. No questions.

The CHAIRMAN. Senator Hansen?

Senator HANSEN. I want to commend you for the excellent statement you have made, Captain Miller.

Captain MILLER. Thank you.

Senator HANSEN. I am not sure I understood how much money you said had been spent in basic research at the Laramie Station.

Captain MILLER. As I recall the figure, $6 million—a total of $23 million expended by the Government on the program.

Senator HANSEN. $17 million at Rifle and about $6 million at Laramie?

Captain MILLER. Six.

Senator HANSEN. I also want to commend you for the statement you made of the threat that is posed to our national security by permitting time to run out in this regard. I agree completely.

Captain MILLER. Thank you.

Senator HANSEN. No further questions.

The CHAIRMAN. Senator Allott?

Senator ALLOTT. Just one question. I do not want to try to correct you, but was not the dollar figure that you mentioned in reference only to the retorting?

Captain MILLER. That is right.

Senator ALLOTT. Not to the mining or the disposal of the material?

Captain MILLER. No. Cost of retorting.

Senator ALLOTT. Thank you.

The CHAIRMAN. Thank you, Captain. We appreciate having your statement.

Our next witness is Mr. Frank Wallick, representing the United Auto Workers. Mr. Wallick, we are delighted to have you. You have a prepared statement.

STATEMENT OF FRANKLIN WALLICK, WASHINGTON LEGISLATIVE REPRESENTATIVE, UNITED AUTOMOBILE, AEROSPACE, AND AGRICULTURAL IMPLEMENT WORKERS OF AMERICA, AFL–CIO

Mr. WALLICK. Thank you, Mr. Chairman, members of the committee, I am Franklin Wallick, Washington legislative representative of the United Automobile, Aerospace, and Agricultural Implement Workers of America, and on behalf of our organization I appreciate the opportunity to appear before this committee to discuss public policy regarding oil shale.

The UAW believes that Congress should move with extreme caution in leasing public land for private development of oil shale. Oil shale deposits may be worth some $300 billion, and I think that is a very low estimate, and at least 85 percent of this is located on public land.

Few Americans today realize how rich they are, and they have every right to know precisely what the implications are of any private leasing of so vast and rich a national resource.

John Kenneth Galbraith, a member of Secretary Udall's Oil Shale Advisory Board, issued a warning, to which we in the UAW fully subscribe, when he said:

> The American people are not presently aware of the wealth they own in these deposits. It is important both for the conservation and wise and equitable development of these resources, that there be the widest public knowledge of this endowment and the issues concerning their exploitation. An informed public will be a major source of strength to officials seeking sound conservation policies. We urge that all conservation-minded members of the Congress and the public inform themselves fully on this vast resource and policies concerning its use.

Those words were written 2 years ago. They are still true today. The American people, I fear, are in the dark about oil shale and what it means to this Nation. These hearings are a welcome opportunity for the public to understand better the consequences of Government policy on so rich a public treasure.

Speaking strictly as a lay member of the public, there are several questions I feel worth raising at this juncture:

1. A totally new allocation of royalties should be made if any oil shale leasing is undertaken. In our view it is unsound public policy for 52½ percent of all royalties to go for reclamation purposes, 37½ percent for the respective State, and only 10 percent to the Federal Government.

With the enormous demands for Federal funds to rebuild our cities, acquire land for outdoor recreational purposes, combat air and water pollution, and the financial needs of modern education, we believe Congress must come up with a modern allocation of royalties if oil shale deposits are leased privately.

2. We question if leasing of surface deposits at this time is desirable. It would be a great tragedy for the whole Nation if Colorado and Wyoming came to look like parts of West Virginia and Kentucky, which bear the ugly scars of and to this day are being disfigured by strip mining. It would be much wiser to experiment with safe underground recovery methods and demonstrate their feasibility before surface mining is permitted.

May I just throw in there that I appreciated very much Senator Allott's discussion with the AEC yesterday about some of the safety problems involved in underground atomic testing, and we do not pretend to have any final answer on this thing. We just think it is a matter that needs to be fully aired, discussed, and explored.

3. While strictly developmental leasing may be wise and necessary now, the Federal Government should have the right to renegotiate any leases on public land once a feasible claim is operating, so the public interest will be fully protected. The present 12½-percent royalty on publicly owned oil and gas deposits may be justified, but this may prove later to be much too generous to the commercial oil companies. Any leasing arrangement on public land ought to be subject to review so the public interest is fully protected.

I may also add at that point that it would be good public policy, in our view, if the oil shale advisory committee could be continued under the leadership of Mr. Fisher and certainly we would like to see Mr. Galbraith back.

4. Great caution should be taken not to damage watersheds and wildlife which could be irrevocably destroyed by reckless leasing.

So finally, Mr. Chairman and members of this committee, we urge Congress to move with great caution on oil shale; to review royalty allocation so the Nation's neglected social needs will be helped; develop safe underground recovery methods before scarring the surface; protect the public interest by a review of the present 12½-percent royality; and protect watersheds and wildlife.

Congress, we believe, has a great opportunity to use this immense national resource to advance education for millions of American young people and other worthwhile programs to improve the quality of life for all Americans by dedicating oil shale royalties for these special purposes.

The CHAIRMAN. Thank you, Mr. Wallick. We appreciate having your statement. It is very helpful.

The point that you made about getting the public interested and concerned in this, of course, is the purpose of these hearings. We had hearings 2 years ago, as you recall, in an effort to inform the public and all those who have some special interest in the development of this resource. That is why we are holding the hearings again, to give citizens, groups, and associations an opportunity to comment on the five-point program of the Secretary of the Interior.

After reading your statement I assume you would agree with the Chair that it is important that we ascertain first of all what the costs are going to be in connection with an oil shale development program. It is rather difficult to come up with a Federal policy, possibly enact legislation to implement it, if one really does not have all the facts.

Mr. WALLICK. Exactly.

The CHAIRMAN. You would agree on that.

Mr. WALLICK. Exactly.

The CHAIRMAN. I think what the Secretary of the Interior is proposing has great logic. In other words, we do need to get into the research and development effort and then, in addition, it would seem that it would be wise to undertake a large-scale plant so that you could really find out what the possibilities are with reference to recovery, the costs, and other developments. In that way it is determined what kind of a leasing program should be carried out.

Mr. WALLICK. Right. We agree. Incidentally, this matter has been discussed at the highest levels of our organization so I am not just sitting here talking for myself. While we feel that oil shale represents a great national asset, a frozen asset is no asset at all.

The CHAIRMAN. That is right.

Mr. WALLICK. Therefore we feel it is good to proceed and to move on this matter because this is a great treasure for all the American people and it is not going to do any of us any good if it just stays there in the ground.

The CHAIRMAN. We should have the means and the knowledge and the techniques based on that knowledge to utilize this resource when the time is necessary. I think the point that was made by a previous witness that the fact that the synthetic rubber program was gone into during World War II in a hurry, without development of the techniques in advance, was a mistake. It had to be done, but it could have been a lot better if that competency had been obtained prior to the conflict. It is conceivable in the future that this country may be in a crisis where it would need to draw upon our shale reserves. If the proper means of utilizing this resource are not available in time, it could cause a lot of trouble. You would agree on that?

Mr. WALLICK. I agree with that, Senator.

The CHAIRMAN. I think the main thing needed here is, as any prudent person would do under the circumstances, is to get the facts, find out all that is really involved. By undertaking the first step to ascertain knowledge of this new industry, we can better make the judgments that the Congress must make.

The point you raised about the division of royalty receipts of course, goes to all of the royalty programs, not just oil shale, I think.

Mr. WALLICK. That is right, except that it certainly is raised in this matter.

The CHAIRMAN. Well, it is brought to the fore, but there are a lot of royalties that are being obtained now, too, that apply to the oil industry as a whole.

Mr. WALLICK. Right.

The CHAIRMAN. We appreciate having your comments.

Senator Allott?

Senator ALLOTT. Mr. Wallick, just one or two questions. You say that this matter has been given much study by the highest level of your organization?

Mr. WALLICK. Well, we do not pretend to be expert on this matter, but we recognize that this is a great pressing national question at this time, and it has been discussed. However, I am not suggesting that we are coming here as experts.

Senator ALLOTT. Well, let me ask in all kinds of friendliness, have you ever called into your high councils the people in this country who are really knowledgeable about this? For example, any of the actual people doing the research on oil shale at the present time?

Mr. WALLICK. No, but that would be an excellent idea, and we would be willing.

Senator ALLOTT. Or such people as Mr. Cameron who was here this morning.

Mr. WALLICK. I would be very happy to suggest that be done.

Senator ALLOTT. There have been three oil shale symposiums conducted in Colorado to date and the fourth, I believe, will be held in April. I have attended two of those three and there were representatives from all over the United States—scientists who frankly lose me in their explanation of processes and other scientific explorations—between 200 and 300 present, scientists and knowledgeable people in this area who participated. Have you or any of your representatives ever attended any of these?

Mr. WALLICK. I could not say for sure, Senator Allott, because we do have members in Colorado, as you know, and there may or may not have been some of our people there. I would certainly encourage them to go and if you will tell me where the next meeting is held——

Senator ALLOTT. I think it would be better if some of the people who make these decisions in your organization—and I say this kindly—attended some of these symposiums.

Mr. WALLICK. That is an excellent suggestion.

Senator ALLOTT. And became firsthand acquainted with the problems that we are trying to isolate here so that we can form a decision. I don't believe any of us on this committee feel that we have permanent answers to these things yet.

For example, I assure you that those of us who are residents of Colorado, Utah, and Wyoming are as interested in the conservation and preservation of our natural values there as anybody in the United States.

Mr. WALLICK. I am sure you are.

Senator ALLOTT. They are a part of our heritage, and we do not intend to——

Mr. WALLICK. You are very lucky, too, I might say.

Senator ALLOTT (continuing). Throw them down the drain.

You refer, for example, to one thing in here. You say the legal question of leasing of surface deposits at this time is desirable. Do you know where there are any surface deposits of oil shale?

Mr. WALLICK. Well, what I meant to say—perhaps I did not phrase it properly—but it would involve some kind of what would amount to stripmining, as I understand it. Now, maybe I am incorrect on this, but I have been told by people who are in a position to know that this would be the equivalent to stripmining, so that there would be large deposits of residue left over on the ground. If this is wrong, I would be very happy to stand corrected.

Senator ALLOTT. Well, some of it might possibly be susceptible to stripmining, but most of the oil shale appears on the surface only in outcroppings along ledges of hills, and even that is covered—even in the most favorable places that I know of—with a considerable amount of overburden.

Mr. WALLICK. I might say, Senator Allott, that I have been impressed by the conservation attitude of a great many of the people on the Oil Shale Advisory Board who commented on this problem. I do think there is a consciousness of the conservation aspect of this whole question. But I do think that it would be very unfortunate if what is still happening in West Virginia and Kentucky were to happen in any part of this country because you can fly over those parts of the country and you can look down and see it, and it is not a very pleasant sight to see.

Senator ALLOTT. Well, we are fully aware of what has happened in those areas, but I would suggest that this problem cannot be solved just by absorbing the viewpoint of an economist who is relatively uninformed on this matter, and that it would really be of immense help to you in arriving at a decision if you could talk with and bring in some of the people who are knowledgeable with the theoretical and practical aspects of this, and, even if some of you could, at this decisionmaking level, attend some of these oil shale symposiums. If you call my office——

Mr. WALLICK. They are in Colorado. I could not say a better place to go.

Senator ALLOTT (continuing). You will be informed when the next symposium takes place.

Thank you.

Senator Moss. Thank you, Mr. Wallick, for your fine testimony. I think it is good to have these matters brought to our attention. I take it that your organization was not very well satisfied with the decision in the tidelands matter when the lands were given over to the States completely and the Federal Government simply bowed out. The burden of your testimony is urging the Federal Government to retain control and make sure that oil shale lands are developed in the public interest.

I notice that one of your reasons for advocating the Federal royalty share be increased was to combat air and water pollution, but is that not a State responsibility? Is not the State going to have to grapple with that?

Mr. WALLICK. Well, as far as providing funds for some of the programs, I think the Federal Government is going to have to, and is now, put money into that.

Senator Moss. Indeed the Federal Government is, but if the development of this oil shale industry appreciably increases air and

water pollution, the burden will come first of all on the State where it occurs and it may get some assistance from the Federal Government.

Mr. WALLICK. I was thinking of our present problems of pollution and the necessity for getting money to deal with that. That is what I really had in mind there.

Senator Moss. Thank you. I appreciate your testimony.

The CHAIRMAN. Senator Jordan?

Senator JORDAN. No questions.

The CHAIRMAN. Senator Hansen?

Senator HANSEN. No questions.

The CHAIRMAN. Thank you very much, Mr. Wallick. We appreciate having your testimony. We hope you will follow the hearings from time to time.

Mr. Angus McDonald, director of research, Farmers' Union, was to be our next witness. We have been informed that he is out of town and apparently misunderstood the date, although he had been advised of the hearings yesterday and today. The Chair will leave the record open so that he may submit a statement for the record at a later date or if there are additional hearings, of course, he will be able to testify.

Our last witness is Mr. J. H. Smith, Jr., Wolf Ridge Minerals Corp., Glenwood Springs, Colo.

Mr. Smith?

The Chair is delighted to welcome you to the committee. I recall with interest your very fine service during the 1950's as Assistant Secretary of the Navy and later as director of the International Cooperation Administration, now known as AID, I believe. We are delighted to have you, and we appreciate your fine service to the Federal Government.

Mr. SMITH. Thank you, Mr. Chairman.

The CHAIRMAN. The Chair has read your statement. I regret that I have another commitment. I am going to ask Senator Moss to preside during my absence, and the Chair has previously indicated that when we complete this morning's hearings, we will adjourn subject to the call of the Chair and the record will remain open so that those who desire to comment on the testimony may submit statements or, in the judgment to be made later by the Chair, we may have additional hearings for those who want to be heard.

STATEMENT OF J. H. SMITH, JR.; ACCOMPANIED BY ARTHUR S. BOWES, JR., AND IRVIN NIELSEN, WOLF RIDGE MINERALS CORP., GLENWOOD SPRINGS, COLO.

Mr. SMITH. Mr. Chairman, my name is James H. Smith, Jr. I represent the Wolfe Ridge Minerals Corp. The views I am expressing are endorsed by our associated companies, Advance Ross Corp., the Utah Shale Land Co., and Colorado Minerals Corp.

Mr. Bowes and Mr. Nielsen, the two senior offices of Wolf Ridge, are with me because we felt that the matters that your committee are dealing with are extremely important. Both oil and aluminum are vital commodities.

I would like to have Mr. Bowes and Mr. Nielsen come up here if that is acceptable to the Chair.

Senator Moss (presiding). That will be fine. Have them come to the table.

Mr. SMITH. Mr. Nielsen right here, and Mr. Bowes.

Senator Moss. Glad to have you gentlemen join us.

Mr. SMITH. We appreciate this opportunity to comment on the five-point program for oil shale development which was announced by the Secretary of the Interior on January 27, 1967.

Wolf Ridge Minerals Corp. is a Colorado corporation engaged in development of natural resources, principally in western Colorado, Utah, and Wyoming. The company is committed to the objective of participating in the creation and orderly development of an integrated mineral-chemical-industrial complex. The company's management and stockholders firmly believe in the feasibility of this concept and that such a development would bring significant benefits to the United States and to the individual States involved.

The company's technical and field operations are headed by Irvin Nielsen, a geologist who has been active in evaluating the geology and mineral resources of the Green River formation for the past 10 years. The company's research efforts are under the direction of John Savage of Rifle, Colo., a chemical engineer who has been engaged in the investigation and development of mineral resources for over 20 years.

Both Mr. Nielsen and Mr. Savage are members of the corporation's board of directors. The other members of the board are Samuel R. Freeman, partner in the law firm of Van Cise, Freeman, Tooley & Eason, attorney for the Colorado Oil & Gas Conservation Commission since 1954, and also formerly assistant attorney general of Colorado; Arthur S. Bowes, Jr., who is with us here today, Chicago, Ill., investments and financial consulting; John P. Boynton, Milwaukee, Wis., investments and oil and gas interest, and myself. I have been active in the development of western resources for 20 years and have served the Federal Government as Assistant Secretary of the Navy and Director of the International Cooperation Administration.

Wolf Ridge Minerals Corp. is an independent company and is not controlled directly or indirectly by any other company. It is associated with several other companies, however, in some of its work. In addition to its own staff, the company has made extensive use of outside consulting laboratories and experts.

The reason for appearing here is that the company has completed, in the last 3 years, sufficient geologic, process, and economic research on Green River formation strata to prove that its sodium exploration permit cores represent valuable discoveries of nahcolite, dawsonite, and other minerals. The minerals in this formation will yield alumina, soda ash, oil, and organic materials and can be produced from the same raw material produced from the same mine.

The company has developed, in the laboratory, a series of processing techniques which can separate and produce each of the above minerals. These can generally be described as follows:

1. Mined rock is crushed and selectively screened to remove a range of "fines." The mineral nahcolite will be concentrated in the fines because of its tendency to crush to finer particles than the tougher or more elastic host rock.

2. The nahcolite fines or concentrates will be sent to a soda ash section for processing.

3. The remaining crushed rock—about 80 percent of the total—will be routed to the retorts for recovery of condensible hydrocarbons and conversion of dawsonite to a more soluble sodium aluminum oxide.

4. The retort ash will be sized by a simple crusher for an optimum leaching. The retorted rock has a very low strength and can be inexpensively reduced in size.

5. The properly sized material will be leached with a mild caustic solution for a short interval of time. Laboratory test results to date show that this process has recovered up to 95 percent of the available aluminum. The residue is easily washed and the solution easily filtered because the rock does not contain a hydrated clay. Also, since no high pressure-high temperature digestion techniques are involved, the quantity of dissolved impurities is small.

6. The final waste, less than 50 percent of original material, will be sent to a tailings pond.

7. The "pregnant" alumina and soda ash bearing solutions can be treated by conventional means to extract soda ash and alumina. The solutions can be recirculated to build up alumina and soda ash concentrations because of the ease of leaching and washing the granular rock and the ease of filtering the solution.

Offsetting the relatively low alumina concentration are the advantages of low cost per ton and ease of crushing, leaching, washing, and filtering which combine to make the rock appear to be an economically attractive source of alumina. The processing of nahcolite is greatly simplified by being able to separate mechanically the rock from the nodular nahcolite. The retorting to recover oil is economically enhanced by removing the essentially non-oil-producing nahcolite.

Our work has included a careful, but not complete, investigation of the Piceance Basin. Our exploration and coring was done during the period April 1964 to April 1966, under sodium prospecting permits issued by the Department of the Interior. In April 1966, we filed, pursuant to the existing laws, for sodium preferential right leases on the basis of the minerals found in our cores. At that time there was a newspaper report that the minerals found were locatable rather than leasable so we were obliged to go out and stake claims.

Consequently, we believe we have taken all the action that could possibly be required of us by any interpretation of the law to permit the next phase of activity. In addition to following the procedures prescribed by law, we have made a presentation to the Secretary of the Interior—verbally on December 7, 1966, and in writing on January 10, 1967—outlining what we call the "multiple minerals" approach to the problem of developing the Piceance Basin.

I should say here that we did not invent this approach—the nature of the deposit happily forces it on us, because, in our opinion, in some areas the raw material will convert to its maximum value only through processing all of its major components. It may also be economically productive only if this is done. In other words, the profitable recovery of any one of these minerals could be interdependent on the recovery of the others. Commencing with the mining much of the route traveled by most of the material in our process is the same and therefore those costs are spread amongst the several end products instead of solely against one.

In any case, the "multiple minerals" approach is new and is made possible because of the discovery of the additional minerals. We do not offer it in any way that would exclude other approaches. By this I mean other technical approaches.

We must emphasize that our work is in the laboratory and limited. We have, at the moment, only a very small quantity of dawsonite, although we have almost all there is immediately available. For this reason, we do not suggest any diminution of other efforts to develop the total resources, with which your committee is concerned. We realize that the atomic explosion and the *in situ* process may not be compatible in close proximity to the multiple-mineral process but fortunately there is a vast area in which various experiments can be tried without interference.

We say "may not be compatible" because we are still receiving some information that has been developed lately which may make it possible to have an atomic explosion in an area in which we have been working.

We urge encouragement of all efforts, bearing in mind that the progress of this country has been due largely to those who were willing to risk financing experiments which did not promise immediate success and to the fact that all of us do better when under reasonable competitive stress.

The Interdepartmental Energy Study Report of the Office of Science and Technology stated:

> It is important to learn more about the origin, characteristics, and distribution of oil shales and carbonaceous rocks.

We feel we have made a contribution to this, and that there is much more to be investigated by ourselves and others.

It may be useful, however, to give briefly the history of the research on dawsonite which has preceded this meeting.

The existence of dawsonite in the Green River formation of Colorado was first noted by Dr. Charles Milton of the U.S. Geological Survey in 1959. The first indication of the quantities of dawsonite in this area was acquired from work conducted by John Ward Smith of the U.S. Bureau of Mines, which he reported in 1963. The first suggestion that dawsonite be considered an ore for aluminum was made by Irvin Nielsen, who is with us today, and John Savage of Wolf Ridge Minerals in November of 1965. Subsequent work by our company, the U.S. Geological Survey, the Bureau of Mines, Kaiser Aluminum & Chemical Corp., Dr. Anthony of the University of Arizona, Dr. Hay of the University of California, Kilpatrick Laboratories of Denver, Hazen Research Inc. of Golden, Colo., Cameron & Jones of Denver, and other research organizations has confirmed that dawsonite may well be a new source of aluminum.

This might have remained undisclosed for many years if these public lands had not been opened specifically for exploration for sodium deposits. Now we—industry and government—are faced with the challenge of how to make this deposit into a marketable national asset.

Continuation of our investigations awaits issuance of the leases by the Secretary of the Interior. Our 2-year prospecting permits expired April last year and we look forward to resuming our work early this spring under appropriate authorization from the Govern-

ment. Point 1 of the five-point program, announced on January 27, 1967, states that "Pending sodium preference right lease applications will be promptly considered on their merits." We appreciate this. We are anxious to resume core drilling on a larger scale to obtain more dawsonite both for our own use and that of the Bureau of Mines, with whom we anticipate cooperating closely. We seek no special rights or privileges and have applied for standard form 4–1134 (March 1964) leases. Our only comment on point 1 is that we believe the most careful consideration should be given to the question whether or not sodium should be returned to withdrawn status. If Executive Order 5327 of April 5, 1930 had not been modified to permit the search for sodium minerals, we would not be where we are today. We suggest that reverting to withdrawn status may deter rather than encourage exploration.

It is understood that a number of companies are interested in the "blocking up" provision of point 2, so we will not comment on them. Our lease applications are not involved.

Point 3 appears to foreshadow an entirely new relationship between the Government and interested companies. If it means there will be individually negotiated contracts between the Department of Interior and each interested company, it appears that we are moving away from the time-tested provisions of the leasing law to what may be a very difficult administrative task.

We also do not believe industry can be expected to undertake the research—to say nothing of the infinitely more costly development—without the firm commitment of a lease. Certainly such a lease could be revocable if the lessee did not produce, but its issuance must be assured. We also feel that this whole area is too new to permit requiring a company to "describe the process sought to be developed." This is the antithesis of research. Our own approach would be to undertake the job of developing our present process or finding a new process without starting with preconceptions, fixed plans, et cetera. We believe in confronting today's problems with tomorrow's technology.

On point 4 we welcome the enthusiasm and know-how of the Atomic Energy Commission and its associated private companies. We are fortunate that the development of clean weapons systems permits the use of atomic explosions for such peaceful purposes as this. Other *in situ* processes should be pursued simultaneously, just as one form of mining should not prevent the investigation of another—for example, we anticipate one method of mining evolving into another.

On point 5 we certainly agree with the objectives but we are not sure what is meant by "Some of these research projects will involve close cooperation etc." We feel the issue of where and under whose management the research is to be done should be faced now. This is an age-old problem—"in-house research." We suggest it is in the national interest to attract industry's best research institutions and to avoid any single-source direction of the research. The chairman (Senator Jackson) of this committee, however, has had so much experience and success in generating good research that we need make no comment.

More research will be needed. The amount of funds which will become available for this will depend on the Government's policy decision on the relative importance of developing these minerals.

These funds may come from congressional appropriations, from industry, or both—but in any case only in amounts that will depend on what importance is given the matter by the Government.

In the energy field, in 1965 the Government spent $11 million on coal research, $40 million on oil and gas, $210 million on nuclear (not including military and space oriented appropriations). Industry spent the same amount on coal, nine times as much on oil and gas, and less than half as much on nuclear. Thus there is great disparity in the R. & D. efforts in the different segments of the energy sector. This means some segments will progress more rapidly than others. It evidences a national policy decision to develop certain types of resources in preference to others. This will determine to a large extent the mix from which we will get our total British thermal units in 1980—coal, oil, gas, nuclear, solar, et cetera, all of which are competing for a share of this market.

At the same time, the Government is making important policy decisions as to where geographically we will obtain our energy. Onshore, offshore, the North or South American continents, Africa, the Middle East, et cetera, all again vigorously competing for a share of this market.

The Secretary of Interior's five-point-shale program is designed to give shale at least a starting position in this race between energy sources. This is most welcome.

The announcement of the program refers to the report of the Oil Shale Advisory Board dated February 1965, and part of the program stems from the alternative courses suggested by that Board.

In the two intervening years events have occurred which we believe must affect some of the conclusions and recommendations of that Board. The Board agreed that "oil shale development is not urgent to provide supplies of liquid fuel for the immediate future."

I would like to add here parenthetically that we do not agree with that. Since that statement the American oil industry has suffered many reversals in its relationship with the foreign countries in which it operates.

Our oil companies have been subjected to the following types of unilateral actions—specific examples can be furnished:

1. Abrogation of existing contracts;
2. Revision of tax rates for future;
3. Revision of tax rates retroactively;
4. Unilateral decision on the price of the commodity to be used for tax base, regardless of actual market price;
5. Increase in transit charges;
6. Unilateral decision as to the amount of commodity to be sold, regardless of condition of the market;
7. Seizure of local bank deposits of any company not complying with these decisions;
8. Seizure of all facilities of a foreign company;
9. Termination of concession and all contractual obligations;
10. Imposition of fines greater than the value of the company's property in the country;
11. Use of discrimination to place some companies at a competitive disadvantage; and

12. Insistence that the headquarters of the foreign company be in the host country.

In this 2-year period five foreign countries have levied retroactively over $450 million in taxes.

The additional taxes paid to these foreign governments are dollars right out of the Treasury of the United States, because they are a tax credit deductible directly from taxes which otherwise would be paid to the United States.

We doubt if this situation can be remedied by any means other than the availability of a new alternate domestic supply of oil. Assuming it will take 10 years from the date of the Government's "go" signal to achieve significant production of oil from the Green River formation (or any other new domestic source) we are already exposed to a long period of adverse actions.

This is a matter of national concern and while many of the directors and officers of this company are local Colorado people, their interest is far from local. Individually for many years they have watched the increasing reliance of the United States on foreign sources of raw materials in the face of a rising spirit of nationalism. During this period disturbing trends have been apparent in the following areas:

1. The national debt;
2. The balance of payments;
3. The gold reserve;
4. The reliance on foreign-flag shipping to handle our peacetime imports;
5. The need for a continuing major antisubmarine effort to assure the safety of such shipping as will be at our disposal in wartime;
6. The migration of U.S. industry with a reduction in job opportunities in the United States;
7. The determination of countries now furnishing raw materials to engage in the processing themselves;
8. The availability of cheap power through nuclear energy to countries heretofore believed to have no economic potential; and
9. The entry of the Soviet Union into the oil and gas market primarily on a barter and long-term government-to-government trade agreement basis.

These trends and conditions which we consider unfavorable can be reversed by policy decisions of the United States. At least $100 billion of new capital will be invested in the oil industry in the next 10 years. Whether this invention will tend to ease or increase our problems will depend largely on the policy adopted for our own natural resources.

The second important change since the Board's report in 1965 has been the recognition of the dawsonite, nahcolite, and other minerals potential.

While neither the Department nor anyone else knows the extent of the deposits of "other minerals" it is more than probable that the usable dawsonite and nahcolite deposits are smaller horizontally than the 16,000 square miles of the Green River formation. It is certain that these deposits occur only in a fraction of the total vertical deposit of shale. It is certain from the Wolf Ridge minerals cores that these deposits are large when considered by themselves, but small quantitatively when considered in relation to the shale deposits.

It is reasonable to assume, therefore, that two very different types of deposits must be dealt with—one composed of shale, dawsonite, nahcolite and possibly other minerals, and the second being without dawsonite and nahcolite. This calls for very different treatment of the two deposits from both a legal and technical point of view.

Without going into deail on the law at this time, the difference here is evidenced by the separate treatments historically given shale and other minerals by the Department under withdrawal orders and other administrative actions, as well as by the variety of laws applicable to the specific minerals. The Wolf Ridge studies and cores indicate that some areas of the Green River formation may be chiefly valuable for shale, some for other minerals and some may contain shale and minerals which individually are valueless but jointly may be commercially feasible. This has inescapable consequences. Whether or not there is a need to accelerate the development of the shale oil process, the need for a domestic source of aluminum must be considered. Our aluminum industry is far more vulnerable to unilateral actions of foreign governments than the oil industry. Almost 90 percent of our bauxite comes from abroad—from a few countries whose need and desire to strengthen their own economy is no less than that of the oil producing countries. Canada, from whom we import both aluminum and oil, has to import both from these same countries to supply us.

Aluminum is also almost as critical a material in both our peacetime and wartime economies as oil. Consumption is rising rapidly, its availability has steadied prices of competitive materials, and the Government has spent substantial sums encouraging search for new sources, both within and without the United States.

We believe the present Government policy with regard to aluminum is:

(*a*) to promote a competitive industry,
(*b*) to encourage the entry of new producers, and
(*c*) to protect the small nonintegrated consumer of ingots or semifabricated aluminum.

Mineral Facts 1965 states that:

> The maintenance of adequate aluminum supply requires assured ore supplies. It also requires acquisition of adequate quantities of low cost electric power. And, thirdly, it requires a decrease in the high-energy consumption in producing aluminum.

We believe we are advancing a project which serves the policy objectives and which has both the assured ore supplies and the necessary low-cost power. It is hoped also that we will be able to show that the high-energy consumption in producing aluminum from bauxite will be reduced when the process commences with dawsonite.

With regard to the Secretary's five additional objectives—encourage competition, prevent speculation, promote conservation, encourage fullest use, provide reasonable revenues to Federal and State governments—we are for all of them. We are very conscious of the public interest in these resources, and feel this will be served well by an action program given impetus by Congress and the Department of the Interior and carried out forcefully by imaginative and competitive segments of American industry.

I would like to close with a statement on our present activity. We are awaiting reply to our application for leases. We have used up practically all of the dawsonite from our cores in experimental work, and expect now to continue the work on dawsonite obtained from deposits outside the United States, until such time as we receive the necessary authority to proceed on the Federal lands. We are also working on water and power supplies; on community planning and, with the State, on conservation and pollution control.

I appreciate this opportunity to appear before your committee and would be glad to answer any questions.

Senator Moss. Thank you, Mr. Smith, for a very fine statement. It reveals to me, at least, the extent of work that your company has been doing in this area.

I take it that you have applied for mineral leases in this area, but you have also made mineral entries on the same land in order to cover that claim, too, if it is necessary to go the mineral entry route, is that right?

Mr. SMITH. That is correct, sir.

Senator Moss. And what is nahcolite? Can you describe that a little and what it is useful for? I know something about dawsonite, but I do not know about nahcolite.

Mr. SMITH. I will turn that over to Mr. Nielson, who is our chief geologist.

Senator Moss. Will you enlighten me a little?

Mr. NIELSEN. Yes. It is a sodium bicarbonate, more commonly known as baking soda, and it is useful in making soda ash, which is a basic chemical used in industry—in the glass industry, pulp and paper and ore refining industries, et cetera.

Senator Moss. When I take some baking soda, I now know I will be taking nahcolite.

Mr. NIELSEN. I would like to make one more comment. Dawsonite is more familiarly known as Rolaids.

Senator Moss. You mean it is a choice between Tums and Rolaids?

The method of recovery of oil from the oil shale that your company has concentrated on would be the removal of rock and retorting rather than looking toward this *in situ* process that we have been talking about, is that correct?

Mr. NIELSEN. Yes. We would start out hopefully in the optimum combination of dawsonite-nahcolite and oil in an underground mining section.

Senator Moss. And would the process you contemplate permit total recovery or what percentage of recovery of the kerogen from the rock?

Mr. NIELSEN. As I visualize it, Senator, we would use a very small section of the oil shale section during the first one or two generations. The deposits are immense and at a small interval would last a very large-scale plant a long period of time.

Eventually, many years after the initial industry is started, I think some complete recovery method would be instituted such as the Bingham pit or the block caving system or whatever else might be devised.

Senator Moss. Your company is not actually engaged in production now. You are still in the research and development stages. Is that right?

Mr. NIELSEN. That is correct.

Senator Moss. Your hope is that the Congress can rather quickly clear up this problem of withdrawal of some of the minerals so that you can move into actual production; is that right?

Mr. SMITH. We were a little discouraged listening to the description of the "legal thicket" yesterday. We do not think we are as involved in that as possibly some other areas are. We feel that it might be possible for us to move ahead faster. However, we are not ready for production at all. We would certainly have to go through a pilot plant phase before we go to a commercial plant. This is the proposal we made to the Secretary of the Interior.

Senator Moss. Are you part of the group which has agreed to support the research and development work in the *in situ* experiment?

Mr. SMITH. We have agreed to help support the AEC atomic explosion, but we are not involved in the Anvil Point group.

Senator Moss. Would your company concentrate on the extraction of nahcolite and dawsonite and work in conjunction with one of the oil companies on the oil part, or would your company do all three?

Mr. SMITH. We are not sure which route we would go ahead with. It depends a good deal on what the next step in our research and development program develops.

Senator Moss. You have not made that decision as yet?

Mr. SMITH. We have not committed ourselves; no, sir.

Senator Moss. Well, your testimony certainly is helpful and enlightening. We appreciate it very much. Probably there will be some questions from the other Senators.

Senator Allott?

Senator ALLOTT. Yes. I realize the hour is late, Jim. I want to congratulate you on a very, very fine statement, but I would like to clarify something I am not quite sure about, from Mr. Nielsen—on account of the sound system we have here.

Did I understand you to say, Mr. Nielsen, that there were sufficient deposits of dawsonite and nahcolite, which were essentially separated from the oil shale itself, that would permit or had promise of permitting a viable industry to develop in just this area alone?

Mr. NIELSEN. I am not sure I understand your question, but——

Senator ALLOTT. Okay. I will put it another way, then.

Did I understand you to indicate that there were sufficient deposits of dawsonite and nahcolite which were essentially separated from the deposits, the oil shale deposits themselves, that you could operate in the foreseeable future and develop a considerable industry without getting into the production of oil itself?

Mr. NIELSEN. No. That is not——

Senator ALLOTT. The reason I ask this is that Mr. Smith, in his testimony, talked about the overall strata of the Green River formation, but he also spoke about vertical areas, which were relatively a small part of the whole Green River formation, in which the dawsonite and nahcolite were very prevalent. Perhaps it would help if you would geologically explain this situation.

Mr. NIELSEN. All right.

The dawsonite and nahcolite occur intermingled in oil shale. It is not possible to extract dawsonite and nahcolite under most conditions without extracting the host rock, oil shale, which is one and the same, in effect.

The richest part of the section is approximately 200 feet thick. However, 600 to 800 feet of the Green River formation contains the two minerals. We believe that we——

Senator ALLOTT. The two what?

Mr. NIELSEN. The two minerals, nahcolite and dawsonite. And all of the 800 foot section would yield oil.

Senator ALLOTT. This is why, therefore, the forepart of Mr. Smith's statement went into the proposed research and separation of the three chief components you have spoken of today, soda ash, and alumina, and the extracts of the oil from the shale itself.

Mr. NIELSEN. That is right.

Senator ALLOTT. Now, Jim, I would like to ask you a question. You said on page 9 of your statement—and I do not think you need it for my purposes—that the proposal of the Secretary is the antithesis of research. Therefore I assume that what you are saying in one sense is first of all that you have got to have leases in order to develop the reserach to the place where you can get it strictly out of the laboratory.

Mr. SMITH. That is not exactly the point I was trying to get across when I said this is the antithesis of research.

Senator ALLOTT. No. You were referring to the leasing policy.

Mr. SMITH. No, we are concerned by the possibility of having the research directed or that we woud have to describe the process sought to be developed before we initiated the research. We think that that closes your mind to the various possibilities. We believe that when you are doing research you should approach the problem with a totally open mind, without any commitments as to what you are going to arrive at. If we had not behaved in that manner, we probably never would have gotten to the position we are with dawsonite today. For example, many people have been involved in doing research on oil shale for years. They have been looking at this mass of rock and they have found out a great deal about the oil shale in it because they set out to find out only about oil shale. What they did not find out, because they did not enter the project with an open enough mind, was the fact that there could be other minerals present that have great economic importance. These turned out to be dawsonite and nahcolite.

Senator ALLOTT. Then this leads us to the second point, necessarily, that you cannot do this research without having an opportunity to procure a lease for further research.

Mr. SMITH. That is true. We believe that from this point on the research and beginning of development would be an extremely expensive thing. We feel that the only way you could finance that, particularly a small company that does not have a going concern, that has a cash flow and is generating its own capital, that this company will have to have a lease that cannot be revoked except for failure to perform. In other words, we should not be asked to make this heavy capital investment, and in fact we would not be able to get a bank to bank it, unless we were assured of a lease and sufficient raw material to go ahead if our process is successful and to go ahead for a long enough period of time to amortise the capital investment.

Senator ALLOTT. Well, this brings us pretty close to the point I made a while ago with respect to the companies which are interested

solely in oil, that they are, in effect, hanging on the edge of a cliff as far as the development of their own resources until they are assured of what the Government's policies are going to be with respect to Federal leasing, does it not?

Mr. SMITH. Yes, very definitely.

Senator ALLOTT. I know that you must have talked with the Bureau of Mines and Geological Survey many times, and I note that there is no one on the list of witnesses for these 2 days from either of those sources.

Have they prepared anything or is there anything available and would it in your opinion be advantageous to us to hear from them about the economic significance and the amounts of minerals that might be procured through the exploitation of dawsonite and nahcolite?

Mr. SMITH. Both the U.S. Geological Survey and Bureau of Mines have very competent people in the Denver area. I think they are fully aware of the work we have been doing. We have cooperated with them. We have given them a lot of information, and I would think it would be helpful to have testimony from technical experts who have actually worked with the material.

Senator ALLOTT. Well, I appreciate that because, after all, they are an arm of the Government and what they contribute might be of definite value.

Thank you very much.

Mr. SMITH. Thank you, sir.

Senator Moss. The Senator from Idaho.

Senator JORDAN. Mr. Smith, I want to compliment you on your statement. It adds materially to the background information that we need before this committee.

Your company has been proceeding on a wide front, I take it. You mention your multiple minerals approach where you expect to isolate all of the separate minerals and recover them if it is economically feasible to recover them. This would assume going forward on regular conventional mining practices, would it not, removing the ore and putting it through the various processes that are indicated by the minerals you expect to recover?

Mr. SMITH. The program we have outlined uses techniques and processes that are well developed and well understood. We would expect to improve those as we go along, but we are trying to start off from known states of the art.

Senator JORDAN. Yes. We would have to forgo some of the multiple minerals approach if we went altogether to an *in situ* approach in mining, would we not?

Mr. SMITH. I think we would like to reserve opinion on that. As I mentioned in my testimony, we have some new thoughts on the subject. It is possible that the Atomic Energy Commission program might be compatible with the work that we are doing.

Senator JORDAN. I believe in your testimony you mentioned a fantastic sum, $100 billion, that might be needed to develop this resource. If this is true, before that kind of capital is made available, certainly the climate would have to be attractive enough and the leases, and so on, to know that you are going to get a fair return on that investment, would it not?

Mr. SMITH. No, sir. I am afraid I did not make myself clear. What I said was that there will be $100 billion new capital put into the worldwide oil industry in the next 10 years.

Senator JORDAN. Yes.

Mr. SMITH. I did not mean it would go into this project. In the normal course of events this is the magnitude of the capital investment that will be made by the industry worldwide.

Senator JORDAN. In toto.

Mr. SMITH. In toto, yes. The industry in the United States right now spends about $2 billion a year just drilling holes. What I am pointing out by this comment is that an enormous investment is going to be made in the industry. Now, which way it goes depends a good deal on Government policy.

Senator JORDAN. All right. Then this leads to the question: What percent of that amount of capital might be induced to come into this area?

Mr. SMITH. That is a very difficult question to answer. What we are saying is, it depends on how important the Government finds the need for a new domestic source of oil and aluminum.

Senator JORDAN. And the terms of risk that might be——

Mr. SMITH. Yes, sir. You see, Secretary Udall's statement was that there was not a need for a new domestic source of oil. He did not make a statement about aluminum. He did not mention the need for aluminum at all. We think there is a fairly urgent need for a new domestic source of oil and we are sure there is for the basic components of aluminum.

Senator JORDAN. Most of the witnesses who have testified agree with you and not with the Secretary.

Mr. SMITH. Yes, sir, I think so.

Senator JORDAN. I have one other question. On page 16, and you do not need to refer to it, you said: "It is hoped also that we will be able to show that the high-energy consumption in producing aluminum from bauxite will be reduced when the process commences with dawsonite."

In what way will commencing with dawsonite reduce the energy consumption in the production of aluminum?

Mr. SMITH. I would like Mr. Nielsen to talk about that.

Mr. NIELSEN. In dawsonite you would start out with the sodium aluminate in solution and you would eliminate the step of roasting lime and soda ash and bauxite together to make the alumina available. You would eliminate one manufacturing step.

Senator JORDAN. The product dawsonite, then, is derived after the great amount of energy has already been applied to the other alumina, and so on.

Mr. NIELSEN. That is correct.

Senator JORDAN. Thank you.

Senator Moss. The Senator from Wyoming.

Senator HANSEN. Mr. Smith, let me say at the outset that I have been very impressed with your testimony before this committee and with the insight you have provided us. Your testimony not only touches on the national policy questions with which we should all be concerned but offers us some real alternatives for solving the mineral development dilemmas facing this country.

I would just like to point out that I believe your remarks here before us represent some of the most concrete, thoughtful, responsible and constructive responses that we have had during these hearings on oil shale development, and I want to thank you, Mr. Smith, at the outset for your contributions and the terrific innovations provided us by Mr. Nielsen.

Mr. SMITH. Thank you.

Senator HANSEN. Mr. Smith, there has been a good deal of discussion concerning the urgency of an oil shale and associated minerals development effort, but so far in these hearings, other than some mention of a 10- to 15-year leadtime requirement, we have not pinned down any facts relating to our future energy needs. I would like to refer to a short article in the Wall Street Journal of Monday, February 20, which summarized the results of a recent study made by Mr. John C. Lichtblau, research director of the Petroleum Industry Research Foundation, Inc.

Mr. Lichtblau predicted that domestic production of crude oil and natural gas liquids would have to rise to 13,208,000 barrels daily by 1980 to maintain the share of the Nation's needs currently allocated domestic producers by the Federal Government mandatory import controls program.

According to the Oil and Gas Journal, this compares with our 1966 output of 9,102,000 barrels a day. Using this as a base, Mr. Lichtblau said that to sustain the 1980 rate of output with the present level of 12-year supply at present rates, U.S. producers would have to find 97.2 billion barrels of new oil reserves in the 1965 through the 1980 period.

This would represent a 51-percent increase from the 52.6 billion barrels found in the previous 15 years.

Citing these needs, Mr. Lichtblau forecast a growth rate for oil, however, of only 2.7 percent a year compared to an estimated 3 percent per year rise in total U.S. energy consumption.

Most disturbing is the fact that he estimated that U.S. wells will have a 21-percent reserve capacity of actual production rates in 1980, down from 75 percent at the present time.

I cite these figures here because Mr. Lichtblau then goes on to say that his research indicates that oil shale would not make a measurable contribution to crude supply in the next 15 years.

That statement, made in the face of such evidence which indicates a drastic decline in our domestic liquid reserves, is disturbing to me on its face.

Would you care to comment on this recent detailed study, Mr. Smith?

Mr. SMITH. I do not know Mr. Lichtblau and I am not familiar with the report. I think I should comment only on his prediction that oil shale will not produce anything for the next 15 years.

On that I would say that Mr. Litchtblau appears to be a very practical, realistic person. He is looking at the history of oil shale. On the basis of past performance and what has visibly been going on so far, I would think that his prediction is right. The only way something is going to happen in the oil shale business is to have Congress, the executive department, and industry make up their minds whether they want it and go ahead with it.

Senator HANSEN. Yesterday this committee had the benefit of testimony by Secretary Udall and Mr. Luce and Mr. Barry. Unfortunately the Secretary's statement was not made available to the committee before he made his appearance, but now that we have had a chance to digest some of the Secretary's remarks I just wondered if you had any further comments on them.

Mr. SMITH. Yes. I have a few points I could develop, although I have not had a chance to study the full transcript of his testimony. I noticed on page 4 of the document that he submitted he stated, "It appears that they"—being other minerals—"cannot be developed without disturbing or possibly damaging the shale."

In our opinion the development of the other minerals cannot help but bring shale oil closer to a reality economically and we see no possibility of damage to shale.

On page 5 the Secretary stated:

> The Director of the Bureau of Land Management has initiated action on pending sodium lease applications to expedite decision whether leases should issue.

In our opinion the issuance of the sodium prospecting permits by Interior in April 1964 and the completion of all the legal requirements by the applicants obliges BLM to issue the leases. It cannot in good faith knowingly permit the work to proceed under the existing laws and in reliance on them for 2½ years and then change the rules.

On page 7 of his prepared testimony he stated:

> We propose to open small areas * * * the most limited that will accommodate a prototype.

This language appears to me to be designed specifically to discourage industry from going into the business. Also on page 7 of the statement:

> The development contract may ripen into a lease.

I do not understand the word "ripen." Our company would not wish to engage in any contractual relationship with the Government that is not clearly defined and publicly approved in advance, preferably on a standard form available equally to anyone else. This is the basis of our applications.

On page 10 it is stated:

> Let us concede we are in no danger of a petroleum shortage.

I think it is very difficult to reconcile this statement with the fact that Interior is considering "early and sharp increases in oil import quotas," according to the news reports today. I believe that this question whether we are facing a petroleum shortage should be looked at with the greatest of care.

On page 12 it is stated:

> The question of tax treatment can be readily identified as a serious factor in determining shale's competitive standing.

The question of tax treatment I believe could be resolved in no more than 90 days if the appropriate authority were asked to do it and got about the job.

Finally, I think the Secretary stated in a section of his testimony that was not on his prepared paper:

> We can control and phase in the oil shale industry.

I do not believe that this is possible unless the Government intends to control every aspect of the oil industry.

The Secretary also expressed concern about protecting the resort and tourist facilities in the area. I am sure that many of you gentlemen are familiar with the Piceance area, but for those who are not I think it is safe to say that there have not been as many people in there this year as there are in this room. It is not a tourist and resort area. It is a rather desolated part of Colorado. So, much as we appreciate the consideration, we do not think it is a determining factor.

I think those are the only comments I have. Thank you, sir.

Senator HANSEN. Mr. Smith, as you know, this committee held informational hearings on oil shale in 1965. In order that we might have some continuity, would you care to comment on those hearings, that is, were there any assumptions made then which need revision now?

I appreciate, I might add parenthetically, that we have had a multiple mineral development that was not discussed then. The Wolf Ridge Minerals, as you know, of course, had not yet awakened the world to the possibility of dawsonite, and in that context I appreciate it has changed. Do you have any further observations that you would care to make, sir?

Mr. SMITH. At your hearings 2 years ago it was stated that the major issue was whether the Federal Government should open up its vast oil shale holdings to commercial leasing. I think it is disturbing that this question is still before us 2 years later. It was also suggested then that possibly the oil shale reserves should be held as an "ace in the hole." I feel very strongly that oil shale is not "money in the bank." Its relative value could decline. We cannot sit here and assume that this vast sum that people are continually talking about is going to be available in dollars 20 or 50 years from now.

We have tried to stress here that this is a very competitive field, the energy field, and it is perfectly possible that oil shale will be outrun by some competitor that is going to be the result of technology that is coming up fast right now.

The question was also asked at your hearing in 1965, "Should an early ruling on depletion allowances be sought?"

I believe there has been legislation proposed that will clear up the tax treatment of shale and again I feel it is regrettable that this legislation has not moved forward.

I noticed yesterday even that the Solicitor of the Department of the Interior was not clear himself as to the meaning of the legislation that is presently before the Congress.

That is all I have. Thank you, sir.

Senator HANSEN. On the overall problem of a progressive oil shale development policy, I want to compliment the Senator from Colorado on the legislation he has submitted before this Congress. Would you care to comment on the depletion allowance he has already——

Mr. SMITH. I believe that the legislation that is presently before the Senate and the House is adequate as far as commencement of an industry is concerned.

Senator HANSEN. Just one final question.

I know we are all concerned with development of these important resources, consistent with other values, and the protection of other

values, and I think you have perhaps done some very unique work in going to different institutions of learning—I believe it was Cornell University—and working with other groups in seeing what can be done in the way of overall planning and development, anticipating the entrance of people into these areas. What will be required in the way of new cities and that sort of growth? Would you have just a word for us in that regard?

Mr. SMITH. We are very fortunate to have several studies made of the impact of the population growth that would result from the beginning of a substantial industry in an area where there are now practically no people. The Denver Research Institute made a careful study, in fact two studies, of the economic impact on the region of an oil shale industry. We then had Cornell University work up a master plan in various phases as to how the population and community would be handled. At the present time we have a regional planning organization supported by tax levy working on the whole program.

We, of course, are very concerned with air pollution and water pollution. We are very concerned with the availability of water which has already been discussed here. I know it is not necessary to state to you gentlemen that water does not wait in the West. It is being taken up rapidly and put to use. We are very much concerned by the possibility that there simply will not be enough adjudicated water to do the million barrel a day job of 5 years or 10 or 15 years from now, to say nothing of the period beyond that. And I agree heartily with Mr. Russell Cameron, who stated that the 20,000 acre-foot figure that was given by the Secretary is not the key figure. We must go much higher than that because if you do not have enough water to support the whole system, enough water to support just one part of the process is not any good at all.

Senator HANSEN. I know you have gone with unusual vigor into seeking out answers to the ramifications of oil shale development, anticipating problems, and I wish we had more time to explore your findings. I appreciate that we do not. I want to commend you for a very excellent statement, Mr. Smith. I think you made a big contribution.

Mr. SMITH. Thank you, sir.

Senator HANSEN. Thank you, Mr. Chairman.

Senator Moss. Thank you, Mr. Smith, Mr. Nielsen, and Mr. Bowes. We do appreciate your coming. The statement was most helpful and reinforces some of the urgency for moving on in this field.

The Senator from Colorado mentioned that we did not hear from the Bureau of Mines and the Geological Survey today. I should announce that both Dr. Hibbard and Dr. Pecora were invited but are out of the city at this time, in California, so they could not appear. However, the committee certainly will invite them at a later date and certainly will hear from them.

As the chairman announced, the record will be kept open at least until March 10 for any additional statements that anyone would like to file to amplify the record and clarify any of the points that have been discussed or bring in any new material. This is an exploratory hearing and we would welcome any additional statements. They will be printed at this point in the hearing record.

(The statements referred to follow:)

STATEMENT OF ANGUS MCDONALD, DIRECTOR OF RESEARCH, NATIONAL FARMERS UNION

Unfortunately, because of assignment in Wisconsin, I was unable to appear before this Committee on the date scheduled for the hearing. I am therefore sending a copy of this statement to each Member of the Committee with the hope that our views may receive some consideration.

National Farmers Union, for many years, has been interested in resource development on public lands. We have appeared many times before many Congressional Committees urging that the public interest receive consideration when policy and action programs relating to the public lands were developed. The National Farmers Union has consistently urged that public land resources be developed or distributed to the end that the greatest possible number of our citizens would be benefitted.

Our position in regard to the family farm Reclamation Law stems in large part from this policy position. We have urged this Committee over a long period of years to protect the 1902 Reclamation Law which provides that benefits from federally built dams be limited to that amount of water required to irrigate 160-acres per person, or 320-acres for a man and his wife. Unfortunately, administration of this law has been difficult and has seemed at times almost impossible to enforce. In our opinion, land-owners in California are illegally receiving vast amounts of water from Federal projects.

We are aware that the Department of the Interior, in the Central Valley and in the Imperial Valley project in California, has taken cognizance of this situation and has taken steps to penalize those who are illegally using water and to bring about better administration of the law.

Formulation of policy relating to the distribution of benefits from development of oil shale lands will no doubt encounter the same kind of obstacles experienced in administering the Reclamation Act. Mining claims, according to the recent statement of the Secretary of the Interior, have not been filed with his Department and it is therefore impossible to ascertain the location and the number of mining claims which have been filed in the land records of counties throughout the West. We suggest that legislation is urgently needed and that these claims, some of them many years old, should be invalidated and that the Department be given authority to bring some order out of chaos in regard to the exploitation of minerals on public lands.

There seems to be a great deal of confusion and misunderstanding, at least on our part, as to whether or not the Department can, under present law, put into effect the program which the Secretary outlined on January 27 of this year. According to various newspaper stories, oil and mining companies have deluged the Department of the Interior with a flood of new mining claims. Apparently this is an attempt to get in on the ground floor and preempt the right to develop oil shale.

I call attention to a press release of the Bureau of Land Management, dated November 23, 1966 which, and I quote, says:

"The Act of August 13, 1954, provides that rights to oil shale and certain other leaseable minerals are reserved to the United States both before and after a patent is issued to a mining claimant on public lands known to be valuable for any leaseable minerals.

"To be valid, a mining claim must be on lands open to mining location, and there must be a discovery of a deposit of a valuable mineral subject to location under the U.S. mining laws.

"The Bureau said reports growing out of the Colorado platinum activity that a claim located for metals carries rights to oil shale simply are not true."

It would seem that if the Department is correct in this release, oil companies and others are going through a lot of lost motion in filing these claims. However, they may be depending on either Department of Interior policy or the enactment of a Congressional statute to circumvent the 1954 law.

Our attention has also been called to a combine consisting of 24 oil and mineral companies, which was formed to investigate the use of nuclear explosives in the recovery of oil from shale. It is reported that this group has met with representatives of the Atomic Energy Commission in an effort to set up a cooperative venture utilizing nuclear explosions to transform the oil shale into a liquid which could then be taken out of the ground.

Industrial and electric power companies have, over a period of many years, indirectly used funds appropriated for the Atomic Energy Commission for their own purposes. We recall that year after year representatives of these firms appeared before the Atomic Energy Committee urging the expenditure of vast funds while at the same time asserting that they required no subsidies. We hope that if a cooperative arrangement is worked out between the oil companies and the Atomic Energy Commission, that the taxpayer will not be required to carry the main burden of developing processes using fissionable material.

Something should be said about the enormous value of the shale oil resources on public lands. According to *The Oil and Gas Journal*, it is estimated that shale oil is worth around $2½ *trillion*. Under existing law if shale oil development is turned over to private firms, the United States will realize only 10% of its value. Thirty-seven and one-half percent would be turned over to state governments and 52½% to the Federal Reclamation Fund. We suggest that before anything is done in regard to the legalization of leases of oil companies that a statute should be enacted providing that the Government would obtain most of the benefits.

The National Farmers Union has supported, as indicated, the Reclamation Law designed to benefit family farmers. However, we feel that money realized from the development of oil shale should not be turned over to the Reclamation Fund. We would prefer rather that it be set aside for purposes of education, rebuilding of cities, purification of the air and abatement of pollution in our streams. Here, perhaps, is a golden opportunity for the Administration to build the Great Society and resolve industrial, population and urban problems.

We do not quite understand the need at this time for a crash program on shale oil, although we would have no objection to a relatively small development project which would pave the way for economical development later on. The record is replete with information to the effect that there is no great hurry. Present reserves in the United States are ample and the major oil companies are importing vast quantities of oil which has, over a long period of years, constituted an economic threat to independent producers in the United States.

Despite these facts, large companies are determined to obtain leases of large areas which would not be needed for many years. For example, it is reported that Shell Oil wants to lease 50,000 acres in an area estimated to contain 150 billion barrels of oil—enough to meet Shell's requirements for 660 years.

Congress, some time ago, authorized a Public Land Law Review Commission, which is directed to study the shale oil problem and make recommendations to the Congress. While we might not agree with such recommendations, we suggest that Congress at least wait until the Commission makes its recommendations which are not due until December 31, 1968. Any legislation except that which would protect the interest of the United States would be premature.

Finally, we urge the Committee to disapprove legislation similar to that introduced in the 89th Congress. Bills in the House call for a depletion allowance rate of 27½% instead of the 15% depletion allowance which would be applied to the shale. In the Senate, legislation would permit only a $2.50 per acre payment to the Government by companies leasing shale oil lands. This legislation would dwarf all previous giveaways ever heard of or even imagined. We urge this Committee to protect the interest of the citizens of the Nation in regard to oil shale lands.

SINCLAIR OIL CORP.
New York, N.Y., March 7, 1967.

Hon. HENRY M. JACKSON,
U.S. Senate, Washington, D.C.

DEAR SENATOR JACKSON: I am pleased indeed that you are taking such an active interest in the economic development of oil production from shale which would seem attainable within the next several years and being a nation whose economy is geared to oil we should give the freest range possible to private enterprise to develop shale production as it has so well developed our other natural resources.

Sinclair has been extremely interested in this for many years, has spent several million dollars in research and field testing and we are currently very actively pursuing our studies.

In light of the recent new expression of impending action by the Secretary of the Interior we have again made our views known to him as we were pleased to make them known to the Senate Committee on Interior and Insular Affairs on February 21–22, 1967.

I feel that our collaboration with the government has been fruitful in this respect and in this feeling we are proceeding to continue our cooperation. I am sending you this separate note just to let you know that this is not only a technical excercise with the Company but throughout our organization we are, all of us, vitally interested in the development of this production.

Again, I am thankful that you are taking such a strong interest in this matter.

Sincerely,

E. L. STEINIGER,
Chairman of the Board.

SINCLAIR OIL & GAS CO.,
Tulsa, Okla., March 8, 1967.

Hon. H. M. JACKSON,
Chairman, Senate Committee on Interior and Insular Affairs,
Old Senate Office Building, Washington, D.C.

DEAR SENATOR JACKSON: Sinclair Oil & Gas Company, the exploration and production subsidiary of Sinclair Oil Corporation, submitted comments on the announced Oil Shale Policy of the Department of the Interior to Secretary Udall on February 14, 1967. Our representatives attended the open hearing of the Senate Committee on Interior and Insular Affairs on February 21–22, 1967. We are pleased with the deep interest evidenced by members of the Senate in future oil shale development.

During your committee hearings, a number of points were raised on which we would like to base further comments. We understand that the record of this meeting is being held open for additional submittals of information and request that my letter to Mr. Udall of February 14 (copy attached) be included in the record of this committee meeting as representing the views of Sinclair on certain matters together with the following elaboration commenting on items raised during your hearings.

1. We strongly believe that there will be real need for a viable oil shale industry in the next decade to meet the needs of our domestic economy, to provide for national emergency, and to prevent serious balance of payment problems due to overdependence on foreign supplies of raw hydrocarbon materials.

2. A company can be expected to risk major research expenditures on oil shale only if assured that it will have a commercial land position as a result of such work. This assurance is not provided by the two-step award procedure implied by the Secretary's announcement.

3. We were pleased to hear a number of comments by Senators as well as by Secretary Udall indicating that the proposed program should recognize the serious research efforts of the several companies who have been striving to develop commercial methods of producing oil from oil shale. Sinclair has invested considerable sums in its own laboratories as well as through the Anvil Points research group to develop a commercial technique for producing shale oil by mining and retorting and has conducted expensive field experiments, independently, since 1953 to evaluate new methods of recovering shale oil with in-situ techniques.

4. In view of the extensive statements made at the Senate Hearing concerning recovery of Dawsonite as well as shale oil, we would like to advise that we have carried out joint research with the Aluminum Company of America for nearly a year. This work is currently in progress and is expected to continue for some time using actual core materials obtained from Sinclair properties. A potential process for alumina recovery has been conceived and is being evaluated. It is premature to expect any company to have conclusive results now as to the economics and processing of these deep, complex, and low-grade assemblages of minerals and hydrocarbons. However, the serious nature of our cooperative investigation illustrates the need to include provision for multiple company operation of both research and commercial leases.

We shall look forward to attendance at future hearings by your committee.

Sincerely,

G. D. ALMEN, Jr.

SINCLAIR OIL & GAS CO.,
Tulsa, Okla., February 14, 1967.

Hon. STEWART L. UDALL,
Secretary, Department of the Interior,
Washington, D.C.

DEAR MR. SECRETARY: Sinclair has been very interested in the recent press releases and official statements of the Department of the Interior concerning the policy to be formulated on future disposition of government-owned oil shale lands in Colorado, Utah, and Wyoming and especially in the Piceance Basin. It appears that many of the proposed rules follow very closely the recommendations made in Mr. J. B. Kennedy's November 24, 1964 letter to Mr. Joseph L Fisher of the Oil Shale Advisory Board, a copy of which is attached for your ready reference. We would like to expand on Sinclair recommendations as they may pertain to the proposed policy and respectfully submit the following:

1. In order to encourage the very large-scale research investments needed to develop commercial production techniques, companies will need assurance that they will be awarded sufficient commercial reserves to make adequate profit on the overall investment. We recommend that, upon presentation of research plans, each company be granted the right to use a development tract for research and an option on a specified commercial tract of its selection. The option would be exercisable by the commencement of operations on the commercial project. Time limitations on the option should be flexible enough to permit extension of serious research and development if needed.

2. If limitations should be established on the total amount of oil shale leases granted to one company, we recommend these take into consideration richness, thickness and process considerations instead of just surface acres. Some flexibility should be allowed to reward those companies who in the past have pursued and who in the future aggressively pursue oil shale research and production.

3. Raw shale oil is not a saleable commodity. It will require pour point reduction in order to be transportable through pipelines and hydrogenation in order to be used in a refinery. Large surface acreage will be needed for water storage, waste disposal, plant operation, etc. Therefore, we recommend that acreage be leased in one large block rather than a "checkerboard" approach of spreading out smaller amounts over a large area. The potential of acquiring larger blocks will do much to encourage research and production investment.

4. Our past research on underground retorting of oil shale and our current program in the Anvil Points cooperative research project lead us to believe that shale oil production will become economic in the foreseeable future. However, engineering and economic analyses made in connection with these projects indicate low potential return on investment. We are not in complete agreemet with the idea that the current nuclear approach to the problem can reduce costs radically, even if the process works. Since there is little technical promise of substantial improvement in shale oil economics, we believe the government should be prepared to accept much smaller royalty rates than are used in conventional oil and gas leases and should encourage investment through an enlarged depletion allowance and investment tax credits.

5. In view of the dollar requirements of oil shale research and the risks involved, it may be necessary for several companies to pool their resources. We recommend that both the provisional development and the commercial leasing policy include provisions for joint operations through government-approved units.

6. Water availability and waste disposal will be important factors in the development of the shale oil industry. We urge the government to take early steps to provide for the development of water resources sufficient for a commercial shale oil program. Government and industry should actively begin formulation of pollution and waste disposal regulations that will both protect the beauty of the lands and promote commercial production of shale oil.

Dr. Rex T. Ellington has been appointed Oil Shale Project Manager for Sinclair. Please feel free to contact him for any assistance that we can provide in this important program. He can be contacted at the letterhead address of Sinclair Oil & Gas Company.

Respectfully submitted.

G. D. ALMEN, Jr., *President*

AMERICAN FEDERATION OF LABOR AND
CONGRESS OF INDUSTRIAL ORGANIZATIONS,
Washington D.C., March 9, 1967.

Hon. HENRY M. JACKSON,
Chairman, Committee on Interior and Insular Affairs,
U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: In connection with recent hearings by your Committee on development of oil shale resources on federally owned lands, I wish to present the views of the AFL–CIO.

The AFL–CIO has long standing interest in development and protection of these resources. Our position was reiterated in a 1965 AFL–CIO convention statement which declared:

"We urge full protection of the enormous stake that all Americans hold in the oil shale deposits on federally owned lands. The federal government should rapidly enlarge its efforts to develop economically competitive techniques of processing liquid petroleum out of shale rock. It should build demonstration plants as yardsticks to private industry, performance and costs. Resumption of leasing on federal oil shale land should not be authorized without the strongest protection against private monopoly and speculation."

The oil shale resources lying under some 5.1 million acres in the Green River Formation of Colorado, Utah, and Wyoming are of almost incalculable value—with estimates ranging from $300 billion to $2.5 trillion. Revenues to the federal government from an orderly leasing program at the proper time and under appropriate safeguards will be enormous.

The importance of our shale oil reserves for this country's future energy requirements can scarcely be exaggerated. We believe these resources should be developed in such a way as to bring the broadest possible benefits to the public welfare, to strengthen the economy, to insure constructive competition, to prevent private monopoly over major natural resources, and to protect the affected environment.

Therefore, we support proposals by the Secretary of the Interior for a 10-year study of technological and environmental problems associated with development of oil shale resources.

However, we strongly oppose proposals by the Secretary which would lead toward commercial leasing of shale oil lands before the major problems of public interest protection, technology, and conservation are solved.

We are particularly concerned about the dangers of monopoly in shale oil development, and therefore we oppose the Secretary's proposals:

(1) To exchange private lands for public oil shale bearing lands in order to assemble "management blocks" for private development purposes; and

(2) To open up small areas of federal oil shale lands to test development by private interests.

We believe these proposals are contrary to the public interest because, as the Secretary himself admits, "the development contract may ripen into a lease for full scale production", and thus open the gates to private commercial leasing before public policy and safeguards are formulated and effective.

We do not oppose development of our oil shale resources, but we insist on full and complete protection of the public interest with such restrictions and controls as may be necessary to prevent monopolistic exploitation which benefits a few giant oil companies. These goals cannot be achieved—and, indeed, will be defeated—if the major responsibility for shale oil development is turned over to private industry.

Let me point out that there is nothing to stop the giants of the oil industry from developing extraction and processing methods for the oil shale lands they own privately already. There is no need to lure these companies into action with give-away open-door opportunities to lease or acquire federally owned oil shale lands.

One other point I would like to make, Mr. Chairman, relates to the joint effort of the Interior Department and the Atomic Energy Commission to determine the feasibility of underground nuclear explosions to release shale oil. We believe the greatest possible safeguards must be adopted to prevent excessive release of radiation into the environment above and below ground and to prevent unanticipated, dangerous underground environmental effects. Furthermore, we question

the need for private industry participation in this feasibility study, particularly when such participation by the CER Geonuclear Corporation is so thoroughly dominated by the nation's giant oil companies.

Mr. Chairman, I respectfully request that this letter be included in the record of your Committee hearings on shale oil development.

Sincerely,

ANDREW J. BIEMILLER,
Director, Department of Legislation, and Chairman, AFL–CIO Staff Committee on Atomic Energy and Natural Resources.

NEW YORK, N.Y.
February 20, 1967.

STEWART FRENCH, ESQ.,
Chief Counsel, Committee on Interior and Insular Affairs,
U.S. Senate, New Senate Office Building, Washington, D.C.

DEAR MR. FRENCH: I refer to your letter of February 11 inviting us to furnish our views regarding the development of the oil shale deposits in the Western United States.

I am much obliged to you for your invitation, and your request for additional comments regarding this subject. In view of our heavy development schedule in Colorado it is not possible to furnish you with completed data at this time. Of course, we will be ready and pleased to furnish concrete information regarding the development of the oil shale deposits in the Western United States at an early date.

I have today instructed Mr. John Stokes of Cleary, Gottlieb, Steen, and Hamilton and Mr. Lyle Youngstrom of Carl Boyir and Associates to attend the hearings as observers.

Respectfully yours,

H. I. KOOLSBERGEN,
President the Oil Shale Corp.

STATEMENT OF ANTHONY MAZZOCCHI, CITIZENSHIP-LEGISLATIVE DIRECTOR, OIL, CHEMICAL AND ATOMIC WORKERS INTERNATIONAL UNION, AFL–CIO

On behalf of an organization whose members have a personal stake in the production of petroleum, I wish to make several comments on the Secretary of Interior's recent recommendations on oil shale policy.

1. *The oil shale advisory committee should be continued.*—We feel that government, business, labor, and public representatives should be given an opportunity to keep a constant eye on the development of public policy regarding oil shale. With over 80 percent of oil shale located under public land, it is vitally important that this trillion dollar resource not be left to a bureaucratic shuffle between government agencies and private oil companies. The American public has a right to know what is happening to oil shale. It was a mistake to let the oil shale advisory committee lapse. Congress should demand that the committee be rejuvenated and strengthened by adding labor members who care about the safety and welfare of people who work in the oil industry.

2. Congress in quest of oil shale should not be *stampeded into permitting underground atomic explosions* which could violate the nuclear test ban treaty, harm underground water supplies and add to the radioactivity of the atmosphere.

3. *Publicly-owned and operated yardstick oil shale plants should be considered to protect the public interest.*—So the public will get the full benefit of oil shale and its development will not be delayed by private combines, Congress should encourage TVA-type public yardstick operations which will keep oil shale prices down. This will enable the American people to enjoy the lowest possible price and the quickest possible availability on the American market.

We realize that the full development of America's oil shale resources may be six to seven years off, assuming that everything is done to move full speed ahead with technical development schemes.

The three points raised here are not the only points which concern us. We also believe that Congress must revise the oil royalties which permit only 12½ percent of the value to go to the government. In addition, it is totally unrealistic

to earmark 52½ percent for reclamation, 37½ percent to the states, and 10 percent to the federal government.

Oil workers are citizens who are victims of these excessively high tax privileges enjoyed by the commercial oil companies. We do not wish to see any of unfair fiscal advantages perpetuated as America's oil shale deposits are made available for the domestic market.

EDMONDS, WASH.,
February 19, 1967.

Hon. HENRY M. JACKSON,
U.S. Senate,
Washington, D.C.

MY DEAR SENATOR: Regarding the policy of the Department of the Interior toward oil shale, it appears to me that the least government is the best government. In the beginnings of our great country taxation was a very crucial matter. Today taxation is an accepted fact of necessity, in addition to other forms of governmental income such as revenue from leasing of mineral lands. It has long been a conviction in my mind that the Department has had the intent for deriving revenue to first, justify its own operation. The all too apparent determination to retain as much of the mineral resources in Departmental ownership may be justified to the public as a necessity to control industry, but that is a debatable question for it is an abridgement of free trade.

With "boards" to control the industry, why would not a tax on the product suffice for governmental revenue? The local taxing bodies would be glad to see the large acreages of federal lands entered on the county tax rolls.

If the Department had only jurisdiction over the industry and not a vested interest through ownership there could be no Teapot Dome cloud ever again.

It is my suggestion that any legislation to settle the question of the oil shale mining claims must spell out all the details of compliance for patent, or its effectiveness and usefulness to the claimant will be lost in red tape as it has been over the last more than forty years.

If a policy endeavors to retain oil supplies for future generations, then the simple solution is to let the 15% in private ownership and unpatented claims carry the ball, but deny the 85% in government ownership a leasehold. If my information is correct it is feasible now to produce oil from the 15%, and it would enable the private holdings to begin to realize on their investment without waiting a hundred or two years until the 85% in leaseholds is depleted.

Very sincerely yours

F. A. MESERVE.

Senator Moss. I might also announce that any of the witnesses who would care to do so may come here to the committee rooms tomorrow and be able to see their testimony as it was transcribed and do any necessary editing where a witness might have misspoken or not been entirely clear in some of these exchanges of questions and observations. We would appreciate it if any of you feel you would like to take advantage of that opportunity to see your testimony as it is transcribed.

Under the order of the chairman, I now will declare these hearings adjourned subject to the call of the Chair.

(Whereupon, at 12:55 p.m., the committee recessed, to reconvene subject to the call of the Chair.)

FEDERAL OIL SHALE PROGRAM

THURSDAY, SEPTEMBER 14, 1967

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

The committee met, pursuant to recess, at 10 a.m., in room 3110, New Senate Office Building, Senator Henry M. Jackson (chairman) presiding.

Present: Senators Jackson, Moss, Allott, and Hansen.

Also present: Jerry T. Verkler, Staff Director; Stewart French, Chief Counsel; William J. Van Ness, Special Counsel; and E. Lewis Reid, Minority Counsel.

THE CHAIRMAN. The committee will come to order.

This is a continuation of the public hearings begun last February by the Senate Committee on Interior and Insular Affairs on the Federal oil shale program. Late in January, prior to our February hearings, the Secretary of the Interior had announced a five-point program for development of the vast oil shale reserves on the federally owned lands. Then on May 10 he caused to be published in the Federal Register proposed regulations to implement the announced program, and invited comment by interested persons before they are put into effect.

This resumed hearing will focus on these proposed regulations. Specifically, the committee would like to get informed views and comment on the probable effect of the regulations on the development of the oil shale reserves of the public lands and their bearing upon the establishment of an oil shale industry.

It should be pointed out that today there is no oil shale industry in America. As yet not a single barrel of petroleum has been produced from oil shale on a commercial going-industry basis. However, there has been a considerable amount of experimental and exploratory work, as well as pilot plant activity by certain companies on private lands and by the Federal Government, itself, in the facility at Rifle, Colo. The Mideast crisis highlights the need for development of additional sources of energy within our country.

The advancement of the state-of-the-art of producing oil from oil shale and the need for additional domestic supplies, make Secretary Udall's action in attempting to unlock the vast energy resource of oil shale particularly timely and fortunate.

Secretary Udall is to be congratulated most heartily for his initiative and in view of the reaction of some people, perhaps his daring. He is the first Secretary of the Interior in the 37 years since President Hoover's order in 1930 withdrawing the oil shale deposits on the public lands to attempt to take affirmative action on a signifi-

cant scale. And his plan is in our historic tradition of development through private enterprise.

Without objection, I will direct that the text of the proposed regulations and the announcement of their publication be set forth at this point in the record of these hearings.

(The documents referred to follow:)

[From the U.S. Department of the Interior, Office of the Secretary, May 7, 1967]

PROPOSED REGULATIONS TO GOVERN OIL SHALE LEASING AND LAND EXCHANGES ANNOUNCED

Regulations which would permit a limited area of oil shale lands to be leased for research and development, and others to be exchanged, under conditions designed to protect the public interest are being proposed by the Department of the Interior.

"We sincerely hope that these proposed regulations, being published in the Federal Register, will receive the widest possible range of comment from the general public, members of Congress, industry, the scientific and educational community and the three States most directly involved," Secretary of the Interior Stewart L. Udall said. He promised careful consideration of all comments before any rules are officially adopted.

The proposed leasing rules were drafted under authority of the Mineral Leasing Act to implement Point 3 of a five-point overall program announced by Udall January 27 to promote the recovery of shale oil and associated minerals from the rich Green River Formation in Colorado, Wyoming and Utah. Most of this land is Federally owned, and administered by the Interior Department's Bureau of Land Management.

The third point of the comprehensive program calls for procedures to permit the Interior Department to consider applications for provisional development leases of oil shale lands. In testimony before a committee of the Senate recently, Udall described this point as "at once the most difficult and most crucial, since it involves the first experimental and limited steps toward opening the shale reserves to actual development."

Known oil shales in the three States are estimated to contain the equivalent of approximately 70 times the nation's proved reserves of crude petroleum. In some locations they are intermingled with substantial quantities of minerals containing sodium and sodium-aluminum compounds.

No more than 30,000 acres in all would be involved in the leasing program under the newly proposed rules. About 11 million acres are classified as containing oil shale land in the three States. About 5.1 million of these acres—some 3.7 million of them Federally owned—contain "15–15" shales—that is, shales at least 15 feet thick which would yield at least 15 gallons of oil per ton.

The richest shales are believed to be in the Piceance Creek Basin of Colorado, where some 770,000 acres contain 25-gallon-per-ton shale in thicknesses of 15 feet or more. About three-fourths, or 580,000 acres, are Federally owned. Thus, 30,000 acres would represent only slightly more than 5 percent of the federally owned shale lands in this area. However, areas to be designated for leasing will be selected by the Department in order to encourage research on a variety of shale conditions, and will not be limited to the richest areas.

Development leases, the Secretary emphasized, would involve two distinct phases. The first phase—limited to 10 years—would require the contractor to expend research and development funds on relatively small acreages. The aim of the Department would be to encourage a variety of approaches leading to a technology which could support a broadly based competitive leasing program, the Secretary said.

The second phase, reached only when the Secretary finds research work has proved successful, would make available to the lessees acreages large enough to sustain a commercial operation of specified capacity for as long as mineral products are produced in paying quantities. However, under the terms of the Mineral Leasing Act of 1920, no lease may exceed 5,120 acres, and not more than one lease may be granted to any one person, association or corporation.

Leases all would expire at the end of their research periods unless the Secretary of the Interior authorized commencement of the commercial production term.

Private citizens, associations, corporations or municipalities would be eligible to make proposals for leases. Evaluation of their proposals, after "consultation with appropriate Federal, state and local agencies," would be based on a number of specified factors. Among these would be prospects of attaining commercial feasibility of a variety of mining and processing methods, under varying conditions; enhancing chances to make maximum recovery of other minerals invilved; improving the competitive opportunities for smaller companies; and limiting potential hazards to the environment and to human safety. Other factors would be the applicant's financial and technical capabilities; his need for leased lands to do the work; the pace of his proposed research and development; the likely effects on competition; etc.

Applicants must disclose their interests in other oil shale lands, and state their need for a lease, the financial and technical capability, their plan of work, including research goals, and the nature, location and cost of plants and equipment they would install. They would have to specify the number of "key persons" to be employed, and the qualifications. Also required will be a schedule of proposed expenditures, and the techniques to be studied.

Additional information to be provided will include a description of steps to be taken to avoid or minimize possible adverse effects on the environment, the applicant's water needs and source of supply, the measures to prevent waste of mineral resources, and plans for a commercial operation if the research succeeds.

There would be a minimum royalty to the Federal Government of 3 percent of the gross value of the mineral products from the oil shale at the point of shipment to market, with a graduated scale of royalties ranging up to 50 percent of the net income from the property. "The purpose of the sliding scale of royalties is to encourage new ventures in oil shale development, while protecting against the possibility of windfall profits," Secretary Udall said. Royalties would be subject to readjustment every 20 years as required by the 1920 Mineral Leasing Act.

The lessee would be required to submit annual progress reports on all work accomplished and results achieved during the research period. The information will be promptly made available to the public.

The right to use inventions made during or under the research term of the lease will be available to the public without charge in accordance with, and subject to the limited exceptions of, the President's Statement of Government Patent Policy of Oct. 10, 1963. In addition, the lessee would be required to issue licenses at reasonable royalties, permitting use of patents he may own which are necessary to permit others to use inventions resulting from the research.

Before approval, leases would be submitted to the Attorney General for advice on their consistency with the objectives of the Federal antitrust laws.

The Department announced that proposed regulations to govern exchanges of oil shale lands, also are being published in the Federal Register. This would implement Point 2 of the five-point shale program, permitting exchanges of scattered holdings of private lands in the region for Federal land of similar qualities. This will permit consolidation of private holdings for efficient mining operations.

Lands offered to the Department for exchange would have to have a value at least equal to the value of the selected public lands. All exchange proposals would be advertised in local newspapers in order that others who wish may also apply for the selected public lands within 60 days.

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MAGEMENT, WASHINGTON

[43 CFR, PART 3170]

OIL SHALE

Basis and Purpose. Notice is hereby given that the Department of the Interior proposes to amend the regulations regarding the leasing of oil shale lands, found at Part 3170 of Title 43 of the Code of Federal Regulations, by revoking those regulations and substituting the proposed regulations set forth below.

Interested persons are invited to submit their comments in writing to the Director, Bureau of Land Management, Department of the Interior, Washington, D.C. 20240, within thirty days of the date of publication in the *Federal Register* of this notice. Persons wishing to present their views orally are requested to communicate with the Director, Bureau of Land Management.

Part 3170 is amended to read as follows:

PART 3170—OIL SHALE

Subpart 3170—Oil Shale: General
3170.0–1 *Purpose.*
3170.0–3 *Authority.*
3170.0–5 *Definition of term "Oil Shale".*
3170.1 *Designation of Available Lands.*
Subpart 3171—Applications for Leases
3171.1 *Qualifications of Applicants.*
3171.2 *Form and Contents of Applications.*
3171.3 *Considerations to be used in Evaluating Applications.*
3171.4 *Time for Filing.*
Subpart 3172—Miscellaneous Provisions
3172.1 *Form of Lease.*
3172.2 *Term of Lease.*
3172.3 *Acreage Designations and Limitations.*
3172.4 *Rentals.*
3172.5 *Royalties.*
3172.6 *Termination of Lease.*
3172.7 *Lease Bond.*
3172.9 *Other Provisions.*
3172.10 *Antitrust Consultation.*

SUBPART 3170—OIL SHALE: GENERAL

§ 3170.0–1 *Purpose.*

These regulations govern the availability for leasing of a limited acreage of oil shale lands under the jurisdiction of the Department of the Interior. The objectives are to:

Foster improved technology for the mining and recovery of shale oil and other mineral components of oil shale;

Encourage competition in development and use of oil shale and related mineral resources and develop a basis for subsequent competitive leasing of Federal oil shale lands;

Encourage participation by companies not favorably situated with respect to access to reserves of the minerals present in oil shale;

Prevent speculation and windfall profits;

Provide reasonable revenues to the Federal and State Governments;

under mining operation and production practices that are consistent with good conservation management of overall resources in the region.

§ 3170.0–3 *Authority.*

These regulations are issued pursuant to the Mineral Leasing Act of February 25, 1920 (41 Stat. 445), as amended, (30 U.S.C. 181–287).

§ 3170.0–5 *Definition of Term "Oil Shale."*

As used herein, the term "oil shale" means sedimentary rock containing organic matter which yields substantial amounts of oil or gaseous products by destructive distillation. The term includes all the minerals which are components of the rock, but does not include:

(a) deposits of minerals which may be interbedded in the sedimentary rock series and which the Secretary determines can be mined (i) without removal of significant amounts of organic matter and (ii) without significant damage to oil shale beds; and

(b) deposits subject to lease as oil and gas, asphaltic minerals, or coal.

§ 3170.1 *Designation of Available Lands.*

The Secretary will from time to time publish notices in the *Federal Register* designating areas of oil shale bearing lands and deposits for the conduct of particular types of mining, extraction, or processing activities which will be made available for leases for research and development and for subsequent commercial operations in accordance with these regulations. Areas will be selected with a view to encouraging research on a variety of mining and processing methods under a variety of conditions of mineral depths, composition, thicknesses and qualities, and taking into consideration sound principles of conservation and environmental protection. A total of no more than 30,000 acres of oil shale bearing lands will be designated hereunder. Oil shale bearing lands, the surface of which is under the administrative jurisdiction of a Federal agency other than the Department of the Interior, will not be designated hereunder.

SUBPART 3171—APPLICATIONS FOR LEASES

§ 3171.1 *Qualifications of Applicants.*

(a) Leases may be issued to:

(1) Citizens of the United States;

(2) Associations of such citizens;

(3) Corporations organized under the laws of the United States, or any State or Territory thereof;

(4) Municipalities.

(b) The term "associations" includes partnerships, syndicates, groups, pools, joint ventures and other unincorporated organizations.

§ 3171.2 *Form and Contents of Applications.*

(a) No form of application is prescribed.

(b) Applications should be in writing and filed in triplicate in the Office of the Director, Bureau of Land Management, Interior Building, Washington, D.C. 20240, notwithstanding the provisions of section 3001.0–6 of this chapter.

(c) The application should provide:

(1) The complete name(s) and address(es) of the applicant(s).

(2) The qualifications of applicant(s) to hold a lease under the Act.

(3) A description of the land for which a lease is desired.

(4) A detailed statement of any direct or indirect interest which the applicant then has in any lease issued or applications pending hereunder, including ownership interests in any holder of a lease issued hereunder.

(5) If the applicant is a corporation, the name and address of each stockholder of record holding more than 10 percent of the corporation's stock.

(6) If the applicant is an association, the name and address of each member who has an interest of more than 10 percent in the association.

(7) A statement of the applicant's interests in non-federally owned oil shale lands and the reasons why the applicant needs federally leased land for the proposed research and development. The statement should include a description of the location and acreage of such lands, and the best available information on the depth, quantity, composition, quality and thickness of mineral deposits present in such land.

(8) A detailed statement of the applicant's financial capability to conduct the proposed research and development.

(9) A detailed statement of the applicant's technical capability to conduct the proposed research and development.

(10 A description of the applicant's plan of research and development during the research term, specifying:

[1] The goals of the research plan;

[2] The nature, location and cost of plants and equipment to be utilized;

[3] The number of key persons to be employed and their qualifications;

[4] The schedule of expenditures;

[5] The mining and processing techniques to be studied;

[6] The possible adverse effects on the environment and the measures to be taken to avoid or minimize such effects;

[7] The acreage required for the research;

[8] The depth, quantity, composition, quality and thickness of shale deposits required for the research;

[9] The quantity of water required and the expected source;

[10] The measures to be taken to prevent waste of the mineral resources of the leased land.

(11) A description of the reserves the applicant then owns or controls of oil and other minerals of the kind believed to be present in the lands applied for.

(12) With respect to the commercial operation sought to be developed if the research plan is successful:

[1] The general nature of the commercial operation, the commodity (ies) product(s) expected to be produced, and the approximate service life and capacity of the plant to be constructed.

[2] The expected annual unit and dollar value of production of each mineral product to be produced. If the proposed commercial operation does not include extraction of component mineral products from the oil shale, a description of the prospective market.

[3] The expected capital and annual operating costs.
[4] The quantity of water required and the expected source.
[5] The expected hazards to the environment and the measures proposed to avoid or minimize them.
[6] The quantity of land and the depth, quantity, composition, quality and thickness of mineral deposits required.

§ 3171.3 *Considerations to be used in Evaluating Applications.*

After consultation with appropriate Federal, state and local agencies, evaluation of the research and development proposals will be made on the basis of the following considerations:

(a) Selection of proposals showing greatest promise of:
(1) Ascertaining the commercial feasibility of a variety of mining and processing methods, under a variety of conditions;
(2) Enhancing opportunities for maximizing multiple mineral recovery;
(3) Enhancing the competitive opportunities of smaller companies;
(4) Limiting any potential hazards to the environment;
(5) Limiting any potential hazards to human safety.
(b) The financial and technical capabilities of the applicant to conduct the proposed research and development, and the projected commercial operation.
(c) The pace at which the research and development is proposed to be conducted.
(d) The applicant's need for leased lands to conduct the proposed research and development, and the projected commercial operation.
(e) The effects on competition of the proposed research and development and the projected commercial operation.
(f) The applicant's need for reserves of the minerals proposed to be produced under his proposal.

§ 3171.4 *Time for Filing.*

No application will be accepted if filed later than five years from the date of publication of these regulations in the *Federal Register*. [The exact date will be inserted when the final regulations are published.]

SUBPART 3172—MISCELLANEOUS PROVISIONS

§ 3172.1 *Form of Lease.*

No form of lease is prescribed.

§ 3172.2 *Term of Lease.*

(a) Research Term. The research term of any lease issued under these regulations shall be designated by the Secretary, but in no event may exceed 10 years.
(b) Commercial Production Term. The Secretary will extend the term of such lease upon completion of the research term to permit commercial production for so long as mineral products are produced, from oil shale in paying quantities from deposits on the land, if he has determined that:
(1) The lessee conducted research activity during the research term substantially in accordance with the plan submitted in his application, or any modification thereof which was approved by the Secretary.
(2) The lessee has, in the course of the research term, developed a mining and processing method, which:
[1] Is commercially feasible;
[2] Provides for optimum recovery of minerals to be produced;
[3] Can comply with requirements determined by the Secretary to be necessary to prevent or minimize pollution of air and water, scenic or esthetic damage to surface resources, to fish and wildlife, and hazards to human safety.
(3) The lessee has complied with all the terms of the lease.

§ 3172.3 *Acreage Designations and Limitations.*

(a) No lease issued hereunder may exceed 5,120 acres.
(b) Upon the issuance of any lease hereunder the Secretary shall designate the part of the leased lands upon which the lessee will be permitted to conduct operations during the research term.
(c) At the time for the grant of any extension of the term of lease as provided in section 3172.2(b), the Secretary will determine the quantity of mineral deposits needed for commercial production, allowing reasonable reserves. The

term will be extended only with respect to the area which contains the quantity of mineral deposits so determined.

(d) No person, association, or corporation (including a municipality) may take, hold, own or control an interest in more than the total maximum acreage of land included in any lease hereunder, except insofar as natural persons are permitted to hold greater interests under 30 U.S.C. sec. 184(e), by virtue of their 10 percent or lesser interests in corporations or associations holding leases hereunder.

§ 31.72.4 *Rentals.*

Leases shall provide for the payment, in advance, of an annual rental of 50 cents for each acre or fraction thereof.

§ 3172.5 *Royalties.*

(a) Leases shall provide for the payment of royalties on production during their comercial production terms.

(b) The royalty rate on production shall be 3 percent on the gross value, at the point of shipment to market, of the mineral products from the oil shale, except as provided in subsections (c) and (d) of this section. Such royalties shall be due and payable monthly on the last day of the calendar month next following the calendar month in which produced.

(c) If the total annual royalty payment on production as computed in accordance with subsection (b) of this section is less than the payment would be if computed in accordance with subsection (d), then the lessee shall pay, by March 1 of the succeeding year, an additional amount equal to the difference between the royalty paid and the royalty as computed in accordance with subsection (d).

(d) The annual net income royalty rate shall be a percentage of net income from the production of mineral products from oil shale to the point of shipment to market.

The net annual income royalties rate is:

Ten (10) percent of that part of the net income which is no more than ten percent of investment.

Thirty (30) percent of that part of the net income which exceeds ten percent and is no more than twenty percent of investment.

Fifty (50) percent of that part of the net income which is more than twenty percent of investment.

As used in this section, "net income" means taxable income, computed without allowance for royalty and depletion. "Investment" means the original cost less depreciation of capital assets used in the aforesaid production and processing of oil shale. The term "investment" does not include oil shale obtained pursuant to a lease issued hereunder.

(e) Lease royalties shall be subject to readjustment at 20-year periods succeeding the issuance of the lease. Lessees will be notified of the proposed readjustment of royalties or notified that no adjustment is to be made. Unless the lessee shall file either a notice of objection and offer to negotiate the proposed readjustment of royalties, or file a relinquishment of the lease within 30 days after receipt of the notice, he will be deemed to have agreed to such readjusted royalties.

(f) The Secretary will, prior to any readjustment under subsection (e) of this section which would reduce the rate of royalty on any lease, publish a notice of intention to make such reduction in the Federal Register, inviting written comments by interested persons, to be filed within 60 days of the issuance of the notice. The Secretary will not readjust such royalties prior to the expiration of such 60-day period.

(g) Leases shall provide for the payment of royalties during their research terms, on minerals and mineral products sold by the lessee. The royalty rates shall be the same as those applicable during the commercial term.

§ 3172.6 *Termination of Lease.*

Each lease issued hereunder shall terminate at the end of its research term unless, prior thereto, the Secretary has authorized the commencement of the commercial production term.

§ 3172.7 *Lease Bond.*

A bond of not less than $100,000, conditioned on performance of the obligations imposed by the lease, the Act, and these regulations will be required prior

to the issuance of an oil shale lease. The right is reserved at any time before or after the issuance of the lease to require an increase of the amount of the bond in any case where the Secretary deems it proper to do so.

§ 3172.9 *Other Provisions.*

(a) Protection of the Environment and Human Safety. The lease will contain such provisions as the Secretary deems necessary to prevent or minimize pollution of air and water, scenic or esthetic damage, damage to surface resources, and to fish and wildlife and hazards to human safety.

(b) Prevention of Damage to Other Mineral Resources. The lease will contain such provisions as the Secretary determines necessary to protect other mineral resources which may be involved.

(c) Diligence in Pursuit of Plan of Research. The lease will require that the lessee pursue diligently both the plan of research upon which his lease was issued and operations during the commercial production phase.

(d) Disclosure of Information Developed During the Research Term.

(1) The lease will contain provisions requiring the lessee:

[1] To submit annual progress reports during the research period, in sufficient detail to disclose fully all work accomplished and results achieved.

[2] To submit, within 120 days after completion of all work under the research plan, a final report summarizing the state of the art and covering conclusions and recommendaions derived therefrom. The report shall include a complete and detailed disclosure of all materials, processes, and equipment involved, including all the technical and financial data needed to enable any qualified person to carry out the work performed under the lease. Where appropriate, the recommendations shall include proposals for further improvements which would advance the future state of the art based on knowledge acquired in the performance of the work under the lease.

[3] To make such other reports and supply such information regarding the progress of the research as the Secretary may specify from time to time.

[4] To permit access, by persons designated by the Secretary, to the leased premises, all facilities thereon, all other facilities in which any part of the research is conducted, and all books and records which directly relate to the plan of research being conducted.

(2) The lease will provide that no report required under the lease may be copyrighted and the lessee, without additional compensation, therein grants to the Secretary the full right to publish, reproduce and use, and have others do so, for any purpose without limitations, the reports and any information obtained by the Secretary hereunder. The Secretary will promptly publish the reports received and make the other information he has obtained available to the public.

(3) The lease will require that the lessee agree not to publish, or to make available to others besides representatives of the Secretary, the results of the research work under the lease or any information concerning the same, without prior approval in writing from the Secretary.

(e) Patents. The lease will contain provisions that the United States will acquire title to all inventions made in the course of or under the research term of the lease, and requiring the lessee to issue licenses at reasonable royalty rates, with respect to such patents as he may own, which are necessary to permit others to practice inventions made in the course of or under the research term of the lease, except that the lease may contain provisions granting greater patent rights to the lessee, in such cases where a proper showing of exceptional circumstances is made, in accordance with the Statement of Government Patent Policy issued by President Kennedy on October 10, 1963, 28 F.R. 10943.

(f) Assignments and Relinquishments. The lease will contain provisions governing assignments and relinquishments.

(g) Cancellation of Leases. Upon failure of a lessee to comply with the provisions of the Mineral Leasing Act, or of the regulations issued thereunder, or of the lease, and continuation of such default for 30 days after service of written notice thereof by the Secretary, the Secretary may institute judicial proceedings for the cancellation of the lease as provided in section 31 of the Act. Failure to give notice with respect to any particular cause of forfeiture

shall not be deemed a waiver and shall not prevent the cancellation and forfeiture of the lease for any other cause of forfeiture, or for the same cause occurring at another time.

(h) Additional Provisions. The lease will contain such additional provisions as the Secretary deems appropriate.

§ 3172.10 *Antitrust Consultation.*

Prior to the issuance of a lease, the Secretary will forward a copy to the Attorney General, requesting his advice as to whether the issuance of the lease would be consistent with the objectives of the Federal antitrust laws.

STEWART L. UDALL,
Secretary of the Interior.

The CHAIRMAN. The committee requested the Secretary to make available copies of the pertinent comments he has received on the regulations. I will direct that these comments, or extracts from them, be printed as an appendix to the verbal presentations that will be made.

Many of these comments are critical of the Secretary's regulations. It is, of course, anyone's right, and privilege, to disagree with them. This is the whole purpose, I may say, of the hearings that we are holding. However, I would point out again, that the Secretary has tried, at least, to do something to bring about development of a great, and obviously controversial natural resource.

I already have stated that the primary purpose of these resumed hearings is for the committee to obtain enlightenment on the probable effect of the regulations on the development of the publicly owned oil shale deposits and on the development of an oil shale industry.

Also, the chairman must point out that the troublesome and highly complex legal question of the validity or invalidity of mining claims located for oil shale under the mining laws before enactment of the Mineral Leasing Act of 1920 is now before the courts where it belongs at least at this stage. This committee, of course, is not the proper forum to argue the mining claims issue and make a judicial decision. Anyone, however, who wants to make recommendations regarding legislation, raises a different issue. But the purely judicial problems that are now pending in the courts must be left to the courts to decide, and it would be inappropriate and improper for this committee to intervene in those judicial proceedings.

We have a long list of witnesses who have asked to be heard. Therefore, we plan to hold the hearings all day today, and will continue tomorrow. The first witness this morning is the Honorable Wallace Bennett, senior Senator from Utah.

Before calling on him, I shall ask my colleagues if they have any comments or statements they wish to make before hearing the first witness.

Senator ALLOT?

Senator ALLOT. Yes, Mr. Chairman, immediately following the statement by Senator Bennett, I would like to insert in the record for my colleague, Senator Dominick, a statement, and immediately following that a joint letter by the Governors of Colorado, Utah, and Wyoming, commenting upon the regulations.

The CHAIRMAN. Without objection, the statements and letters will be included at that point in the record.

Senator Moss?

Senator Moss. Thank you, Mr. Chairman.

The only comment I have to make is to echo the remarks by our chairman when he spoke of the necessity of moving forward in this field. I, too, commend the Secretary for taking some action in getting things moving. Obviously, there is a great difference of opinion on the proposed regulations and that is what we are to hear today and to make the record so that the committee may make some decisions as to what ought to be done.

I have some reservations on certain aspects of the proposed regulations so I am going to listen carefully to the witnesses hoping that we can find a way to develop this great resource and make it useful and do it in a way that is in the public interest of all of the people of the country.

The CHAIRMAN. Thank you, Senator Moss.

Senator Hansen?

Senator HANSEN. Thank you, Mr. Chairman. As soon as it can be arranged, I would hope that we might be able to hear from Congressman Harrison. I know he is extremely busy, as are all the Members of the Congress.

The CHAIRMAN. He will be heard right after Senator Bennett.

Senator HANSEN. Very good.

I would like, also, to insert in the record correspondence we have received that I think will be helpful in compiling a record and provide a better appreciation of the problems that confront the Government in determining how best to develop this resource.

May I also say that I echo the sentiments the chairman expressed, that it should be noted that, as yet, not one single barrel of oil has been produced from this tremendous energy reserve resource that we have. I compliment the Secretary for the efforts he has made to see that it be developed in the tradition of our free enterprise economy. I have nothing further, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Hansen. In order not to interrupt the oral statements at this point, we will make an appendix of the letters you have submitted.

(The material referred to begins on p. 487.)

The CHAIRMAN. Senator Allott?

Senator ALLOTT. Mr. Chairman, I would also like to request that at the conclusion of the Secretary's statement, and any questions that may occur, a statement from the Rocky Mountain Oil & Gas Association by Mr. Collis P. Chandler, Jr., be inserted in the record.

The CHAIRMAN. Without objection, it will be included in connection with the previous request made by the senior Senator from Colorado.

The Chair wishes to state again that the Chair is approaching this matter with an open mind. This is indeed a very complex problem. We are dealing with the disposition of one of the greatest known resources this country has ever possessed. Obviously whatever action is ultimately taken must be guided by the overriding public interest to see that the assets of the United States are properly protected and, at the same time, provide for the development of this resource.

I think the fact that this resource is such a tremendous asset and involves such a large sum of money, does not mean that we ought to delay action. It seems to me that this matter has been delayed for a long, long time, and that now is the time to make some decision as to

how we should proceed with development and at the same time properly protect, as we must, the assets of the United States.

Senator Bennett?

STATEMENT OF HON. WALLACE BENNETT, A U.S. SENATOR FROM THE STATE OF UTAH

Senator BENNETT. Mr. Chairman, I appreciate the opportunity to appear here today, and I particularly appreciate the privilege you have given me to appear first.

On the floor of the Senate they are discussing a flood insurance bill which came out of the Banking Committee and I have responsibility with respect to that bill. So I am glad I can appear now and get my statement in the record earlier.

Estimates of oil shale deposits in the United States stretch from 600 billion barrels of oil equivalent for shale yielding 25 gallons per ton to as high as 2 trillion barrels if low quality shale yielding 10 gallons per ton is included. According to Secretary Udall, approximately 80 percent of the reserves are federally owned and 20 percent privately owned. For the most part private holdings are in isolated pockets or thin strips of low yield shale.

We have the opportunity to develop this new domestic industry in an orderly way through the cooperation of State and local governments, private industry, and the Federal Government.

It does us no good to talk of this resource in terms of billions of barrels of oil or trillions of dollars as long as the resource remains undeveloped in the ground.

I feel that the Department of the Interior should modify the proposed leasing regulations so that a healthy, comprehensive and ultimately profitable private industry can be developed on the public oil shale lands. The regulations as written will not, in my opinion, achieve that objective.

I believe the objective can best be achieved by strengthening private industry's role in developing the oil shale potential of Utah, Colorado, and Wyoming. I am sure no one is surprised that I would take this point of view. I do not believe Government can match the efficiency and economy which are the natural results of industrial competition.

In line with the opinion of other westerners involved in this problem, and while officially I have not seen the statement of the three Governors, I understand that my statement is in line and gives support to theirs, I would suggest that the proposals be changed as follows:

1. Open lands to competitive bidding in blocks up to 5,120 acres using tested competitive bidding procedures, now used for other leasable minerals under the Federal Mineral Leasing Act. The Interior Department's concept of "negotiated leases" based on the need of an applicant for oil shale reserves, would inevitably develop charges of favoritism and special interest, no matter how hard attempts were made to avoid this.

2. Provide a fixed royalty rate like that used for oil and gas or other leasable minerals which would include a provision for periodic renegotiation after production starts.

3. Lease terms should be fixed for at least 10 years subject to extension by production. Due to the present state of oil shale technology, less than 10 years is probably impractical.

4. Initiate an immediate rental program that will produce revenue under the Mineral Leasing Act. The failure of the Federal Government to realize any rentals is hard to understand. Even if no royalties materialize, rentals could be substantial.

5. Provide for increasing rentals or accelerating advance royalties during the lease term so that speculative nonproductive holding would be made uneconomic, and this would give to legitimate producers the opportunity to offset such penalizing expenses by obtaining successful production.

6. Discard research and development leases as the only immediate method of getting leases on Federal lands.

7. Eliminate the "net profits" approach to charging users which is repressive and would discourage commercial production.

8. Provide incentives for achievement, including elimination of the requirement that oil shale technology inventions be made available to the public without charge. It is basically unsound, under the philosophy of our private economic system, to require that a lessee make public all the knowledge, and give up title to any patents, resulting from his research on public lands. I consider the regulations relating to patents and disclosures a negation of our patent system, which is in large measure responsible for the scientific and industrial progress of our country. As a reward for innovation, and for disclosing the nature of his invention to others by publication of a patent, the inventor has traditionally been given a limited monopoly for 17 years on its use. Requiring that patents be assigned to the Federal Government and that all results of research be made public immediately will remove the most powerful competitive force that can be brought into oil shale development.

9. Allow State and Federal governments cooperatively to provide pollution and conservation controls under laws applicable to all lands rather than use special rules applicable to Federal oil shale lands only.

Mr. Chairman, the regulations as presently written would impede development, in my opinon, since they do not provide any economic incentive or advantage to a firm engaged in research and development. It is estimated that on an average it will take an investment of around $125 million to build a plant that will produce 50,000 barrels of oil a day. Without some sort of advantage over potential competitors who might move in later and ride free, no company is going to invest millions of dollars in research and development to see that the effects of that are given away without cost to another company.

Governor John Love, of Colorado, has predicted that private industry, given a free hand, could develop feasible methods for mining the oil shale by the next decade. It is estimated the development would bring in tens of millions of dollars annually in royalties to Utah, Colorado, and Wyoming, as well as to the Federal Government.

Mr. Chairman, I don't need to remind you that my State of Utah is controlled 74 percent by the Federal Government, which means that it only has a tax base of approximately one-quarter of its area, and

I feel that it should have an opportunity to acquire royalties under the present mineral leasing program from the development of oil shale.

In order to attract private capital, the regulations must be revised to provide incentives for industry. These include the certainty of issuance of any commercial lease; the size of such leases, the right to benefit from successful research undertaken at the lessee's expense; the right to hold Federal oil shale leases in more than one State under their varying conditions; and the existence of some predetermined royalty or rental payment program.

I would suggest that perhaps Congress should assume the initiative in writing into law what I consider to be a reasonable and responsible leasing policy. In any event, I assure you of my continuing interest and support in Congress for early oil shale development.

I am confident, Mr. Chairman, that in the American way private industry, working together with all levels of government, will be able to develop this tremendous resource for the benefit of all our people.

I thank you for the opportunity to appear.

The CHAIRMAN. Any questions?

Senator ALLOTT. No; I just simply want to compliment the Senator from Utah on the very concise statement with which I certainly agree in the main.

Senator HANSEN. I have no questions.

The CHAIRMAN. Thank you, Senator Bennett. We appreciate having your statement.

Senator BENNETT. Thank you very much.

The CHAIRMAN. As previously stated, the statement of Senator Dominick and the Governor's letter will be included at this point.

(The data referred to follows:)

STATEMENT OF HON. PETER H. DOMINICK, A U.S. SENATOR FROM THE STATE OF COLORADO

Mr. Chairman and members of the committee, it is a pleasure for me this morning to enthusiastically welcome and endorse the resumption of hearings by the Senate Interior and Insular Affairs Committee on the subject of oil shale.

As the members of this Committee are aware, this is an area in which I have been interested and involved for many years. Oil shale was a complex topic even before the problems incident to the associated minerals question arose. Certainly it merits the fullest public attention and discussion.

Mr. Chairman, I presented my general views on oil shale in testimony before the Antitrust and Monopoly Subcommittee during the April, 1967 hearings. Following the announcement of the proposed regulations, I forwarded my comments to the Bureau of Land Management in June. My letter to the Bureau summarizes my position and I respectfully request that the Committee make it a part of the hearing record. Thank you.

(The letter referred to follows:)

Mr. BOYD L. RASMUSSEN, JUNE 8, 1967.
Director, Bureau of Land Management, Department of the Interior Washington, D.C.

DEAR MR. RASMUSSEN: In accordance with the notice of proposed amendments to the regulations for the leasing of oil shale lands published in the Federal Register on May 10, 1967, I am forwarding my comments to your office.

First, let me point out that I am delighted to see the Department of Interior's affirmative position for permitting private enterprise to carry out the research and development program. This is definitely a step forward and has my complete support.

I am concerned, however, that the regulations, as drafted, are overly cautious.

Although the participation of private enterprise is clearly contemplated, almost no incentive seems to be offered to encourage the same. What does one gain by engaging in the research and development program

Frankly, an onerous responsibility and far too much discretion have been placed with the Secretary of the Interior.

With respect to particular areas of the proposed regulations, my comments are as follows:

OBTAINING A COMMERCIAL PRODUCTION LEASE

1. There are no firm assurances by the federal government that one will receive a production lease even if he acts in good faith in performing his R & D lease. We should not expect the private sector to spend the large sums which will be required in research and development on the mere hope the Secretary may extend the R & D lease into a full scale production lease.

2. Of the three prerequisites to the Secretary's determination that a production lease shall be granted, the requirement that the lessee shall have "developed a mining and processing method" which is commercially feasible is most objectionable. There are no guidelines as to what constitutes a "method". Must the "method" be wholly new or may it contain elements of other processes which the regulations, as proposed, would place in the public domain? I question the necessity and desirability of such a provision particularly in view of the other two conditions: that the lessee's research activity was conducted "substantially in accordance" with an approved plan, and that the lessee "complied with all the terms of the lease". The lessee who completes the R & D phase by full good faith performance should not be penalized simply because he did not come up with a new method satisfactory to the Secretary.

3. Apparently the only manner in which you can acquire a production lease is to first complete an R & D lease program. This forces those who may have already developed advanced techniques to forego production.

DISCLOSURE AND PATENTS

1. I am not convinced that techniques invented during the R & D stage should be placed in the public domain without compensation. Certainly many companies are needed in the field to avoid undue concentrations of economic power. However, it seems to me a better incentive system to accomplish this would be to allow patents on inventions made during the R & D stage with the requirement that the techniques be subject to licensing at specified royalties.

2. The regulations are silent as to whether the inventor will have exclusive rights to inventions made during the production phase. For clarity, a statement should be added dealing with the matter.

3. The proposed regulations would permit access by the Secretary not only to all facilities on the leased permises, but to any other facilities of the lessee where research is conducted. Moreover, the Secretary would have the right to inspect "all" books and records directly relating to the research. In my view this is far too sweeping, and will undoubtedly discourage participation by many. Representatives of government should not be allowed to run at large through the lessee's off-the-premises research departments or his books and records under the guise of a connection with oil shale. The annual progress reports and final report supplementing on-premises inspection should be adequate.

4. I am wary of the lessee being precluded from publishing or communicating anything concerning his research work with parties other than representatives of the Department of Interior unless he has the prior written approval of the Secretary. Such a provision would stifle or encumber the free exchange of ideas in trade journals, at conventions of the various professional groups whose members would be engaged in research, etc. There is no similar industry-wide ban among existing industries, nor should there be one among the emerging oil shale and associated minerals industry.

ACREAGE

1. Since the lease is apparently to be issued with its final acreage only tentative, and the Secretary is to designate "the part of the leased lands" upon which research is to be conducted, does the 30,000 acre limit apply to the former or the latter? The regulations are ambiguous in this respect for they also seem to contemplate that only the amount of the R & D acreage will be known up to the time for extension. At that point, a production lease may be granted for an "area" containing "reasonable reserves" as determined by the Secretary.

2. It is with some alarm that I note "the Secretary will determine the quantity of mineral deposits needed for commercial production" when the time arrives to consider extending the R & D lease into the production stage. To place sole discretion with a single individual is to me unwise.

3. If the 30,000 acre limit is intended to be the maximum acreage to which the R & D leases may be expanded as production leaseholds, and the Secretary were to allow leases approximating the 5,120 acres permitted by the Mineral Leasing Act, only half a dozen R & D leases would be available.

4. Apparently the production acreage would be adjacent to and include the R & D acreage, but the regulations should be clarified in this regard.

ROYALTIES

1. I have serious reservations about the far-reaching effects of the royalty structures proposed and feel this needs thorough reconsideration.

2. Gross value "at the point of shipment to market" as a basis for the minimum royalty rate of 3 per cent needs definition. I foresee some problems in applying this in integrated and non-integrated operations.

3. The provision for calculation and payment of additional royalties by March 1 "of the succeeding year" is inflexible and fails to provide for the situation where a taxpayer has elected a tax year other than the calendar year.

4. The time is not certain within which a lessee must file his notice of objection and offer to negotiate a proposed readjustment of royalties. If it is intended that the same 30-day period apply as for filing a relinquishment of the lease, some rephrasing would be beneficial.

5. It is not clear to me why the Secretary is required to publish a notice of any intention to reduce a royalty rate when there is no provision for publication when an increase is suggested.

DILIGENCE IN PLAN OF RESEARCH

1. The regulations require diligence in "the plan of research upon which (the) lease was issued" *after* the R & D lease is fully performed. Research during the production stage should be left to the individual and the interplay of competitive forces in the economy. The effect of the regulations, as drafted is to tie the production lessee to his original plan of research though more efficient techniques may have been developed and made available to him in the meantime.

APPLICATION FOR A LEASE

1. The application requires a statement of "the reasons why the applicant needs federally leased land" for research and development one of the factors to be used in evaluating his application is "the applicant's need" for the land and for "reserves". It is difficult to think of a provision which could be more ambiguous, unnecessary, and susceptible to abuse. It is to be noted the regulations already delineate maximum limits on the interest one may take, hold, own or control.

2. The requirement that the application describe the "reserves" owned or controlled by the applicant should be clarified as to whether information is sought on known or recoverable reserves.

DRAFTING

1. The frequent use of the word "will" throughout the regulations rather than "shall" or "may" likely will lead to problems of interpretation.

Sincerely,

PETER H. DOMINICK, *U.S. Senator.*

Re oil shale program.

Hon. STEWART L. UDALL,
Secretary of the Interior,
Department of the Interior,
Washington, D.C.

DEAR SECRETARY UDALL: You have discussed with us your concern with development of an oil shale industry utilizing the federally owner, as well as state and privately owned oil shale deposits. You have expressed your preference for private development but only if such route is consistent with full

consideration of other values, including optimum financial return to the federal government, preventing of pollution, stopping monopolies, avoidance of speculative windfalls, elimination of wasteful extractive practices, and preservation of aesthetic and other values of national concern. Basic to all our thinking is of course, our obligations to avoid waste of the resource itself by denying it an opportunity to enter the energy field.

Our discussions, including the one with you, have identified what we consider to be the major goals by which to judge any program for development of federally owned oil shale, and probably of non-federally owned oil shale as well.

These are—

1. Development of oil shale as an available supplemental energy source to meet national security needs. The other benefits of development, nationally and regionally, are obvious without further comment.
2. Protection against pollution and waste and against any unnecessary lessening of aesthetic and other use values.
3. Provision for maximum privately financed development as an alternative to publicly financed operations.
4. Provision for optimum financial return to the federal government by minimizing windfall profits, monopoly control and preferred treatment for any segment of the national economy.
5. Giving fair recognition to the role of private, state, and federal contribution to an oil shale development program and to the just interests and responsibilities of each.

After consideration of your proposed regulations we conclude we should here honor your request for our advice by leaving technical discussion to the lawyers and other professionals and addressing our comments to the soundest method for achieving those essential goals.

You have indicated your proposed regulations are tentative and that you seek and welcome suggested improvements.

After careful study we conclude that the regulations need some revision to best achieve your stated objectives. We agree with you that a competitive private enterprise, operating within the framework of the general laws for the protection of the public interest, is the only suitable vehicle for the development of an oil shale industry.

This view gives full recognition to our full and firm support for proper conservation of our natural resources, for preservation and improvement of our environment, and for proper regulation of those who would misuse the opportunities afforded private enterprise in our nation and states. All these we have weighed, and no one should assume otherwise. Our concern is with seeing that an oil shale industry develop, and that all development, whether on federal, state or privately owned land conforms to controlling public interest requirements.

The following expands our views on the results of testing the goals we have stated against proposed and possible alternative procedures.

First: National Security. Oil shale in the ground and without availability of its oil and other products through proven and immediately useable methods is valueless in national emergencies. Recent Middle-East and other area incidents show that potential need for alternate sources of oil may arise with critical suddenness. Only presently accelerated research and experimentation plus pilot and proto-type plant operations in a variety of areas can provide the answer. Not to know whether oil shale resources can be available if and when needed is a dangerous ignorance we need not and should not risk.

We believe the public interest, with special emphasis on national security, demands that shale oil in substantial quantity begin to flow to the market place in the 1970's. A program which brings to bear all of the financial and technological resources of industry can accomplish this objective. Such a program for offshore oil land drilling resulted in resolving much the same questions as are found in developing oil shale. Such a program for oil shale can, we believe, result from your regulations as to the federal portion of the resource. The changes in approach, which we propose, will better achieve the necessary efforts from industry.

Second: Protection of other values. There can be no disagreement between us as to the need to avoid waste of the resource itself by non-use or misuse, to stop or prevent air and water pollution, to treasure and protect all surface and aesthetic values to the greatest extent possible, to give our full attention to water and community development and planning. Our only possible disagreement would

be as to methods. Neither the federal, state, or private interests have or should have a monopoly on devotion to or efforts for such programs. Each has its place. No program would be acceptable to our states which disregards the multiple values of those areas containing oil shale.

Third: Private Financing. The full costs of carrying an unborn oil shale industry to full growth can only be estimated. However, the development of oil shale in our three states appears to be a closely parallel situation to the recent history of the Outer Continental Shelf. Less than a generation ago, little was known about techniques of handling deep water drilling. The impediments to such development were considered all but insurmountable. Investments to date on only the Gulf of Mexico portion of the Outer Continental Shelf have been estimated at over six billion dollars. The six billion investment was private money from many companies. Without reasonable rules and adequate incentives, private capital could not have been invested. An appropriation of such funds from the federal treasury would have been unlikely. In June of this year, bonus bids of $510,000,000, one-half billion, went into the federal treasury for the blocks offered on the Continental Shelf off Louisiana. With adequate opportunities and incentives, private development of oil shale might duplicate such progress. If private capital can make the investments required, increasing our national budget by federal appropriations would be unnecessary and undesirable, even if otherwise possible.

Private capital can be expected to make the investments and provide the efforts if incentives are adequate. We suggest that certain changes in your proposed program are needed to achieve such private effort.

The concept of negotiated leases based on the "need" of an applicant for oil shale reserves creates serious impediments to any development. It also creates serious problems for administration that far overbalance any possible benefits. The actual "need" with which we are concerned is the need for our nation to develop an alternate source of energy to be available when required. The premise of your proposed regulations appears to be that the lease holder who has no present oil or other reserves might be expected to proceed more aggressively. It does not necessarily follow that he will be most successful. We suggest that this method of trying to obtain active and successful lessees by choosing a select few might stifle the efforts which ultimately would be most successful. Active programs of research and development can better be achieved by a combination of incentives to go forward and penalties in some form such as increasing rentals if there is not successful progress to production.

You have assured us that each of the three states would have at least one research and development lease offered. Even so, the difference in conditions from area to area, might cause applicants to limit themselves to one area. There would be no opportunity for the great complex of problems such as land ownership diversity, feasibility of strip versus underground mining, economic climate, and other factors to generate simultaneous interest in several and, hopefully, many different locations. We suggest also that acreage limitations not preclude one party holding oil shale leases in more than one state.

Further, we question the wisdom of a Secretary of the Interior exposing his high office to the attacks which will be made charging favoritism and special interest. Selection of one of several applicants could be considered a form of special preference. Even if such selections were uniformly successful, the charges of benefit to a chosen few could appear. An open competitive bidding situation is the one method most likely to avoid these attacks and the resulting deterioration of confidence in government.

The government's interest in net profits and its tight control of the plans of research and development do not provide the optimum opportunity for successful development. In addition they are incompatible with the sound investment and risk-taking policies of the American businessman who must elect to perform and finance the oil shale ventures.

Under the "net profits" provisions the federal government will take a rental if there is no production. It will take a 3% royalty on gross sales if there is production but no profit, but a "net profit" share up to 50% if there is a profit in excess of the 3% royalty. The government share of "net profit" fixed in the proposed regulations uses the depreciated investment as a base. Foreseeable oil shale commercial production is not anticipated for several years. The depreciated investment at such time might make the first profit in the 50% bracket and normal recoupment of heavy initial investment and operation costs would

be denied. Since a corporation can be expected to pay a federal income tax equal to 50% of its net profit, the initial profit sharing with the United States might more likely be on a 25–75 basis.

The critical objection to the "net profits" approach is the repressive effect it has on proceeding into commercial production. The principal difference in expenditures for traditional oil recovery and for recovery of oil from oil shale is the exploration costs. Oil exploration expenses have been substantial; lifting or extraction costs are usually relatively minor. As to oil shale the reverse is true. Once oil is discovered by exploration, the economic test as to producing it for market is whether the sale receipts exceed the lifting and marketing costs. Lease acquisitions and exploration costs may be greater than can be recovered from production, but production of oil is still economically justified. If a "net profits" charge is made by the lessor, the charge is added to lifting, or extraction costs, whether the product be oil from wells or oil from oil shale. Production is thereby repressed, and the product unproduced is wasted and withheld from its place in the continually growing energy complex of our national economy. Excellent testimony on this and related points was presented at the recent monopoly hearings as to oil shale held by Senator Hart. Specifically testimony was given by Dr. Walter J. Mead and Dr. Henry Steele.

The "net profits" approach is also open to question because of the expense to both lessor and lessee of maintaining and supervising records, and because of potential inefficiencies being made economic to the lessee.

Among the incentives to proceed which we note as needed, but missing in your proposed regulations, are the certainty as to whether any commercial lease will issue, the size of such lease, the right to benefit from successful research at the lessee's own expense, the right to hold federal oil shale leases in more than one state under their varying conditions, and the existence of some predetermined royalty or rental payment that can be calculated.

Regarding patents, the requirement of the proposed regulations that all patents and inventions arising out of the lessee's research become the property of the United States is not consistent with the position which we believe the government should maintain as the lessor of an oil shale lease. Laws against monopoly and emergency power of government in times of need can protect the public interest. There is no reason why the government should demand the further consideration of the right to inventions made at the lessee's expense, nor do we believe that President Kennedy's Statement of Government Patent Policy of October 12, 1963, need be construed to require such a harsh interpretation. To do so, of course, deprives the inventor of the reward given for his discovery. This reward—this hope of greater profitability or better competitive position—is the incentive which not only spurs inventors to make discoveries but spurs their competitors to make others lest they otherwise fall behind. It is not reasonable to require that an inventor who has taken substantial risk of time and money to make an invention should give it up without just compensation, and, worse yet, have it made available free of cost to competitors who have not shared in that risk. This approach necessarily places the forward looking, aggressive lessee at an economic disadvantage relative to his competitors. It is submitted that this device will discourage rather than encourage research. Such a plan may also lead to the pooling of research efforts and the elimination of effective competitive research.

We consider that your concern with preventing lessees from acquiring and holding leases for speculative purposes and without progress toward production is justified. The costs of holding non-producing leases are one of the best preventive measures. Suggestions which we feel worthy of consideration are a fixed term lease that can be extended only by production, with a substantial rental per acre, and with such rental or minimum advance royalty increasing each year. Such procedure has the added importance of bringing revenue to the federal government and states from resources that today produce no return.

Fourth: Financial Return. The failure of the federal government to realize any rentals is hard to understand. The States and Reclamation fund share in Mineral Lease Revenue, in contrast to the Outer Continental Shelf where the federal government keeps 100%. Even if no royalties materialize, rentals could be substantial.

The shifting from public to private investors of the cost of research could be another substantial financial benefit.

As previously discussed, the potential return to the federal government would probably be as great or greater from a fixed royalty than from a "net profits" share. Under a competitive bidding system for leasing, the initial bonuses could be substantial without acting, as would a "net profits" provision, as a deterrent to production.

Fifth: Joint Federal-State-and Private Efforts. Concern with many values over and above the oil shale itself is proper, but to assume that only the federal government as a proprietor can control these matters is unrealistic and unduly obstructive. Such position ignores that state and private lands also contain oil shale and would have to be separately regulated, controlled, or supervised. The states have policing power and laws against pollution and other abuses. They can and must enforce them. Should they fail federal intervention would become necessary. The pattern of federal legislation on pollution, administered to some extent by your department, already exists and is applicable to all lands. Until federal intervention is necessary states should not be denied their proper partnership position. Likewise, responsible business leaders are emphasizing sound conservation. This acceptance of our national ideals should be cultivated and encouraged not only because it minimizes the governmental costs of regulation and supervision, but also because in the long term, it is most effective.

A three state compact is one possible approach, although we see no present overwhelming need.

We in Colorado, Utah and Wyoming, in cooperation with interested industrial concerns, have been doing all within our power to lay the groundwork for a sizable oil shale industry. Preliminary attention has been given to the complex problems of financing the schools, roads and community services which inevitably must be provided for oil shale communities. Much thought has been given to zoning and city planning so that oil shale communities will be model cities and not cancerous blights.

Colorado, Utah and Wyoming have taken a position of strong leadership in the fields of natural resource conservation and the abatement and prevention of air and water pollution. We are convinced that these matters—as matters of great local concern—can be and should be handled at the local level where the problems are and where the people directly affected reside. We intend to do all that is needful in these matters and are satisfied of our ability to do so. We are most encouraged by the cooperative attitudes of Colorado, Utah and Wyoming industrial leaders towards acceptance of and compliance with our antipollution legislation. We fully expect enlightened participation in the resolution of these matters.

SPECIFIC RECOMMENDATIONS

As shown by our discussion above, we specifically recommend you consider changing your proposed regulations to achieve the national interest goals by:

1. Opening lands to competitive bidding in blocks up to 5120 acres upon your or private nomination, using the tested competitive bidding procedures for other leaseable minerals under the federal Mineral Leasing Act.
2. Provide a fixed royalty rate as in the case of oil and gas or other leaseable minerals, but including a provision for periodic renegotiation at a reasonable period after production commences.
3. Fix a term of at least ten years which can be extended only by production. Less than ten years is probably impractical due to the present stage of oil shale technology.
4. Initiate an immediate rental program that will produce revenue under the Mineral Leasing Act.
5. Provide for increasing rentals or accelerating advance royalties during the term of the lease, so that speculative non-productive holdings is uneconomic. Give to legitimate producers the opportunity to offset such penalizing expenses by obtaining successful production.
6. Eliminate the research and development leases as the only immediate method of obtaining leases on federal lands. Avoid the necessity of choosing between proposals and possibly thereby eliminating some that might contribute to ultimate success. Minimize administrative costs and supervisory burdens by simplifying accounting.
7. Eliminate the net profits approach as being adverse to our ultimate goal of production. Also, we can recognize the taxes collected on operations are in essence net profits charges.

8. Provide incentives for achievement, including elimination of the requirement that inventions be made publicly available without charge other than when public funds finance such development.

9. Allow and expect the states and federal government to provide the pollution and other conservation controls through state and federal cooperation under the laws applicable to all lands, rather than by use of rules applicable to federal oil shale lands alone.

We commend you for moving in this controversial field. Your announcements of the principles you follow are appreciated. Our recommendations, we believe, go to the heart of those principles. We feel they will provide the means by which the federal, state and private segments of our nation can most fairly and equitably proceed in the best of interest of all.

Very truly yours,

JOHN A. LOVE,
Governor of Colorado.
CALVIN L. RAMPTON,
Governor of Utah.
STANLEY HATHAWAY,
Governor of Wyoming.

The CHAIRMAN. Congressman William Henry Harrison of Wyoming.

STATEMENT OF HON. WILLIAM H. HARRISON, A U.S. REPRESENTATIVE FROM THE STATE OF WYOMING

Mr. HARRISON. Thank you, Mr. Chairman. I appreciate every much the opportunity of appearing before your committee, particularly because my good friend and very able junior Senator of Wyoming, Clifford Hansen, is one of your members.

Wyoming, of course, is very much interested in the proper protection and the proper mining of the oil shale lands, particularly because Wyoming has the largest deposit of oil shale, even though it is not quite as rich in oil-bearing shale as the deposit located in Colorado. However, this presents a problem to our State. We are a natural resource State, and in order for our State to progress industrially, we must be in a position to use our minerals and our other natural resources.

In Sweetwater County, Wyo., where a great deal of the oil-bearing shale is located, we have large deposits of trona, which is being mined now by several outfits—FMC and Allied Chemical are two of them—and they are very much worried over the possibility that the mining of trona will be restricted through the withholding of the oil shale lands.

At the request of Mr. Cimino, representing the manager of the FMC Corp. at Green River, Wyo., and Mr. Russ Beamer, secretary of the Wyoming Association, I am here before you asking that some certain changes be recommended in the regulations published by the Department of the Interior in the Federal Register of Wednesday, May 10, and I would like to read a part of the telegram sent to me from Mr. Cimino setting out some of the points he would like to have changed in order to protect the trona industry in our State:

1. The purpose of the regulations should include language establishing noninterference with the leasing or mining of trona in Sweetwater County.

2. The definition of oil shale should exclude trona which is to be used in a commercial facility in addition to the presently proposed exclusions of gas asphaltic minerals or coal.

3. The designation of available lands should exclude, protect, and preserve lands containing trona of commercial value in Sweetwater County.
4. The proposed regulations should include language to protect the renewal of Wyoming sodium leases.

I would like, Mr. Chairman, to be able to introduce that telegram and have it made part of the record.

The CHAIRMAN. It will be introduced in the record in connection with your remarks.

(The telegram referred to follows:)

[Telegram]

Hon. WILLIAM H. HARRISON,
House Office Building,
Washington, D. C.:

DENVER, COLO., *September 13, 1967.*

Russ Beamer advises that a Senate hearing is to be held September 14, 15, at which the proposed regulations regarding the leasing of oil shales will be discussed. We will appreciate your assistance in protecting the trona rights in Sweetwater County. We suggest that these rights be protected by the inclusion of trona land exception amendments to the proposed regulations (43 CFR 3170). The amendments should contain the following:

1. The purpose of the regulations should include language establishing noninterferance with the leasing or mining of trona in Sweetwater County.
2. The definition of oil shale should exclude trona which is to be used in a commercial facility in addition to the presently proposed exclusions of gas asphaltic minerals or coal.
3. The designation of available lands should exclude, protect, and preserve lands containing trona of commercial value in Sweetwater County.
4. The proposed regulations should include language to protect the renewal of Wyoming sodium leases.

Please advise if we can be of any further assistance in this matter.

S. M. CIMINO,
Resident Manager, FMC Corp.,
Green River, Wyo.

Mr. HARRISON. I have also received a call from Mr. Beamer, who, as I said, represents the Wyoming Mining Association, and he has submitted to me certain proposed changes in the regulations promulgated by the Secretary in the Federal Register, and I believe that these proposed changes are identical to the changes which were recommended to the Secretary of the Interior, Mr. Udall, by Allied Chemical earlier, and I would like to read just the proposed changes to 43 CFR 3170, just briefly.

Add a new subsection (f) to Section 3170.0–1 reading:
(f) not interefere with the leasing or mining of trona in Sweetwater County, Wyoming.

Second, modify subsection (b) of section 3170.0–5 (Definition of the term "Oil shale") to read (new matter in italic and word to be deleted bracketed):

(b) deposits subject to lease as oil and gas, asphaltic minerals, [or] coal, *or sodium* [*trona*] *in Sweetwater County, Wyoming, to be used in a commercial facility for the production of soda ash and/or other chemical products.*

Third, the present paragraph designated as section 3170.1 (Designation of available lands) be redesignated as subsection (a) and a new paragraph designated as subsection (b) be added reading:

(b) Lands containing trona which are located in Sweetwater County, Wyoming, and which are presently or hereafter held under sodium leases pursuant to the Mineral Leasing Act and which also contain oil shale shall not be desig-

nated hereunder unless the development of the oil shale therein would not adversely affect in any significant way the trona values of such lands. Any such oil shale lease shall contain terms and provisions governing the oil shale development as are adequate to fully protect and preserve the trona values of such lands.

Finally, it is urged that the proposed regulations be amended to incorporate a new provision designed as Section 3170.2 reading:

RENEWAL OF WYOMING SODIUM (TRONA) LEASES

Nothing contained herein shall be construed to limit, now or hereafter, in any manner whatsoever the application for and/or the granting of any renewal of any sodium lease for the mining of trona on lands located in Sweetwater County, Wyoming.

Although I have been assured by the representatives of the Department of Interior that there is no desire on their part nor intention to injure in any way or to withhold the mining of trona in Sweetwater County, Wyo., it is felt there by the industry, and many of us in the State, that in order to go ahead with the production of trona which is necessary in our State for our economy and for the supply of the material for the country, that these provisions should be changed and should be inserted as a change in the regulations as promulgated by the Secretary in the Federal Register.

I hope that these ideas can be considered and these changes made, and I am sure that if they are the mining of the oil shale, which will probably be in the future, will not be injured in any way but in the meantime the mining of trona can proceed in a proper and orderly manner as it should.

The CHAIRMAN. Thank you, Congressman.

Any questions?

Thank you very much for your statement.

Senator HANSEN. Mr. Chairman, if I may, I would like to compliment Congressman Harrison for the very able job he does in representing Wyoming and to echo his concern as expressed in the telegram that he received from Mr. Cimino. I, too, have a copy of that wire, Congressman Harrison, and I had intended to insert it in the record. You have already done it, so I simply say that I endorse what you have said.

Mr. HARRISON. I know that our junior Senator is well aware of the problems of the State of Wyoming, and he takes the proper and necessary steps to see that those interests are protected.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Congressman. I appreciate your coming here.

Our next witness will be Secretary Udall.

Mr. Secretary, we are delighted to welcome you to the committee this morning to discuss this most important subject. We are delighted that you have the Solicitor, Mr. Barry, with you.

STATEMENT OF HON. STEWART L. UDALL, SECRETARY OF THE INTERIOR, ACCOMPANIED BY FRANK BARRY, SOLICITOR, DEPARTMENT OF THE INTERIOR

Mr. UDALL. Thank you very much, Mr. Chairman. I assure you I have enough misery where I am.

Mr. Chairman, I have a prepared statement which I shall read, and we also have available for the committee and for the record what we

have styled a general summary of the comments which have been received by this department up to this point. This is not complete, but we did feel this should be in the record.

The CHAIRMAN. Without objection, the comments you referred to will be included at this point.

(The document referred to follows:)

GENERAL SUMMARY

Thirty six specific comments have been received or considered by August 22, 1967, in connection with the invitation to submit comments concerning the proposed oil shale regulations as published in Federal Register of May 10 (Vol. 32, No. 90).

These comments were separated into the following categories:

Congressional	2
Federal agencies	3
State government agencies	4
Associations	2
Industry	18
Conservation groups	1
Private individuals	6

The period for submitting comments has been extended until the close of business October 16.

Summary Analysis

Major interest in the proposed regulations center around the following points:

1. *Royalties:* Some stated the regulations concerning royalty are not realistic, and that to encourage company participation no royalty should be required until at least five years after commercial production; thereafter, the royalty should be modest—i.e., five percent of the production at the mine or wellhead. There was a suggestion that royalty payments be used to offset deferred rentals.

2. *Patents:* Some stated that the provision in the proposed regulations that the United States acquire title to all inventions will discourage participation. It was contended that as an incentive, the participant should have the right to retain title to all inventions subject only to the requirement that they be licensed to others on a nondiscriminatory reasonable royalty basis. Most making this point also urged a use of a competitive leasing system. On the other hand the view was expressed that the patent technology be available to all without cost.

3. *Term:* It was suggested that the lease should be for a fixed term of years and as long thereafter as oil shale is commercially produced—provision should be made for an extension of the fixed term on a showing that research has proceeded diligently and that there is a reasonable possibility that research will prove successful or that commercal production can be obtained during the extended term. It was suggested that the uncertainties contained in the proposed regulations with respect to the lease term should be eliminated.

4. *Acreage:* Some criticized the provision permitting a reduction in acreage when commercial production is attained. It was contended that few companies would be willing to undertake a research project of this nature without knowing in advance the number of acres that it would be entitled to hold during both the research and commercial phases of the lease. It was also urged that one of the most important facts to be developed through research is a determination of the optimum sized tract for oil shale development and that the acreage allowed a participant should be large enough to permit research and experimentation in this regard.

5. *Selection of Lessees:* There was opposition to the criterion of evaluating applications for leases on the basis of the applicant's need for lands to conduct research, on the ground that applications should be granted to any applicant that indicates it has the financial and technical ability to conduct a good research program. Many suggested that competitive bidding be used as the system for selecting lessees.

6. *Multiple Resources:* Some urged that it was not clear from the proposed regulations whether nahcolite and dawsonite are included in the definition of

oil shale, and that this question be clarified so that if an applicant proposes a research program designed to developed a method for the extraction of minerals associated with the oil shale, that proposal be given weight in considering the application.

7. *Disclosure of Information:* Some opposed the provision making all data available for public use, because that would remove the incentive for investment. It was suggested that the lessee furnish, on a confidential basis, the data needed to indicate good faith and prudence.

8. *Discretionary Authority of the Secretary:* Some raised objection to the degree of discretion in the Secretary to determine the research type and site, the quantity of mineral, the need for commercial production, the area of commerical production and the commercial extension of the lease term, as making it extremely difficult to predict profit potential and to secure financing.

9. *Land Exchanges:* It was suggested that the land exchange provisions under the proposed regulations are too restrictive in requiring that the lands to be exchanged have similar geologic and physical characteristics. The suggested criterion was that the offered lands be of a value approximately equal to or exceeding the value of the selected public land. Another objection was that land obtained in trade would be subject to many of the public land regulations.

10. Miscellaneous Comments Were as Follows:

a. Antitrust consultation is unnecessary.
b. Leases should contain provisions permitting joint operations.
c. Leases should include customary force majeure provisions.
d. Mining claim conflicts should be resolved.
e. The automatic termination provision should be clarified to prevent the lessee from losing his investment. Provision should be made permitting removal of plant and facilities.

CONGRESSIONAL

I. Senator Hart—Congressional Record, July 11, 1967

Oil shale leasing program would have some unhappy results—monopolization by the major integrated American Oil Companies, higher consumer prices and lackadaisical development.

The flaws in the program are:

A. the use of land subsidies would discourage all but the largest integrated companies from competition for leases.
B. it would keep enterprising companies willing to proceed with present technology from actually beginning production.
C. it would keep some research oriented companies from becoming involved.
D. the program would discourage total development of all the resources, particularly aluminum and sodium since large integrated companies expertise in drilling—not mining.
E. it requires the most pervasive kind of continuous Government regulation with subjective decisions to be made on a regular basis. This could be a stifling barrier to rapid development and an open invitation to charges of "give-away."

One aspect of the program should be applauded—providing that government will acquire title to all inventions made in the course of the research and requirement for licensing of other patents. Senator Hart suggests the following alternatives.

1. 30,000 acres as a start should be thrown open to leasing on a bid basis, not tied to research and development.
2. the leasing agreement should provide for deferred high rentals which would be offset by royalty payments. Under such plan, the land is most likely to be leased by non-petroleum industry.
3. the land should be leased on the basis of minerals in the ground—not acreage alone.
4. wherever possible the land to be made available should be kept intact and contiguous.

The Government should embark on a intensive research program to develop both the in-situ process and technology to extract sodium and aluminum. Other alternatives were suggested for a TVA or Comsat type corporation. There is general agreement that prompt development of these resources is desirable.

II. Senator Peter H. Dominick, letter of June 8, 1967

The departments affirmative position for permitting private enterprise to carry out R & D is a step foreward. The regulations are overly cautious. An onerous responsibility and too much discretion is placed in the Secretary. Specific comments are directed to—

A. *Obtaining a Commercial lease:*

1. no firm assurances by the government that one will receive a production lease.

2. the requirement that a leasee shall have "developed" a mining and processing method is most objectionable. No guidelines are given as to what constitutes a "method."

3. the only manner in which you can acquire production lease is to first complete an R&D lease. This restricts those who may already have developed advance techniques to forego production.

B. *Disclosure of Patents:*

1. techniques invented during R&D should not be placed in public domain without compensation. Should be subject to licensing a specified royalty.

2. regulations are silent as to whether inventor will have exclusive rights to inventions during production phase.

3. regulations permitting access to all facilities on and off site and all books and records is far too sweeping.

4. the prohibition or limitation to publication or communication concerning research work would stifle or encumber free exchange of ideas in trade journals and between professional groups.

C. *Acreage:*

1. the regulations are ambiguous about the acreage or area containing "reasonable reserves" and what guidelines will be used to make this determination.

2. to place the sole discretion with a single individual (the Secretary) for the determination of the quantity of mineral deposit needed for commercial production is unwise.

3. only a half a dozen leases would be available if only 5,120 acre leases were issued.

4. the regulations should clarify whether the production acreage would be adjacent to and include the R & D acreage.

D. *Royalties:*

1. the proposed royalty structure needs reconsideration.

2. gross value "at the point of shipment to market" needs clarification.

3. royalty payment period should be adjusted to tax period.

4. clarification of rephrasing is needed to specify the time within which lessee must file objection and offer to negotiate a proposed re-adjustment of royalties.

5. why publish a notice of intention to reduce royalties and not publish a notice of intention to increase royalties.

E. *Diligence in Plan of Research:* The effect of regulation is to tie production lessee to his original plan of research instead of competitive and more efficient techniques which may be developed.

F. *Application for lease:* The requirement in the application for a statement of need for federally leased land is ambiguous and susceptible to abuse.

G. *Drafting:* The frequent use of the word "will" instead of "shall" or "may" will lead to problems in interpretation.

FEDERAL AGENCIES

I. Federal Water Pollution Control Administration June 8, 1967

Require notice to prospect lessees that they will be required to include adequate research, development and implementation measures for water pollution. The FWPCA proposes amendments to the regulations to insure strict water and air pollution control.

II. Bureau of Sports Fisheries and Wildlife May 25, 1969

The Bureau proposes re-phrasing to insure protection of environment, including air and ground and surface water.

III. Bureau of Outdoor Recreation

The Bureau requests that a section be inserted to provide consultation with B.O.R. in site selection and priority of areas to be given where there will be the least adverse effect on recreation resources and natural beauty environment.

STATES

I. Governors John A. Love, Colorado, Calvin L. Rampton, Utah, and Stanley Hathaway, Wyoming, joint letter to the Secretary

A. The major goals for a development program on federally owned oil shale lands and probably non-federally owned oil shale lands are:

1. Development of oil shale as an available supplemental energy source to meet national security needs. The other benefits of development, nationally and regionally are obvious without further comment.

2. Protection against pollution and waste and against any unnecessary lessening of aesthetic and other use values.

3. Provisions for maximum privately financed development as an alternative to publicly financed operations.

4. Provision for optimum financial return to the federal government by minimizing windfall profits, monopoly control and preferred treatment for any segment of the national economy.

5. Giving fair recognition to the role of private, state, and federal contribution to an oil shale development program and to the just interests and responsibilities of each.

They concluded that the regulations need some revision to best achieve the stated objectives; They agree that a competitive private enterprise, operating within the framework of the general laws for the protection of the public interest, is the only suitable vehicle for the development of an oil shale industry.

The following expands their views on the results of testing the goals they have stated against proposed and possible alternative procedures.

1. *National Security.*—Oil shale in the ground and without availability of its oil and other products through proven and immediately useable methods is valueless in national emergencies. Only presently accelerated research and experimentation plus pilot and proto-type plant operations in a variety of areas can provide the answer for the availability of the petroleum product.

2. *Protection of other values.*—There can be no disagreement as to the need to avoid waste of the resource itself by non-use or misuse, to stop or prevent air and water pollution, to treasure and protect all surface and aesthetic values to the greatest extent possible, to give our full attention to water and community development and planning. The only possible disagreement would be as to methods. Neither the federal, state, or private interests have or should have a monopoly on devotion to or efforts for such programs. No program would be acceptable which disregards the multiple values of those areas containing oil shale.

3. *Private Financing.*—(*a*) The full costs of carrying an unborn oil shale industry to full growth can only be estimated. However, the development of oil shale in the three states appears to be a closely parallel situation to the recent history of the Outer Continental Shelf. Less than a generation ago, little was known about techniques of handling deep water drilling. The impediments to such development were considered all but insurmountable. Without reasonable rules and adequate incentives, private capital could not have been invested. With adequate opportunities and incentives, private development of oil shale might duplicate such progress. Private capital can be expected to make the investments and provide the efforts if incentives are adequate. Certain changes in the proposed program are needed to achieve such private effort.

(*b*) The concept of negotiated leases based on the "need" of an applicant for oil shale reserves creates serious impediments to any development. It also creates serious problems for administration that far overbalance any possible benefits. The actual "need" with which we are concerned is the need for our nation to develop an alternative source of energy to be available when required. The premise of your proposed regulations appears to be that the lease holder who has no present oil or other reserves might be expected to proceed more aggressively. It does not necessarily follow that he will be most successful.

(*c*) Further, the wisdom of a Secretary of the Interior is questioned. He is exposing his high office to the attacks which will be made charging favoritism

and special interest. Selection of one of several applicants could be considered a form of special preference. Even if such selections were uniformly successful, the charges of benefit to a chosen few could appear. An open competitive bidding situation is the one method most likely to avoid these attacks and the resulting deterioration of confidence in government.

(*d*) The government's interest in net profits and its tight control of the plans of research and development do not provide the optimum opportunity for successful development. In addition they are incompatible with the sound investment and risk-taking policies of the American businessman who must elect to perform and finance the oil shale ventures.

(*e*) Under the "net profits" provisions, the federal government will take a rental if there is no production. It will take a 3% royalty on gross sales if there is production but no profit, but a "net profit" share up to 50% if there is a profit in excess of the 3% royalty. The government share of "net profit" fixed in the proposed regulations uses the depreciated investment as a base. Since a corporation can be expected to pay a federal income tax equal to 50% of its net profit, the initial profit sharing with the United States might more likely be on a 25–75 basis. The critical objection to the "net profits" approach is the repressive effect it has on proceeding into commercial production. The principal difference in expenditures for traditional oil recovery and for recovery of oil from oil shale is the exploration costs. The "net profits" approach is also open to question because of potential inefficiencies being made economic to the lessee.

(*f*) Among the incentives to proceed which we note as needed, but missing in your proposed regulations, are the certainty as to whether any commercial lease will issue, the size of such lease, the right to benefit from successful research at the lessee's own expense, the right to hold federal oil shale leases in more than one state under their varying conditions, and the existence of some predetermined royalty or rental payment that can be calculated.

(*g*) Regarding patents, the requirement of the proposed regulations that all patents and inventions arising out of the lessee's research become the property of the United States is not consistent with the position which we believe the government should maintain as the lessor of an oil shale lease. Laws against monopoly and emergency power of government in times of need can protect the public interest. There is no reason why the government should demand the further consideration of the right to inventions made at the lessee's expense nor do we believe that President Kennedy's Statement of Government Patent Policy of October 12, 1963, need be construed to require such a harsh interpretation. To do so, of course, deprives the inventor of the reward given for his discovery. It is submitted that the device will discourage rather than encourage research. Such a plan may also lead to the pooling of research. Such a plan may also lead to the pooling of research efforts and the elimination of effective competitive research.

(*h*) The concern with preventing lessees from acquiring and holding leases for speculative purposes and without progress toward production is justified. The costs of holding non-producing leases are one of the best preventive measures. Suggestions which are worthy of consideration are a fixed term lease that can be extended only by production, with a substantial rental per acre, and with such rental or minimum advance royalty increasing each year. Such procedure has the added importance of bringing revenue to the federal government and states from resources that today produce no return.

4. *Financial Return.*—(*a*) The failure of the federal government to realize any rentals is hard to understand. The States and Reclamation fund share in Mineral Lease Revenue, in contrast to the Outer Continental Shelf where the federal government keeps 100%. Even if no royalties materialize, rentals could be substantial.

(*b*) The shifting from public to private investors of the cost of research could be another substantial financial benefit.

(c) As previously discussed, the potential return to the federal government would probably be as great or greater from a fixed royalty than from a "net profits" share. Under a competitive bidding system for leasing, the initial bonuses could be substantial without acting, as would a "net profits" provision, as a deterrent to production.

5. *Joint Federal-State and Private Efforts.*—(*a*) Concern with many values over and above the oil shale itself is proper, but to assume that only the fed-

eral government as a proprietor can control these matters is unrealistic and unduly obstructive. Such position ignores that state and private lands also contain oil shale and would have to be separately regulated, controlled, or supervised. The states have policing power and laws against pollution and other abuses. Should they fail federal intervention would become necessary.

(*b*) A three state compact is one possible approach, although there is no present overwhelming need.

(*c*) The Governor's of Colorado, Utah and Wyoming, in cooperation with interested industrial concerns, have been doing all within their power to lay the ground work for a sizable oil shale industry. Much thought has been given to zoning and city planning so that oil shale communities will be model cities and not cancerous blights.

Specific recommendations

As shown by discussion above, the Governor's specifically recommend that we consider changing the proposed regulations to achieve the national interest goals by:

1. Opening lands to competitive bidding in blocks up to 5120 acres upon your or private nomination, using the tested competitive bidding procedures for other leaseable minerals under the federal Mineral Leasing Act.
2. Provide a fixed royalty rate as is the case of oil and gas or other leaseable minerals, but including a provision for periodic renegotiation at a reasonable period after production commences.
3. Fix a term of at least ten years which can be extended only by production. Less than ten years is probably impractical due to the present stage of oil shale technology.
4. Initiate an immediate rental program that will produce revenue under the Mineral Leasing Act.
5. Provide for increasing rentals or accelerating advance royalties during the term of the lease, so that speculative non-productive holding is uneconomic. Give to legitimate producers the opportunity to offset such penalizing expenses by obtaining successful production.
6. Eliminate the research and development leases as the only immediate method of obtaining leases on federal lands. Avoid the necessity of choosing between proposals and possibly thereby eliminating some that might contribute to ultimate success. Minimize administrative costs and supervisory burdens by simplifying accounting.
7. Eliminate the net profits approach as being adverse to our ultimate goal of production. Also, we can recognize that taxes collected on operations are in essence net profits charges.
8. Provide incentives for achievement, including elimination of the requirement that inventions be made publicly available without charge other than when public funds finance such development.
9. Allow and expect the states and federal government to provide the pollution and other conservation controls through state and federal cooperation under the laws applicable to all lands, rather than by use of rules applicable to federal oil shale lands alone.

II. Colorado Department of Game, Fish and Parks. May 26, 1967

Under Section 3172.9(a) Protection of environment and human safety suggest that lease also contain provisions for conducting of concurrent research on methods of restoration of disturbed areas and waste disposal areas.

OIL AND GAS ASSOCIATIONS

I. Rocky Mountain Oil and Gas Association

Association is favorable to private industry's responsibility in oil shale development. The proposed regulation will not generate a broad base of competitive research and production.

A. General Comments are as follows:

1. government acreage should be to all qualified applicants for the sole purpose of research and it should not be restricted to applicants selected by the Secretary.
2. the uncertainty in the proposed regulations for commercial production extension is a definite deterrent to research and production.

3. the royalty provisions would operate and discourage investment, make it difficult to compete with other energy sources and would be difficult to administer. The RMOGA proposes a fixed royalty, not to exceed 5%.

4. the Government patent policy is not applicable to oil shale research on federal lands. The proposed regulations will curtail research by not allowing lessee to retain benefits and recoup investment.

5. the inherrent uncertainties make it impossible to do advance planning and financial evaluation for financing research and production operation. Difficulty, therefore of obtaining conventional financing will restrict R&D. These problems should be eliminated by drafting a prescribed form of lease and amending regulations to spell out in detail the Dept. supply connection.

B. Specific Comments are as follows:

1. Section 3170.0–1.—Indicates an intent to favor those who have not previously obtained oil shale reserves.

2. Section 3170.0–5.—The lease and regulations should specifically provide that an oil shale lease will include oil shale and all other associated minerals unless those minerals are not intermingled with oil shale and are capable of being produced separately. If separate, a preferential right to lease would avoid problems arising from reciprocal convenants of support maintenance and non-interference between lessees.

3. Section 3171.2(c)(11).—The disclosure of crude oil reserves is not necessary or relevant to applicant's qualification. Delete.

4. Section 3171.3.—The applicant's need for lands and reserves is not material to a determination of an applicant's capability of conducting a commercial oil shale operation.

5. Section 3172.2(b).—The wording may result in automatic termination of the lease if production ceases for any cause or if production ceases in paying quantities even temporarily. Safeguards to prevent loss of investment in plant and facilities should be provided.

Guide lines should be spelled out with respect to the requirements of commercial feasibility, optimum recovery, prevention of pollution and damage to surface resources.

6. Section 3172.3(c).—After substantial investment in research, the Secretary could unilaterly determine amount of mineral for extended production term. The amount of reserves should be known by lessee prior to making investment. Since only one lease will issue to person, association or corporation an individual or company would be reluctant to take a lease unless the extent of lands and reserves to be covered by the lease for commercial production were known.

7. Section 3172.3(d).—Should be clarified and state that a total "net" interest of not more than 5120 acres in United States oil shale lease will be allowed.

8. Section 3172.5(b).—Needs clarification. Suggest that gross value as provided attach to product from retort, where mining and retorting process used, or at wellhead of an in-situ well. This section is unclear as to whether previous cost of research and experimentation are to be included in term "investment".

9. Section 3172.5(e).—Suggest additional criteria and provisions to avert uncertainties affecting a large investment such as the date which such 20 year period would be measured.

10. Section 3172.6.—Proposes that the extension of the lease for a commercial production term should be at option of lessee subject to having complied with specific requirements, rather than unilateral discretion and action of the Secretary. The lease would provide specifically for right to remove plant and facilities upon termination of the lease.

11. Section 3172.9 (d) and (e).—RMOGA believes these provisions would discourage competition in development of techniques for oil shale development. The patent provisions are in effect a denial and rejection of the philosophy of the patent laws of the United States.

Conclusions and recommendations

The Rocky Mountain Oil and Gas Association has a membership of 470 individual and company oil and gas operators of all sizes, from the smallest of independents to major oil companies. As we have considered the proposed regulations within our organization, we have found a wide range of individual situations and views. If the oil shale resources are to be effectively developed to meet the needs of the nation we believe that the proposed rules should be broadened and made

more flexible so as not to discourage development of this resource by restricting the entry of a broad variety of companies and other groups into the research and development of oil shale.

We therefore recommend that the rules be further clarified and broadened to offer prospective applicants a choice of the following alternatives:

(*a*) We believe that the regulations as written are unworkable as discussed above because of the complexities introduced by tying the research and commercial phases together. Nevertheless, if they are modified to eliminate some of the problems discussed above, there may be some who would desire to proceed under such a program.

(*b*) We recommend that tracts of public lands be made available solely for research purposes, limited in size, with the provision that once the research program was completed, the premises would revert to the United States. These tracts should be made available without cost, or at a nominal charge, to any qualified party desiring to do research, with such party retaining all patents and research project. The benefit to be derived by the United States would be encouragement of research and development of this vital natural resource.

(*c*) There may be some companies who now would like to have the opportunity to acquire commercial oil shale leases on specific tracts and proceed with construction of facilities for production of shale oil without the necessity of doing further research as required under the rules as proposed. Leases could be put up for sale on a competitive bidding basis similar to that now used for off-shore leases. For the protection of the government and the lessee, the leases should be on a prescribed lease form. Reasonable annual rentals or other payments could be established which would be sufficiently high to provide an incentive for early development by the lessee. Such rentals would not be payable once commercial production was established. The lease term should be for five years and so long thereafter as diligent operations for the production of shale oil are being conducted. The rentals and relatively short primary term of the lease would discourage speculation and foster continuous progress toward production.

The regulations should provide adequate provisions to permit the inclusion of all commercial leases, in whole or in part, in units which are subject to plans for development similar to those now in use for federal oil and gas leases. Any lease so committed to a unit would be extended beyond its initial term while the unit remains in existence, in accordance with a plan of development approved by the Secretary.

Some of the suggestions which we have made in these comments may require the enactment of legislation to clarify and supply needed authority for the Secretary. To the extent required, legislation to accomplish this purpose should be drafted and introduced in Congress.

II. Independent Petroleum Association of America

A. Executive Order No. 5327 should be continued until appropriate legislation is enacted that will insure a program for the orderly, fair and simultaneous leasing of the public oil shale lands.

B. Such legislation should encourage development of the public oil shale lands under our free enterprise system by private industry without Government financial assistance or subsidy.

C. The size of leases awarded under the program should be limited, and much smaller than provided in the present law, in order that private firms, both small and large, will be able to participate in the leasing program. A multiplicity of operators, both large and small, will promote competition and eliminate the threat of monopoly in this potentially vast energy source.

D. This Committee, and other appropriate committees of the Independent Petroleum Association of America, must be continuously alert to developments in oil shale and its impact on the conventional crude oil and natural gas industry in the United States.

INDUSTRY

I. Allied Chemical Corporation—June 28, 1967

Suggests amendments and modifications to prevent interference with sodium leasing in Sweetwater County, Wyoming, and modify definition of oil shale [3170.0-5(b)] to exclude lands containing trona unless oil shale development would not adversely affect in any way the trona values.

II. Amerada Petroleum Corporation—August 9, 1967

A. The regulations should seek to protect public health, scenic values, wildlife or whatever national resources may be involved. In the case of the proposed regulations, however, we think the effort to protect and conserve other values has been carried to the point where effective development of an oil shale industry may actually be inhibited.

B. Under the proposal, the lease applicant is required to have a fully prepared program for the development of the acreage at the time he makes application. If the lease is granted, it will contain a limitation on the number of acres which the lessee will be allowed to use during the research term. If the lease is extended during the commercial production term, another limitation will be imposed. These limitations, the extent of which are not known to the lessee at the time he makes his application, may be entirely inconsistent with his concept of what he deems necessary for the successful completion of the project. The possibility of their being unduly restrictive is bound to be a deterrent to active bidding.

C. The provisions with respect to disclosure of information developed during the research term, the compulsory licensing of patents, and particularly the opening to the public of all books and records, is unrealistic in the extreme.

D. The legitimate interest of the public can be protected by the manner in which tracts are put up for leasing, by regulating their size and location, by providing suitable royalty schedules, by fixing terms which are long enough to allow development as economic conditions develop while not encouraging inaction and speculation. Sufficient restrictions can be imposed to guarantee protection of other economic and esthetic resources.

III. Bear Creek Mining Company—August 7, 1967

A. Procedures for selecting research and development proposals may eliminate favorable avenues of work.

B. The regulations are unnecessarily restrictive as to the mechanics of the possible testing program. The details of goals, plans, personnel, financial and technical capability must be submitted with the lease application; modifications must be approved.

C. Time restrictions on the research lease, to be set by the Secretary and not to exceed ten years, are unnecessarily cautious and thereby may eliminate some research which may be fruitful although the odds are adverse now.

D. The proposed gross value royalty scale which may range from 3 to 50% is excessive and will have a tendency to discourage venture capital. The royalty rate should be on a graduating sliding scale based on time with the upper limit no higher than the present Federal petroleum royalty rate of 12½%.

E. The "open book" aspects of the regulations run counter to the security policies common to any industry.

F. The main objection we have to the land exchange program is that the lands obtained in trade in the "blocking up" plan bring with them many of the regulations of the public lands.

Questions that remain unresolved are:

1. Will any consideration be given to prior heavy spending and developed capabilities?
2. Will preverence be given lease applicants according to time of filing?
3. Will information filed with subsequently rejected applications be held confidential?
4. Should not a company be assured some period of process exclusivity when it has phased from research and development into commercial production?
5. What degree of selectivity may the lessee exercise in selecting lands when it goes commercial?
6. Will provisions for water rights be made for areas covered by specific leases?

Beer Creek Recommends:

1. The time for commenting be extended to November 9, 1967.
2. Public hearings be held in the areas involved during September and October to solicit the views to all public land users in these areas.
3. If recommendations 1 and 2 above are not followed, then the whole matter be referred to the Public Land Law Review Commission for its consideration and recommendation.

Beer Creek's concluding remarks

It appears that the Secretary proposes that industry should undertake to finance and perform specific government-conceived and directed research projects under a program that offers little incentive in the form of exclusive rights (if not permanent at least temporary) on profits commensurate with risk. The apparent amount of Departmental control of the oil shale industry under this program would be onerous to all except possibly the public utilities. The proposed regulations would probably promote effectively only one of the listed purposes—it would prevent speculation and windfall profits.

The single most effective measure the U.S. Government could take to promote the *development* of the oil shale industry aside from straightening out the land problem would be to have the percentage depletion allowance apply to the retort product rather than to the shale itself, as now, and to have it increased from the present 15% to the 27½% applicable to the petroleum industry.

IV. Cameron and Jones, Incorporated—August 14, 1967

A. Cameron and Jones agree with the decision of the Secretary of the Interior to open the Federal oil shale lands for lease. An opposing viewpoint has been advanced that there are adequate lands in private hands to begin shale oil production if the owners choose to do so; therefore, the Federal lands should be reserved for the future.

In their view, the further withholding of Federal oil shale lands will create an artificial shortage, generate windfall profits for those who hold non-federal lands, limit competition, and generally inhibit the development of oil shale. They agree fully with the concept of a *limited* leasing program at the present time. This is consistent with the need for acquiring industrial experience before committing substantial reserves for development.

After careful study and consideration of the subject, particularly the leasing procedure in the proposed regulations, we conclude that the non-competitive selection of a lessee is administratively unworkable and that a system of competitive bidding should be formulated.

In the interest of encouraging early development and providing an off-set to the cost of the extensive and expensive research still ahead, they suggest that for the initial lease offering of 30,000 acres one-half (½) of the bonus payment be credited against royalties payable on production during the first 10 years of the lease term. The effect should be higher bonuses, earlier production and a means for the operator to recapture his investment more rapidly.

In summary, they believe a system of competitive bidding should be used to award oil shale leases. These leases should not be limited to research and development but should encourage production. A competitive leasing procedure along the lines discussed will benefit all parties—the government, the lessee and the public.

It will be simple and straightforward to administer.

It will provide incentive for early development.

It will be a fair and impartial method of selecting the successful lessee.

It will provide maximum compensation to the owner (the public) consistent with the competitive position of oil shale products in the marketplace.

Cameron and Jones feel that there is no disagreement about the need for additional research on oil shale despite the not inconsiderable knowledge of oil shale technology that already exists. But should the primary aim of the present leasing program be research to the virtual exclusion of commercial development? They suggest a better balance of the two phases.

First, some organizations are well advance in their knowledge of techniques to mine and process oil shale, or have access to such knowledge through licensed processes. They should be given equal opportunity to lease public lands.

Second, Cameron and Jones are concerned with the lack of assurance to the lessee that commercial production will be allowed. When and how the commercial phase begins should be a business decision of the lessee if he meets reasonable standards of conservation and otherwise complies with the terms of the lease.

Third, we suggest that the plan for research and its execution are too closely controlled.

We strongly recommend a lease that allows and encourages production whenever justified in the opinion of the lessee. No specific research requirements should be imposed.

They hope that the parts of the regulation dealing with disclosure and patents will be changed to promote a propietary competitive technology.

The following are specific recommendations regarding the various aspects of research, disclosure, patents and technology:

1. Limit government ownership of patents to instances where direct government expenditures are involved; however aim government-sponsored research at subjects of industry-wide concern such as conservation, waste disposal, resource studies, and chemical-physical data.

2. Provide in the lease for the *confidential* disclosure of research results and other data needed by the Department for the wise administration of the resource.

3. As noted previously give the lessee wide latitude in the planning and execution of research.

Royalty—The case for moderation

The royalty provision of the proposed leasing regulation is unique and discriminatory—it will discourage shale oil production from Federal lands. If a graduated net profit royalty has merit it should be applied uniformly to all minerals, especially to the fuel minerals with which shale oil must compete.

The point of these figures is this. To compete successfully for capital funds oil shale must necessarily be as profitable as other industries.

It is their belief that minimal royalties will be required at the present time to encourage development of the Federal lands. They suggest a royalty provision comparable to that for Utah state lands of 5% of the gross value of crude shale oil at the retort, or the well head in the case of *insitu* retorting, for the first 5 years of production with an increase of 1% per year thereafter, up to a maximum of 12½% at the option of the lessor. Other minerals could be treated in the same manner.

Cameron and Jones see no need to introduce such concepts as government-controlled technology or profits participation to protect the public interest. Provisions to encourage competition in all phases of the endeavor—land acquisition, research and production—will best serve the industry and the public.

V. Cities Service Oil Company—August 2, 1967

The time is propitious for stimulation of oil shale development by a public lands leasing program and concur generally with the stated objectives of the proposed amendment, the May 7 draft of regulations appears to be too restrictive to be attractive to private industry.

Cities Service Oil Company believes the proposed R&D leasing program should be altered to—

(1) develop a basis for leasing of Federal oil shale lands by competitive bidding using a bonus system with fixed royalty;

(2) discourage lease-holding for speculative purpose by requiring annual expenditures, on a predetermined scale, for R&D purposes until the achievement of commercial production;

(3) provide specific terms for holding R&D leases with commercial term to start upon satisfactory completion of research program and to continue as long as paying quantities of deposits are produced;

(4) require disclosure to the Government (to be held confidentially) of only such technical data as may be necessary to assure that the lessee is diligently and efficiently pursuing his research operations, and permit the leasee to hold and license patents under the same conditions as any other patents, and assignment of patents.

VI. Continental Oil Company—June 7, 1967

Their reaction is not favorable. The Continental Oil Company considers that the rights to be granted are circumscribed with restrictions and conditions to such an extent that sufficient economic incentives will be lacking.

Conoco believes that a competitive bidding method must be devised for making public domain shale oil lands available. Criteria should be established under which prospective bidders may qualify. Acreage limitations and all other restrictions and covenants should be liberal enough to attract capital in an innovating and highly competitive economy.

VII. Geonuclear Corporation—August 11, 1967

CER Geonuclear Corporation is not an oil company and does not have a direct interest in oil shale leasing. Nevertheless, as a sponsor of Project Bronco, a proposed nuclear experiment in oil shale, CER does have a vital concern with the proposed rules.

A major omission from the proposed rules is that they make no provision for a company, or group of companies, which develops the technology outside the framework of the proposed rules to obtain commercial oil shale leases. It should not be necessary for a company or group which successfully completes research and development to go through a two-stage leasing program.

A second weakness of the proposed rules is the provision for publication under 3172.9(d). "We are certain the Department's intent is to make information on any research breakthroughs available to the public as rapidly as possible."

The most objectionable feature of the proposed rules is the provision which gives the Government, in the absence of exceptional circumstances title to all inventions. The Geonuclear Corporation suggests that patent ownership reside in those who make the inventions with a royalty-free license to the Government and licensing at reasonable royalties to third parties.

VIII. Gulf Oil Corporation—June 14, 1967

Insofar as shale oil production is concerned, the regulations proposed by the Secretary of the Interior and released on May 7, 1967, do not, provide the proper basis on which to conduct the research necessary to make efficient, economic development possible. Comments on the proposed regulations are as follows:

1. Oil shale lands, by definition, include minerals which are components of the rock but exclude mineral deposits which can, in the opinion of the Secretary of the Interior, be mined without damaging the oil shale beds. We feel many legal and operational problems are inherent in an attempt to isolate a deposit of minerals interbedded in the shale oil.

2. There appears to be no real assurance that, after spending up to 10 years on research, the term of the lease will be extended to allow the operator to proceed with development.

3. Under the proposed regulations, no operator is allowed more than a total of 5,120 acres. This has the effect of encouraging a large number of relatively small operations and hence makes economies of scale very difficult.

4. The proposed regulations suggest a sliding scale royalty based on the percentage which taxable income bears to investment. Neither royalty nor depletion are allowed when computing taxable income. This departure from convention places royalty more in the category of an additional tax than a royalty payment.

5. The provisions in the proposed regulations concerning disclosure of information and title for patents are particularly onerous. Making all data and patents available for public use destroys any advantage an operator may have.

The Gulf Oil Corporation believes that development of a resource such as shale oil by the mining and retort method, will be difficult to justify economically under the best of circumstances. In their opinion the regulations proposed by the Department of the Interior do not provide the incentive necessary to attract private industry into conducting the research and making the tremendous investment required for development.

IX. Humble Oil Refining Company—June 8, 1967

A. The Secretary is to be commended for taking the initial step which could result in the development of the federally owned oil shale reserves. However, Humble believes that the proposed regulations do not provide adequate incentive for private industry to commit its technical and capital resources to the development of such reserves. Humble is particularly concerned that the proposed regulations embrace certain principles that would inhibit the normal working of the free enterprise system in the development of this natural resource.

Development of shale oil production should be controlled by normal economic forces governing competition among fuels. The free interplay of competitive pressures among domestic energy sources continues to be the best means of supplying the needs of the public at the lowest cost.

Bidding for leases should be open to all potential participants on a competitive basis, with no discrimination in respect to firms in any particular industry, size category, or other classification. Unitization of lands into conservation or production units should be permitted.

The holding of leases for speculation should be discouraged by requiring the expending of appropriate sums for research and development during each year of the lease until commercial production has been achieved. Any failure to carry out diligently the agreed upon program should be grounds, subject to court review, for forfeiture and cancellation of the lease as provided for in the regulation.

B. Specific Comments:

1. 3170.0–1. *Purpose.* The objective to "encourage participation by companies not favorably situated with respect to access to reserves of the minerals present in oil shale" could result in discouraging those companies which in the past have taken the initiative to develop research and technology for the exploitation of oil shale and related minerals. The regulations should encourage and foster research and development efforts by any and all qualified individuals and companies.

2. 3170.1. *Designation of Available Lands.* This section precludes industry from having any voice regarding lands that will be designated for leasing. The location of the lands is of utmost importance from the standpoint of terrain, accessibility, availability of water and other utilities and of constructing and operating plants for research and commercial operations. Also, limiting leasing of oil shale lands to not more than 30,000 acres, presumably divided among three states, would unduly restrict broad industry participation in oil shale development. This section should provide that from time to time, the Secretary will designate reasonable amounts of lands, with *clear title,* based on nominations made by qualified individuals and companies. The regulations should not contain a limitation as to the total amounts of land which the Secretary may so designate.

3. 3171.2–3171.3. *Form and Contents of Application and Considerations to be Used in Evaluating Applicants.* These sections relate to the qualifications of an individual or company for acquisition of an oil shale lease by application based on an acceptable research program and the need by the applicant for both the acreage and the products therefrom. Those portions of the sections requiring disclosure of ownership in private lands, divulgence of confidential reserve information, detailed projections of research and commercial operations, go far beyond what is necessary to determine capability and qualifications. The principle that an applicant's need for reserves should be a factor in determining whether an applicant would be granted a lease is a real cause for concern. The merits of the proposed plan of research and development and applicant's ability to carry out that plan should be the determining factors in granting or failing to grant a lease. Oil shale leases on federally owned land should be awarded by competitive bidding with the requirement that the successful bidder peform a reasonable amount of research and development leading to commercial production.

4. 3172.2. *Term of Lease.* The research term is indefinite and extension of the commercial production term is solely dependent upon the discretion of the Secretary.

The lease terms proposed are not appropriate for the competitive bidding system advocated by Humble, and the lease terms should be modified as follows:

(*a*) *Research Term.*—All leases and notices of lease sales should provide for a specific research term. Such research term may be extended by the Secretary, provided the total term, as extended, does not exceed ten years. The leases should be subject to termination after appropriate court review in the event research and development obligations are not satisfied.

(*b*) *Commercial Production Term.*—The commercial term of the lease should commence upon satisfactory completion of the work to be performed during the research term and should continue for so long thereafter as mineral products are produced from oil shale in paying quantities from deposits in the land.

5. 3172.3. *Acreage Designation and Limitations.* This section is too restrictive on the rights of the lessee because the Secretary would have the sole right to select the research site and determine the quantity of mineral deposits needed for commercial production and to select the area of commercial operations.

The lessee should have the right to select the reseach site and should be permitted to hold and develop the total acreage as described in the lease.

The regulations should provide that the Secretary may permit the inclusion of additional acreage in the lease, provided the total acreage covered by the lease does not exceed the legal limitation.

6. *Royalties.* The proposed royalty schedule would stifle the development of avilable shale oil and associated minerals industry on federally owned lands. Such a scheduled based on a graduated percentage of net income, together with the current federal income tax structure, would operate to discourage their investment of private capital. Royalty should be payable only on products sold or used off the premises. The royalty payments should be waived during the first five years of the research term as permitted by the Mineral Leasing Act.

7. 3172.9. *Other Provisions.* Portions of this section which require that disclosures of technical information be made public and that patents be assigned to

the Federal Government would destroy one of the most powerful competitive forces that could be brought into the oil shale development.

The lessee should be required to make available to the Federal Government only such data and information as is necessary to assure that the lessee is conducting a prudent and efficient operation. All technical information so acquired should be held confidential by the government during the research term.

8. 3172.10. *Antitrust Consultation.* This regulation is unnecessary because of the limitations contained in the Mineral Leasing Act and should be deleted.

9. 2244.1–7. *Exchange of Oil Shale Lands.* Subparagraph (b) (1) is too restrictive in requiring that the oil shale lands to be exchanged have similar geologic and physical characteristics. The criterion should be that the offered oil shale lands be of a value approximately equal to or exceeding the value of the selected public land.

X. Marathon Oil Company—August 11, 1967

A. Marathon concurs with the basic purpose of the proposed regulations which make available a limited portion of the public domain for research and the development of oil shale technology. The development of techniques for commercial production of oil from oil shale is a necessary prerequsite to the determination of the need form statutory changes and the promulgation of regulations relating to commercial production. The development of such technology through the competitive research efforts of the private enterprise system is the best method to accomplish this objective.

Many of the detailed provisions of the proposed regulations inhibit rather than encourage industry participation in shale oil technological development. The proposed regulations are too preoccupied with government controls and with provisions to insure revenue to the government from the research efforts.

Marathon favors regulations which require a company that acquires a tract for research to invest sums sufficient to demonstrate a bonafide intent to make a meaningful effort to develop oil shale technology; they further favor a requirement that such company meet certain work progress requirements.

As previously indicated, many of the proposed regulations will discourage rather than encourage industry participation.

B. Specific Comments:

1. *Royalty.*—The regulations pertaining to royalty are not realistic. In order to encourage company participation no royalty should be required until at least five years after commercial production; thereafter the royalty should be modest—i.e., five percent of the production at the mine or wellhead.

2. *Patents.*—The provision in the proposed regulations that the United States acquires title to all inventions will discourage participation. As an incentive the participant should have the right to retain title to all inventions subject only to the requirement that they be licensed to others on a nondiscriminatory reasonable royalty basis.

3. *Term.*—The lease should be for a fixed term of years and as long thereafter as oil shale is commercially produced. Provision should be made for an extension of the fixed term on a showing that research has proceeded diligently and that there is a reasonable possibility that such research will prove successful or that commercial production can be obtained during the extended term. The uncertainties contained in the proposed regulations with respect to the lease term should be eliminated.

4. *Acreage.*—The proposed regulations indicate that a reduction in acreage may be required if commercial production is attained. Few companies will be willing to undertake a research project of this nature without knowing in advance the number of acres that it will be entitled to hold during both the research and commercial phase of the lease. It should be recognized that one of the most important facts to be developed through research is a determination of the optimum-sized tract for oil shale development. The acreage allowed a participant should be large enough to permit research and experimentation in this regard.

5. *Need.*—The proposed regulations provide that one of the bases for evaluating applications for leases is the applicant's *need* for lands to conduct research. It is submitted that this is a poor criterion. Applications should be granted to any applicant that indicates it has the financial and technical ability to conduct a good research program.

6. *Multiple Resources.*—It is not clear from the proposed regulations whether nacholite and dawsonite are included in the definition of oil shale. This should

be clarified and if an applicant proposes a research program which is designed to develop a method for the extraction of minerals associated with the oil shale, that proposal should be given weight in considering the application.

XI. Mobil Oil Corporation

A. The proposed regulations introduce some rather radically new concepts. Studies which the Mobil Oil Corporation has conducted has caused them to conclude that, with the increasing energy demand and with further technological developments, there is a high probability that there will be commercial production of shale oil within the next decade.

B. Specific Comments:

1. Since the oil shale deposits are rather well defined both as to existence and probable quality, we strongly support the concept of competitive leasing.

2. Generally, the procedures which have been used in the leasing of offshore lands appear to us to be an effective and practical method of handling nominations and bidding for leases. We should like to suggest, however, that sales should not be held too often and that nominations be limited in some manner.

3. We believe that any lease should cover an area up to 5,120 acres. This would provide a compact block to be worked for oil shale production which we believe would be the minimum size and the configuration for optimum development in the light of presently known technology.

4. We should like to see the elimination of lease provisions constituting a plan of development. At this time and in the light of present technology, definitive plans of development are difficult to determine. Furthermore, it would impose a significant burden on those charged with the responsibility for making an award of a lease on competitive bids, and would cause continuing review of the status of lessee's compliance with the plan of development. We should like to recommend that in lieu of plan of development provisions in the lease form, the lease be for a term of ten years and as long thereafter as shale oil is being produced therefrom.

Coincident with our recommendation of a lease term, we should like to suggest that the Mineral Leasing Act allow inclusion of leases into units which are subject to plans for development. Any lease so committed to a unit would be extended beyond its term while the unit remains in existence (requiring compliance with the plan of development). Under this type of procedure, the Secretary would have the discretion of approving any such unit and the plan of development thereon, the lessee having to commit to undertake such plan of development. This procedure would allow the lessee to determine whether to commit to a plan of development at a time when the commencement of development is contemplated and could be definitely fixed.

5. We would recommend $2.00 per acre per year as the rental or minimum royalty requirements.

6. It is exceedingly difficult at this time to determine the proper royalty rate, particularly in the light of the effect on presently uncertain economics of oil shale production. We feel that a royalty of 5% for the first twenty years of production with provision for adjustment of such rate by the Secretary of the Interior upwards to 10% thereafter would be a reasonable royalty. We have some concern how properly to fix the point of application of the royalty and determination of market value for the purpose of calculating any such royalty.

7. The lease should include appropriate clauses such as, "force majeure", "right of surrender", no termination for temporary cessation of production and generally similar clauses to those found in present oil and gas lease forms.

XII. Pan American Petroleum Corporation

A. In their view, the approach taken by the current proposals will neither serve the national interest nor the private interest concerned with initiating an oil shale industry with venture capital.

The general approach discerned in the proposed regulations is an outgrowth of a fundamental misconception concerning the nature of oil shale operations. This misconception involves the belief that, without the imposition of severe restrictions by the Interior Department, tremendous profits, garnered almost risk-free, would come to private industry from the exploitation of Federal oil shale lands. This attitude is reflected throughout the proposed regulations (e.g. the royalty provisions of Section 3172.5, the stated concern for preventing "windfall profits", Section 3170.0–1, and the requirement that the oil shale lessee disclose to the

Secretary, fully and free of charge, all informations, reports and inventions arising out of the lessee's anticipated "highly profitable" and virtually "risk-free" venture in the field of oil shale, Sec. 3172.9).

B. Pan American Petroleum Corporation has set out several matters which should help put the incipient shale oil industry in perspective.

1. The reserve estimates relative to Federal oil shale lands which range to several trillion barrels of oil, standing alone, are meaningless.

2. The large reserve estimates relative to Federal oil shale lands are by no means a measure of the "economically recoverable" oil present.

3. Even the best mineable beds of oil shale, testing over 35 gallons per ton, must realistically be considered a very low grade mineral resource.

4. Oil shale operations represent a high-risk investment industry. An industrial market for mined shale must await full scale technological development, with attendant high financial risk.

C. Specific Comments:

1. *Section 3170.1. Designation of Available Lands.*—(*a*) This section allows the Secretary to specify a particular type of operation on a given site, but there does not seem to be any compelling reason in the public interest why the Secretary should restrict in the first instance the types of proposals to be submitted; certainly, control in the Secretary permits meritorious projects to be encouraged and contemplates the rejection of valueless proposals. It is submitted that the initiation of an industry is the prime objective, rather than the encouragement of theoretical or pure research. Moreover, regarding conservation principles the richest oil shale deposits should initially be made available to furnish impetus to the commencement of an oil shale industry. The third sentence states that no more than 30,000 acres will be designated for lease. There does not seem to be any compelling reason for this restriction.

2. *Section 3171.2. Form and Contents of Applications.*—(a) Emphasis in this section should be directed to the formal qualifications of the applicant for lease, including, as well, minimal information regarding the technical and financial capability and intention of the lessee to conduct bona-fide research.

The requirement that an applicant for lease furnish information on other holdings of shale oil and petroleum goes far beyond what the Secretary should logically need to determine the lessee's qualifications and technological ability.

3. *Section 3172.3. Acreage Designations and Limitations.*—(*a*) (a)(d) The Mineral Leasing Act (and regulations) should be amended to permit up to 5,760 acres to be contained in any one oil shale lease, and an individual or company should be given the right to hold an aggregate of 23,040 net acres, on a national basis.

(*b*) This portion of Section 3172.3 states that "upon the issuance of any lease hereunder, the Secretary shall designate the part of the leased lands upon which the lessee will be permitted to conduct operations during the research term." This grant of authority is unduly restrictive, and it is suggested that the lessee should be permitted to select, at his discretion, the site deemed most suitable for his research operations.

(*c*) This part of Section 3172.3 provides in effect that the lease will be extended into the commercial production term only as to an area which contains the quantity of mineral deposits needed for commercial production; the Secretary determines the quantity of mineral deposits needed for commercial production. The apparent aim, here, is to require the lessee to invest for the maximum production rate in order to prevent the loss of some part of his lease, but the regulation as written does not quantify or describe "the mineral deposits needed for commercial production." One way to handle this problem would be to provide that the term of the lease would be extended for an area which contains, say, 50 years' worth of shale deposits geared to lessee's total refining capacity. Another approach, certainly having the virtue of simplicity, would be to permit the lessee to hold all of his original lease in the commercial production term for so long as production continues from the leased premises.

4. *Section 3172.4. Rentals.*—(*a*) The annual lease rental should be established at $2.00 an acre. Such rental, in place of the 50 cents per acre rental set out in this proposed regulation, would tend to eliminate or to reduce speculation in oil shale leases.

5. *Section 3172.5. Royalties.*—(*a*) The basic royalty is set out as "3 percent on the gross value, at the point of shipment to market, of the mineral products from the oil shale . . ." The royalty rate should realistically be set at a low figure to encourage the growth of an oil shale industry, and the basic rate of 3 percent, standing alone, is considered satisfactory. However, the term "gross

value" apparently does not contemplate that an allowance for plant processing costs will be provided. Nor, in our opinion, should royalty be calculated "at the point of shipment to market"; the royalty should not be computed on completely refined products. Royalty should be payable only on the value of oil recovered from the retort, and suitable allowance for plant processing costs should be provided.

(*b*) Subparagraph (d), in our opinion, removes the incentive for efficiency on the part of the lessee, and eliminates any expectation that profits will markedly increase as the shale oil operation gets underway. This sliding-scale provision would discourage the growth of an oil shale industry.

6. *Section 3172.9. Other Provisions.*—(*a*) (d) The Secretary shall have exclusive rights to publish research information developed by the lessee.

(*b*) (e) The oil shale lease must provide that the United States will acquire title to all inventions made during the research term of the lease.

(*c*) The provisions of (d) and (e) are contrary to the competitive spirit of our form of economy, and, it is further emphasized, would act as a deterrent to the commencement of an oil shale industry—the temptation would obviously be present for one to wait for somebody else to do the research work.

The lessee should only be required to furnish to the Secretary, on a confidential basis, a limited amount of data to indicate the lessee's *bona-fides* and his prudence and efficiency in conducting research. Patents obtained by the lessee should be held and licensed by him in just the same manner as any other patents.

7. *Proposed Exchange Regulations (43 CFR, Subpart 2244) Section 2244.1–7 (c) (3).*—It does not seem reasonable for the applicant to have to enter into a written agreement covering the particulars named as to his own privately-owned shale lands, as a prerequisite to the consummation of the exchange sought by him.

D. Conclusions:

1. All leases shall be awarded on the basis of the highest cash bonus offered in sealed bids.

2. Primary lease term shall be fifteen years and as long thereafter as production is obtained, or additional operations for developing production are carried on continuously.

3. Annual lease rental should be established at $2 an acre.

4. Royalty should be established on a sliding scale basis of 5% to 7½%; to encourage early development, the royalty should be at the rate of 5% of the value of products recovered and sold during the first ten years of the lease term, then increased ½% annually until the 7½% maximum is reached.

5. Lease should reflect that royalty is payable only on the value of oil recovered from the retort, and sold; and suitable allowance for plant processing costs should be provided.

6. No single lease shall cover more than 5,760 acres, and each shall be in compact form.

7. No individual nor company shall hold an aggregate of more than 23,040 net acres, on a national basis.

8. No acreage shall be offered for lease when it is known to the Government that the acreage is burdened with mining claims.

9. When it is discovered that leased lands are burdened with mining claims, all lease terms and obligations shall be suspended until the claims are eliminated; in such cases the lessee and the Government shall cooperatively act promptly and diligently to dispose of the claims.

10. Lessee should have the right to relinquish all or any part of a lease at any time.

11. Operators should be permitted to participate in joint leasing bids.

12. Leases should contain the right to unitize or cooperate in development contracts for either exploratory or development operations.

13. Leases should include customary "force majeure" provisions.

14. Overriding royalties in excess of 2½% should be prohibited.

15. "Multiple use" as it pertains to oil shale development should be clarified, particularly with regard to the "in situ" method versus "mining operations under oil shale leases," and with regard to the "in situ" method when used in operations under conventional oil and gas leases.

XIII. Pennzoil Company

We are firmly convinced that the national public interest in the economic development of the natural resources of this country will be advanced by the development of oil shale reserves within the private sector of the economy, subject to reasonable regulations in the public interest. The development of natural re-

sources is a venture in which publicly-owned companies, public investors and consumers all have a stake.

As the regulations are presently drafted, the Pennzoil Company is convinced that private industry would be unable or unwilling to dedicate the large sums of capital and the technical talent required to carry out a research program looking to the development of oil shale reserves. Requisite incentives for this effort are hampered by manifest uncertainties in the proposed regulations.

Uncertainties exist as to what areas will be designated for research development. The regulations should provide for selection of acreage by any qualified applicant and the 30,000-acre limitation should be deleted.

Uncertainties exist as to the form of the lease. A reasonable form should be prescribed.

The research term is uncertain in duration and there is no certainty that the Secretary will extend the terms of a lease to permit commercial production.

The royalties of the United States are uncertain in amount. These royalties should be fixed at a level and reasonable amount.

The benefits to be derived by private industry from research are uncertain in that the United States will acquire title to all inventions and all information must be disclosed. This feature of the regulations should be rewritten to provide for a fair license to others by any company developing an invention.

XIV. Phillips Petroleum Company

A. As a general criticism of the regulations, they do not provide incentive to attract investment and application of the capital, research facilities and personnel of the caliber which would offer possibilities of success.

The proposed rewards are nebulous and are not equated to the risks to be undertaken. Patents, processes and technical information developed on the governmental land cannot be retained by the developer; royalty rates are extremely onerous and there is no real assurance that, after up to 10 years of effort, the applicant will even receive a shale lease, nor are there any assurances as to the size of the lease which may be awarded.

The limitation of the program to 30,000 acres of land is unwise. This is less than six times the individual limitation of 5,120 acres. Since each applicant would surely require the maximum-size lease allowed by law in order to justify the tremendous expenditure envisioned, these regulations would effectively limit the Secretary to five or six leases.

Satisfactorily definitive standards are not provided touching (a) whether the lease will be extended into a commercial production term and (b) the area to which the lease will be extended for a commercial term. It appears that only those lessees who have been eminently successful in developing a "commercially feasible" processing method effecting "optimum recovery of the mineral to be produced" while preventing or minimizing damage to water, air, scenic values, etc. will be entitled to a commercial lease. It would be far better to have the ground rules laid out in advance than to ask the applicant to rely on a retrospective evaluation of an initially risky investment.

The requirements in the regulations that all technical information be made public immediately and that all patents be assigned to the federal government are highly objectionable and deterrent to the commitment of private research funds, facilities, and technical talent to the needed development of oil shale technology. Patent and technical know-how rights should reside with those who have paid for their development.

To impose additionally the onerous provisions for sliding scale royalties is most discouraging. Under the proposed wording it is doubtful that any credit could be taken for research costs in determining the "investment" which fixes the royalty rate. The proposed royalty scale resembles an additional income tax, which could take up to 50% of net income computed without allowance for royalty or depletion. In the sliding scale, royalty should be eliminated. The government already has a heavy weapon against excess profits in its right to readjust royalties 20 years after the date of the lease.

Section 3170.0–5 leaves it unclear as to when an oil shale lease will cover dawsonite, nahcolite and other minerals as they occur in the Piceance Basin. It would also seem desirable to give the oilshale lessee a preferential right to a lease on other minerals which are separately minable in order to avoid occupancy and interference problems.

Section 3171.2(c)(11) appears to require a disclosure of conventional crude oil reserves. This unnecessary and irrelevant requirement should be deleted.

Section 3172.2(b) provides for a commercial production lease, "for so long as mineral products are produced from oil shale in paying quantities." Presumably, this would be interpreted as not requiring forfeiture in case of a temporary cessation of production. However, provision should be made for a term certain as a transition between the research term and the production term to allow the commencement of commercial production.

Section 3172.3(b): It appears to the Phillips Petroleum Company that the lessee should have the entire leased premises available for its operations provided it complies with standards stated elsewhere in the regulations with respect to minimization of pollution of air and water and protection of scenic and esthetic values.

XV. Shell Oil Company

A. Shell believes that the proposed regulations represent a positive step toward the development of this nation's oil shale resources; however, they are concerned over the following point and suggest they be changed to provide the necessary incentive for the risk involved.

1. There is considerable uncertainty as to the amount of acreage that would be granted to a company after it completed the research phase. The maximum amount is clearly stated (5,120 acres), but the criteria for determining: (a) whether a research lease will be extended into the commercial production term, and (b) how much land in addition to that part of the R&D lease used during the research term ultimately can be obtained.

2. The provisions dealing with patents and disclosure of information seem so stringent as to interfere with the timely development of oil shale. The incentive to develop new techniques is limited by the requirement that results of research become public domain immediately. Free play of competition would encourage the development and simultaneous evaluation of several recovery methods. A term of non-disclosure after the R&D phase or the establishment of equitable licensing arrangements would be necessary to encourage competition.

The proposed amendment to the regulations under the Taylor Grazing Act to allow for exchange of privately owned oil shale lands is a most worthwhile revision of the regulations and the Shell Oil Company supports this proposal.

XVI. Sinclair Oil and Gas Company

A. Sinclair feels that the proposed leasing regulations would require a leesee to give up so much of the technical know-how and income from a project on government land that there is little likelihood that any company or consortium would invest millions in research to develop a process for a commercial lease. They believe the regulations are so indefinite regarding granting of commercial leases that there is no incentive for acompany to undertake a development project.

31701 states that "The Secretary will * * * publish notices * * * designating areas of oil shale bearing land * * * which will be made available for leases for research and development and for subsequent commercial operations * * *" 3172.3(c) states, "At the time for the grant of any extension of the term of lease as provided in section 3172.2(b), the Secretary will determine the quantity of mineral deposits needed for commercial production, allowing reasonable reserves."

Sinclair interprets these statements as saying that government representatives will make the decision as to when the company could move to construction of a commercial plant, and the commercial life and size of the plant.

Sinclair wishes to rceommend that award of a lease on a limited area for research and development carry with it an option on a specified tract for expanded commercial operation. The decision to go commercial should rest with the organization. The company should not suffer the additional hazard that Interior will apply criteria of success different from industry in general.

3171.2(c)(11) requires "a description of the reserves owned or controlled by the applicant of oil and other minerals believed present in the land applied for.". This statement needs clarification.

3172.2(b) states that the Secretary will extend the term of the lease to permit commercial production if certain tests are met. These tests are not spelled out with respect to "optimum recovery of minerals" and air and water pollution.

3172.3(c) states that "the Secretary will determine the quantity of mineral deposits needed for commercial production, allowing reasonable reserves." This lacks definition as to project life and thus precludes definitive economic analysis.

3172.3(d) It is recommended that this be clarified to state that a "net" interest of no more than 5,120 acres in United States oil shale leases may be held by a lessee at any one time.

3172.5(b) Sinclair recommends clarification because this regulation could promote inefficiency by forcing intermediate sales and precluding integrated plant complexes.

3172.5(d) states the royalty rate as a percentage of net income related to depreciated original cost. The disappearing base would have the effect of putting much of the net income into the high royalty bracket near the end of a project. The total portion of net income going to federal income tax plus royalty could reach 80 to 90 percent for a project having even a modest profitability before royalty.

3172.9(d) Sinclair feels that the lessee should own the data and be able to use or sell them without government restriction. At most, the Department of Interior should receive reports to show due diligence in prosecuting the research, and these should be held confidential for at least five years. They would not object to a requirement of licensing at reasonable royalty rates after some waiting period.

3172.9(e) This is one of the most critical points for private companies and investors. It would seem to place a premium on waiting and letting others do the early development. It basically says that the lessee may make development investments of many millions, and then must file all the results away. The "proper showing of exceptional circumstances" appears to be a formidable obstacle.

There are a number of paragraphs in which the language leaves doubt as to the true intention of the Department of Interior. An appendix is attached to Sinclair's comments in which these questions are raised.

With reasonable modification, the proposed regulations can become the basis for private development of a healthy shale oil industry with adequate safeguard of the public interest. Sinclair feels the regulations, in their present form, are too stringent to foster private investment in development on public oil shale lands.

XVIII. Sun Oil Company

A. Comments on Sun's position are listed separately by major section of the proposed regulations.

Sun Oil Company concurs with some of the stated purposes of the proposed regulations.

Each applicant for leases should be conseidered on its own merits. Each applicant should be permitted to operate with a minimum of external control.

Any oil shale policy should be formulated with conventional crude oil production practices in mind.

B. Application for Leases:

1. Sun is concerned that the proposed regulations on applications for a federal lease indicate (3171.2(c)(7)) that it would be necessary to provide information concerning interests in non-federal oil shale land. Such a provision in a program to provide leases for research on federally-owned oil shale might tend to favor individuals who do not have access to privately held acreage. The same objection applies to one of the stated objectives (3170.0–1) which is to "encourage participation by companies not favorably situated with respect to access to reserves of the minerals present in oil shale." No company should be penalized or excluded from participation merely because it had obtained shale oil leases on its own initiative. Also, Sun Oil is uncertain of the requirements which would have the applicant describe the reserves owned or controlled (3171.2(c)(11)). Sun feels that such information is not germane to the issuance of a research shale lease. In reviewing the proposed regulations (3171.2(c)(12)) covering commercial operation if research is successful, it is our belief that the amount of detailed description is unrealistic.

C. Miscellaneous Provisions:

1. Since no form of lease is prescribed, any actual lease or development contract for a shale research program will have to be analyzed as to its form and terms. A Standard lease form is desirable.

2. Section (3172.2(b)), This section should be re-worded: "Upon the request of the research lessee, the Secretary will extend the term of the research lease providing the terms of the original lease have been fully complied with and * * *." The determination of whether the lessee has conducted research activity substantially in accordance with the plan submitted, for the purpose of extending the terms of the lease, is solely with the Secretary.

It is difficult to predict the profit potential under the proposed regulations since broad discretionary powers are reserved for the Secretary.

A company's willingness to commit the investment necessary for commercial production should be the basis for determining the economic feasibility.

The Secretary can require optimum recovery of shale oil and other minerals. The requirement needs clarification since it could be so rigidly enforced that economic production would be impossible.

The Secretary is to designate that part of the leased lands upon which the lessee will be permitted to conduct operations. This section (3172.3(b)) should be withdrawn since the requirements elsewhere for the protection and conservation of the surface area will afford the public interest the protection to which it is entitled.

Another section (3172.3(c)) which concerns us is the granting to the Secretary the right to determine the commercial or a market demand for oil shale products and that the commercial extension of the lease area is to be governed by such commercial need. Shale oil and its products should be allowed to compete on the open market with crude oil from conventional production.

Section 3172.5(d) seems to be unreasonably high and may well discourage investment. Sun strongly favors a straight royalty on each barrel regardless of total production or total profits. The proposed requirements for a lease bond specify that it not be less than $100,000. There is, however, no upper limit on the amount that may be required.

The proposed requirement on the disclosure of research information (3172.9(d)) would make it impossible for a company to develop technology, processes, or engineering design information without giving that information to all other companies. This provision completely removes the incentive for carrying out a proprietary research program.

It also would handicap the research work itself if a company wished to make use of equipment or research work supplied by outside contractors.

Section (3172.9(e)): No company doing research work can expect to recover part of its cost of the research. This also detracts from the incentive to do research work and, is an unreasonable requirement and should be withdrawn. Although Sun agrees that the Secretary always can seek advice from the Attorney General, we do not believe the proposed regulation on antitrust consultation (3172.10) should be included under the Mineral Leasing Act.

D. Summary:

Sun Oil Company believes that the general provisions of the Federal Regulations released by the Secretary of the Interior on May 7, 1967, will discourage rather than encourage the economic development of the oil shales. With only 30,000 acres currently available for lease and a maximum of 5,120 acres would not offer sufficient potential reserves to justify the expenditures necessary to develop techniques for extracting minerals from the shales.

Further, it is Sun's observation that these provisions generally are in conflict with the concept of our free, competitive enterprise system which has proved itself repeatedly as the best approach to the successful solution to problems such as the ones that face us in the oil shale areas and which historically has been a key factor in maintaining the strength of our country.

XVIII. Texaco

Texaco considers that the public interest would be best served by the Government making available oil shale leases on a competitive-bid basis. The Department of the Interior has established such a procedure in administering the offerings of Federal lands under the Outer Continental Shelf Lands Act. A similar procedure to orderly development and result in the effective utilization of this great natural resource.

CONSERVATION GROUPS

National Wildlife Federation

While not relating directly to the regulations, there are two basic questions which should be resolved prior to a determination that the oil shale lands should be offered for leasing:

1. Since such a tremendous public wealth is involved, why does not the Government conduct the necessary research and development for the competitive economic extraction of oil from the shale?

2. If private research is to develop the process, is there not enough land already in private ownership to prove the value of such an operation? Extreme care should be taken that private research and development and the subsequent patents cannot be used to limit the development and competitive use of such a vast public resource.

The proposed regulations, if leasing and land exchanges are considered to be in the public interest, do, in our opinion, contain the proper safeguards for fish, wildlife, and recreation, which will adequately protect the surface of the land after extraction has been completed.

PRIVATE INDIVIDUALS

I. Noel de Nevers, Associate Professor, University of Utah

The policy proposed on May 7 will satisfy neither the oil companies who are expected to take up the R&D leases nor those members of the public who fear a "giveaway," nor free-enterprise advocates who will dislike the profit-sharing aspect of the regulations. I think that all parties could be satisfied if the following policy were adopted:

A. The Secretary should announce that there will be no leasing of the Federally-owned shale lands for some fixed time period; e.g. ten years.

B. The Secretary should ask Congress to authorize a special tax rebate to those who develop commerically successful oil-shale production plants, using privately-owned shale-oil holdings. The applicant for this tax rebate would have to agree to license to any interested parties all his patents which bear on the operation of the plant, at some predetermined, modest royalty rate.

C. The Secretary should make some firm and binding statement that a barrel of shale oil shall be treated the same as a barrel of ordinary petroleum in calculating oil import quotas.

II. J. B. Mitchell, Mineral Leasing Consultant, Washington, D.C.

Various provisions as well as the regulations as a whole as presently written, will not promote the development of the public domain oil shale deposits by private enterprise.

In connection with the foregoing contention, particular attention may be directed to those provisions that: (1) impose a limit on the number of leases that may issue under the new regulations (five or six leases if they contain the maximum acreage allowed by law); (2) fail to specify the size of leases that may issue; (3) impose a condition that obligates a lessee to relinquish an unknown amount of acreage and reserves at the end of the so-called experimental work; (4) impose a payment to the Government of a percentage of net profits; (5) tend to discriminate against lease applicants that presently own oil shale reserves (there are many such companies and a number thereof have already spent considerable money in research work); (6) provide that the Government while entrusted with supervisory responsibility and authority as to safety, pollution, conservation of the mineral and other natural resources, shall also have a monetary interest in net profits (these dual roles appear undesirable from a conservation viewpoint), and (7) impose abnormal restrictions on the patent rights that a lessee can obtain by his own research expenditures. Unless the provisions just cited are eliminated or substantially modified, it seems reasonable to conclude that the proposed regulations if adopted will discourage and delay, rather than promote development of the Government-owned oil shale reserves.

Section 3172.5.—I do not feel that it was the intent of Congress to authorize the Secretary to gamble on a net profit interest. The word "royalty" (or "royalties") when used in connection with interests created by mineral leases has a commonly accepted meaning of an interest in production or the value thereof free and clear of the cost of operations and production.

Where exchanges are to be made as contemplated by Section 2244.1–7 of the proposed regulations for the sole purpose of improving the management and exploitation of mineral deposits, it would seem appropriate if the Secretary's statutory authority is to be free from being challenged, that more appropriate legislation should be sought.

In lieu of the action contemplated by the proposed regulations, it is recommended that one of the following plans be adopted:

A. Select a small working committee representing the oil and gas and mining industries to meet and work with a comparable Government committee for the purpose of drafting regulations designed to promote in an equitable manner development of the Federal oil shale deposits.

B. Cancel existing as well as pending proposed regulations and substitute therefor new regulations based on a competitive leasing system similar to that used for OCS lands but modified to the extent necessary to conform to the provisions of the mineral leasing laws. Such regulations should contemplate and provide for: (a) a call for nominations by industry of the lands they would like to have offered for lease; (b) a pre-prescribed lease form that is specific as to the contractural obligations of a lessee with respect to term, rental, royalty and minimum development requirements, and (c) a flexible form of bidding that will permit bidding on more than one tract under a single advance cash deposit.

Cancel existing regulations and issue non-competitive leasing regulations pursuant to which: (a) leases would be awarded under a simultaneous drawing procedure with an applicant having a choice of tracts if successful in drawing top priority for more than one tract; (b) leases would bear a relatively high advance annual rental; (c) lease applications must cover specific parcels (5,120 acres if available in compact form) as described by public notice in advance of opening an area; (d) leases would bear a royalty of 3% of the aggregate value of the minerals extracted from oil shale at the point of shipment to market, or not less than 12½% of the value of oil shale production if marketed prior to extraction of the minerals, and (e) the form of lease would be prescribed by the regulations and be available for review prior to issuance of the regulations in final form.

In rewriting the regulations, whether for competitive or non-competitive leasing. I do not feel that the Government should attempt to control or manage future research work by private industry through the leasing system or otherwise.

III. J. W. Smith, Laramie, Wyoming

Objections to effects generated by the proposed regulations:

1. Existing oil-shale technology developed privately and independently can produce shale oil on a commercial or major pilot scale right now.

2. Completion of the research phase is deterred and impeded by the proposal's severe limitation of reward to the researchers. Upon development of a successful technology the non-researcher leases production land on the same basis as the risk taker.

Patents could be granted successful researchers with rights of federal government application reserved at no fee.

The graduated royalty structure applied to product value rewards mediocrity and penalizes efficiency.

3. The onerous and involved requirements imposed on the researcher by the proposed regulation impede applications for leases.

4. Subordinating mineral research to the oil-shale research requirement delays and discourages development of Colorado's oil-shale minerals into a domestic alumina source. Rapid development of a domestic alumina supply is much more important to United States welfare than rapid development of shale-oil production. The proposed regulation contains no provision overcoming the legal impediments posed by the sodium exploration permits and mining claims.

VI. Michael E. Parrish, New Haven, Connecticut

The pending regulations are lacking a concern for the welfare of the people, dictated by expediency, and designed ultimately to perpetuate monopoly.

The leasing guidelines set forth by the Department of the Interior embrace conflicting principles. We are told that the basis of awarding research and development leases will include: (1) enhancing opportunities for maximizing multiple mineral recovery; (2) the financial and technical capabilities of the applicant; and (3) enhancing the competitive opportunities of smaller companies. This is utter nonsense. According to a report of engineers from the Bureau of the Mines: "The cost per barrel of producing shale oil by mining and retorting will be substantially lower for an operation on the order of 50,000 barrels per day than it would for a small operation such as 5,000 barrels a day. Accordingly, it is doubtful that small scale operations would be economic or practical. The capital requirement for an economic-scale shale-oil production facility in the 50,000 barrel-per-day range would be as great as $3,000 per barrel of daily capacity, *which is out of the reach of most small operators.*"

The only provision designed to enhance "the competitive opportunities of smaller companies" is the provision concerning patents.

I suggest that the only possibility of competitive development from the point of view of the American consumer, remains a Federal corporation similar to the T.V.A.

VII. J. R. Freeman

The exchange regulation should not be adopted until it is determined whether all previously disposed oil shale lands or their value can be recovered.

The regulations are designed to continue transfer of oil shale reserves to giant oil companies.

The executive branch should propose a government corporation or T.V.A. development plan.

VIII. Michael D. Cohen

Oil should be sold to the oil companies with full profits going to the government.

IX. J. Wayne Kinney

Mr. Kinney wants oil shale lease for turning oil shale into food by bacterial action.

Mr. UDALL. I also wish the record to show that I have with me at my right the Department Solicitor, Mr. Barry, who will sit with me at the hearing this morning.

Mr. Chairman, I should first like to say that I think this is a very timely hearing. There is a crescendo of interest in this subject. There is another month to run for the official comments, but I think having a hearing at this time is most appropriate. It certainly gives us all an opportunity to air our current views on this subject.

I want to say to all of those in the room, because I think we have a very impressive witness list, that I intend to personally read every statement that is going to be presented. There is no subject on which there has been more top executive timber involved in my Department than this during the year 1967, and I suspect this will continue to be the case.

I am impresssed by the fact, Mr. Chairman, that you have here leading experts on the scientific technology aspect, such as Dr. Jones of Humble Oil and Dr. Orlo Childs; that also Fred Hartley of Union Oil is here. His company probably has the largest holding and has spent more money on research over the long past, and you have Mr. Winger of Chase Manhattan, a leading economics expert in this field; Mr. Winston of the Oil Shale Corp., that has been extremely active. That leading conservation organizations are represented here today, I think is very good.

I have said before to this committee and I want to reiterate today that on a subject as important as this I think we need the big white spotlight that only a congressional committee can throw on this subject before final decision can be made.

We had a "Teapot Dome" controversy—scandal, in my judgment—because the Secretary dared to make policy in the dark of night and that is the last thing that we would propose to do on this subject. I think that the illumination that we will get from this hearing and from the comments that are made should help us make policy where all the arguments and all the alternatives are spread out before not only us but before the people of the country. This is the reason I say very sincerely that I welcome this hearing. I think it is most timely.

I want to make one more preliminary comment before I begin reading and that is I think that without doubt the Middle East crisis of June, and it still continues, was a very traumatic experience, as one would expect, for the petroleum industry. It has caused a lot of our leaders in this industry to review their policies.

I think it is very obvious it has caused them to take a homeward look, too. This was evident in the very handsome bidding that took place on the Continental Shelf. It happened we had scheduled the lease sale months before the Middle East crisis. The sale occurred on June 13, 1967, and Uncle Sam is $510 million richer as a result. It has also been evident in the past weeks in a very definite quickening of interest we sense from the industry people in the leasing programs on our Continental Shelf.

We are considering, and I wanted to report this to the committee—we have made no decisions—but we are giving very serious consideration to a large new leasing in a completely new area on the Continental Shelf in the Gulf of Alaska. Very promising seismic information has been made available on this.

We are also considering a new leasing program fairly soon on the Continental Shelf areas off Louisiana and Texas. This is as a result, as I say, of this new and very lively interest in looking down the road to future development.

There is a long leadtime in petroleum development, even in terms of the present technology of undersea exploration and development on the Continental Shelves. There will be a long leadtime, this we all know, in oil shale as well, and the reason why we have to have foresight in making policy is that we all recognize, I think every one in this room recognizes, that with a Nation whose industrial power is growing the way ours is, that the need for energy and the need for raw materials is increasing at a very rapid rate. We therefore have to do proper long-term planning.

So I am pleased, Mr. Chairman, to report on the status of the proposed leasing regulations.

I direct my attention particularly to point three of our five-point program because I think the other four points are not seriously controversial in the program we announced last January.

On May 7 we announced the issuance of proposed regulations. I will address myself to proposed leasing regulations in this statement and will be pleased to answer questions about the proposed exchange regulations as well.

As a matter of fact, I want to ad lib another comment here.

I discussed this program only last week on a western trip with Governor Hathaway of Wyoming, and Governor Love of Colorado, whom I visited again in regard to this matter. Governor Hathaway brought up an interesting point that had been raised by his people. He said all of the States in this region under the grants at the time of statehood have State land and he asked if the State were to want to block up its holdings in leasable units would that be permissible, would we cooperate with this?

My reply was in the affirmative. I told him I wanted to check this, and I have checked this with my Solicitor, so the States are in a position to take some initiative themselves in this field, if they so desire.

The Department's Bureau of Mines, Geological Survey, and Bureau of Land Management have for many years studied developments in the oil shale technology. It is their conclusion that a great deal has yet to be learned about the technology and economics of mining and processing oil shale and the recovery of shale oil and other mineral products from the rock. As of this time, neither oil nor other minerals are recovered from oil shale in this country in any commercial operation, although there are substantial private research efforts being made to achieve that result. So far as I know the most optimistic estimate made thus far is that of a single private venture, and they are represented here in the room, to be in production of shale oil in Colorado in 1970. We are aware of other minerals in the shale which may be valuable resources in the future. These include the sodium and aluminum minerals present in dawsonite, and the sodium minerals present in nahcolite.

It is likely, as we all know, that the largest, by far the largest deposits of aluminum minerals in the Nation, in a Nation that is short of aluminum, is present in these oil shale deposits.

The technology for economic recovery of these minerals from oil shale is less developed than that for the recovery of shale oil from the Green River shales.

Faced with the absence of practical experience in the production of oil and other minerals from the oil shale, we considered that it was premature to open the lands for general leasing—important information gaps, we believed, had to be filled first. The lack of information on the cost of converting oil shale to marketable minerals left us without a firm base for establishing royalties which would provide the incentive to induce venture capital, while insuring a fair market return to the Government. The absence of reliable cost information also afforded no basis to determine what the proper maximum acreage for leases should be. And we have yet to ascertain the environmental hazards and the costs of minimizing them. Additionally, if the lands were made open to general leasing before a technology is developed which can be made widely available, there is a danger that the resource might be monopolized by the few who made early breakthroughs.

This was the point I think mainly underlined by Senator Hart in the Monopoly Subcommittee in commending us for our patent policy.

Accordingly, we proposed regulations which had as their objective the utilization of the oil shale provisions of the Mineral Leasing Act to develop a meaningful body of experience on which a permanent leasing policy could ultimately be based, looking toward a competitive bidding system of leasing, which, of course, is the established and prudent long-term system that has been used in this country.

A total of 30,000 acres was considered to be sufficient for this research and development effort, but if less is needed, less would be used, and if more is needed, more would be used. We made no final judgments on this issue at this time. In no event would we propose to lease under our proposed regulations any more oil shale acreage than would be reasonably necessary for the research and development program proposed.

Some persons have suggested that the research and development can be accomplished without the leasing of any land, and should be pursued solely through Government-sponsored research expenditures. We agree that much can be accomplished by direct or Government contracted expenditure on research and development.

Indeed, this is one of our five points.

Point four of the program looks to joint research with industry in the use of nuclear explosives to fracture oil shale to permit retorting *in situ*.

It is interesting, the first of the AEC experiments on Project Gasbuggy in trying to improve the yield of gas fields in northern New Mexico has been postponed although it will take place within the next 60 days.

Point five looks to a total expenditure of about $100 million over 10 years on oil shale technology, economics and geology, and related conservation and environmental protection. About $15 million of that amount would be for *in situ* retorting research using nuclear explosives for fracturing (point IV). We believe there is also much to be gained by an approach taking into account the many firms and institutions, which, with their diverse research programs and commercial interests may be able to make important contributions to the effort.

On the other hand, there are suggestions that the state of the art is far enough advanced to permit a system of competitive leasing now.

This was a major point made by the Governors of the three States in their statement which I think anyone who would read it would have to say is a constructive and forthright statement, and one that obviously was very carefully prepared.

It has been suggested that we make suitably sized tracts of oil shale lands available for competitive bidding, and allow the marketplace to determine the pace of investment in oil shale research and production. Many of the comments we have received to date, including the comments submitted jointly by the Governors of Colorado, Utah, and Wyoming, urged this course. As I have mentioned earlier, we were not satisfied that we could devise a full-scale leasing policy now that would permit such development and at the same time protect the public interest. We are open to argument that there are ways of doing this, but we have had serious doubts about this.

However, the intensive study we have underway, and to which I will refer in a moment, will afford an opportunity to evaluate further this as well as other proposals.

This is the background to our initial decision to propose research and development leasing by use of the Mineral Leasing Act. We devised proposed regulations to obtain the necessary information in the shortest time possible, with safeguards to prevent speculation and monopolization, to provide maximum revenues, and minimize environmental and safety hazards. We offered the regulations for public comment to be made within 30 days of the time the regulations were announced, and we subsequently extended the time for comment, until mid-October, as you know.

We have received views from individuals, industry, and the educational community, Federal agencies, and State governments. I am sure,

because it is always the case, that some of them will come in at the tail end, just before the final deadline. Indeed this record here is, in essence, part of the same record.

We are carefully studying these comments to test out our assumptions and to improve our approach. I am pleased to furnish the committee copies of the comments, with a brief summary. Aided by these comments we have in process—and we are not waiting until October—we already have underway the further intensive study of oil shale policy which is so necessary in arriving at the decisions on a proper program. Our target date for completion of this study is mid-January 1968.

I would now like to outline the manner in which our proposed regulations would operate in their present form; that is, the form we published them in May.

We would expect that those interested in research on the publicly owned oil shale lands would present their proposals to the Bureau of Land Management. The proposals must look toward research in the recovery and processing of oil shale during a maximum research period of 10 years. The applicant would have to show that he is technically and financially capable of conducting the work and has a serious interest in going forward. Before any lease would be issued, the Department would decide whether there is any basis for permitting the statutory maximum of 5,120 acres to any single venture. If the facts demonstrated that any optimum operation, allowing for reasonable reserves, could be expected to need less than the 5,120-acre maximum then a lesser figure would be the maximum specified in the lease.

The lease would have two phases. The first phase, which would be a maximum of 10 years, or any shorter perior of time if the work moved more rapidly, would permit the applicant to engage in the proposed research and development on a designated tract of oil shale land within the area leased to it. During the research phase if the applicant needed less than the total acreage of the lease, he would, therefore, be permitted to conduct the research only on that part which he demonstrated he needs. When the applicant completed his research within the 10-year term, and satisfied this department that he had developed a commercial process, he would be authorized to begin commercial production. The acreage within the maximum which would be permitted for commercial production would be that amount which the applicant demonstrated was needed for his commercial operation, with a reasonable amount for reserves.

In considering whether to issue a lease, a number of facts would be important. Leases for the purposes of speculation or to hold the land without doing the research and development would not be issued.

We are not going to give someone a lease that they can sell. That is not in the public interest.

It would therefore be necessary for the applicant to demonstrate his need for the Federal acreage. Any applicant who asked for a tract similar to shale lands he already holds, in terms of acreage, overburden, grade, thickness, quality, and depth of deposits, and accessibility to transportation, water, and other needed resources, would have a heavy burden to discharge. On the other hand, much

of the land in private ownership has substantially different physical and geologic characteristics than some of the Federal lands, and if the proposed program were a promising one which could not be pursued on the private land, the need for Federal lands could be established.

These proposals which offer the greatest protection to the environment would, in our view, be more favorably received than those which do not.

The extent to which applicants have available alternative sources of supply of the minerals that they propose to recover from the oil shale would be taken into account. However, these considerations would not be administered arbitrarily. The purpose would be simply to select proposals most likely to enhance the basic objectives of the program—to develop oil shale technology, to prevent waste, to conserve resources, to encourage competition, to prevent speculation, and to avoid windfalls.

One of the most difficult tasks was to devise a suitable royalty system for the proposed regulations. I particularly direct the committee to this as an extremely difficult task. As I mentioned earlier, one of the purposes of the program would be to develop a body of information on which a royalty system for competitive bidding could be based. For the research and development lessees, great care must be taken to insure that even on the limited acreage involved in the research and development phase there would be no possibility of windfall. Care also must be taken to insure that the royalty system would not operate to preclude sound ventures from successful operation.

We considered the royalty system now in use on leased Federal oil lands, which is a percentage of the value of production—one-sixth of the value on the outer Continental Shelf; one-eighth for noncompetitive leases under the Mineral Leasing Act—while this system has worked where the costs of production were known, it might be an impediment to oil shale production if it were followed without modification. I underscore that word "impediment." A royalty on production is an expense of doing business. It is payable irrespective of whether the product can be marketed competitively with other sources of the same product. It is possible therefore that one-sixth or one-eighth royalty on production might make shale oil noncompetitive with conventional oil, depending upon the costs, as yet unknown, of producing the shale oil.

We therefore devised an alternative which would not be imposed as a cost of doing business, but would permit the public to share in any profits of the venture. A percentage system based on net income has this characteristic. If production costs of shale oil turn out to be high, and the margin between cost and market price is low, no additional expense of doing business would have been imposed to render the venture unprofitable. The net income percentage therefore would operate in the same manner as a percentage income tax operates. If the venture were profitable, there would be a tax on the percentage of income. If the venture were unprofitable, there is no tax.

My people took considerable pride in this part of the proposed regulation, and I would certainly welcome the most incisive comments

from the members of this committee and from the witnesses who are going to appear, on this aspect, because it is troublesome and it may be very vital.

This is why we proposed to use the income percentage method of obtaining royalties. However, we did not want to depart completely from the production percentage basis, because whatever the profitability is, if companies are willing to produce a substantial quantity of the product from the public lands, there should be some return to the Government from the sale of publicly owned mineral resources of the leased land. Therefore a minimum royalty of 3 percent of production was proposed.

We also had to decide what the appropriate rate of royalty would be. Here again the lack of experience on the cost of shale production rendered the problem difficult. We set as a goal a royalty rate of shale oil net income which would have the equivalent impact on net income as the royalty rate on production value used on the Outer Continental Shelf lands leases. That royalty is 16⅔ percent of the value of the minerals produced. It was the judgment of our economists that on the average a 16⅔-percent royalty on production would work out to be about 30 percent of net income from conventional oil producing property. A royalty rate of 30 percent of the net income from the property was therefore our target, without taking into account depletion or the payment of the royalty itself. The simple method to have done this would have been to state that the royalty rate was 30 percent of net income from the property, without regard to depletion or payment of the royalty. There was, however, another factor to be considered. The net income royalty system, although not an expense of doing business, does have an effect on the rate of return of investment in the venture. We were concerned that a flat rate of 30 percent of net income might reduce the total income from the venture to a point where it would not be attractive to enter this new and unproved business. Accordingly, the royalty percentage we proposed would be made applicable in brackets so that the venture need not fear that a low rate of return on investment would be reduced to below where it would be attractive to make the investment.

We proposed three brackets. On that part of a company's net income which represents no more than 10-percent return on investment, the royalty rate would be 10 percent. On the part of its net income which exceeds 10 percent and is no more than 20-percent return on its investment, the royalty rate would be 30 percent. On the part of its net income which is more than 20 percent of investment, a 50-percent royalty would be imposed. This means that no firm would pay an effective rate of 50 percent of net income in royalty. It would operate like the income tax rate, in that a taxpayer in the 50-percent bracket is not paying 50 percent of his income as tax, but is paying a tax something like an average of the bracket rates up to 50 percent. In the case of our proposed royalty system, the effective royalty rate of the most profitable venture is estimated to be approximately 30 percent of net income if the venture, in terms of return on investment, were about as profitable as the production of oil from conventional sources. If the venture were to yield a higher rate of return on investment than from conventional sources of oil then the effective rate may be greater

than 30 percent of net income, and would trend in the direction of 50 percent, but would never reach that point.

A great deal of interest has been expressed in this royalty system, and in the actual bracket rates which were proposed, and what we proposed 4 months ago was simply our best thinking at that point. Some of the comments which we received addressed themselves to the impact of the system on anticipated operations. These views will be considered carefully in our study. I want to emphasize, however, that the system was developed for the special needs of our research and development program only. It was our hope that the outcome of the program itself would provide the information needed to design a royalty system, a permanent royalty system, for competitive leasing, when such leasing becomes appropriate.

Another difficult aspect of the regulations involves the problems of multiple mineral development. This is another item I should like to underscore for the committee. The shales in the center of the Piceance Basin contain substantial quantities of dawsonite, a sodium-aluminum compound finely disseminated in the shale rock. Nahcolite, a sodium compound, is also present, and it is always possible that other minerals will be found. We expect, through the research and development program, to learn a great deal about the technology and economics of operating in this mineral complex, with a view to developing processes to recover economically substantially all the marketable minerals within the shale. In other words, if we went just to a straight competitive bidding approach on this, are we in a position where we can require the recovery in the national interest of all of the values that are present or have a party holding the lease simply go ahead and recover the oil and leave the other values there. It is possible, however, that some techniques may be proposed which would result in the recovery of some minerals but not others. Thus, while we would encourage the maximum recovery of all the minerals, we would also consider proposals which would concentrate on only some of them, because it is premature to render a final judgment that a particular deposit should be worked only if all the minerals can be extracted, or that any or several minerals should be preferred over others. We do not know. Our experts do not know at least at this point.

Another matter of special concern relates to inventions resulting from the program. We have announced our intention to follow the President's patent policy which provides that in the case of Government-sponsored research for the general public welfare, the rights to inventions should vest in the United States, so that they may be used by all without royalties. This, of course, is good for industry generally in terms of the competitive situation. It is also good for the consuming public. It must be remembered that the entire effort was aimed at creating techniques so that when the shale lands are made available they would be made available in a meaningful sense—the techniques developed for exploiting the shale would not be monopolized by the few who had obtained research leases in the beginning. Any policy whereby the Government made such a large resource available to a few for research purposes without providing that the benefits of the research go to the public, would not be a research and development policy at all, but simply a land disposal program. If we believed that

the techniques were far enough advanced now so that a simple land disposal program could be initiated, that is what we would have proposed. But we did not feel that we could make the resource available for the purpose of developing the technology without guaranteeing that the technology would be available to develop the resource over the long-term future.

In sum, under point 3 we proposed to purchase for the public, with a limited amount of oil shale resources, technology which all thereafter could use. We proposed to purchase technology on terms that would induce the substantial risk capital involved, while returning to the public fair market value for the resources disposed of. We examined a variety of alternatives—those that would hold back the development of the resources were as unacceptable as those that would open all the lands when so much had to be learned about how to best protect the long-term public interest.

Before concluding, there is another aspect of oil shale development which I want to discuss. On April 25, 1967, the Department of the Interior transmitted to the Congress a proposed bill to provide for the recordation of mining claims. The bill was introduced by the chairman of this committee by request on April 27, 1967, as S. 1651.

That bill has an important bearing on the ultimate objectives of the Department's 5-point program for the development of oil shale resources. The oil shale development program requires action to clear titles to Federal lands and to determine the validity of oil shale mining claims. In fact, this is our big threshold problem, and it is a very serious one. We estimate that location certificates for about 30,000 to 60,000 oil shale mining claims were filed in local county recorders' offices under the 1872 Mining Act, prior to passage of the Mineral Leasing Act of 1920, which precluded further locations for oil shale. Location certificates for an additional estimated 10,000 claims have been filed recently, within the last 18 months, in oil shale areas for various minerals.

Under the present Mining Law, with a few exceptions, the mining claimant is required to file notice of his claim only in the local county recorder's office. No filing with the Federal Goverment is required. Many of the mining claims now on record in county recorders' offices describe the claims in terms of corners tied to rocks, blazes on trees, and other natural monuments. The physical site of the claims may be ascertained, if at all, only by actual inspection on the ground. It would take a whole army of people if our Department were to have to undertake this. Additionally, the identification and location of the claimants in many cases has long been out of date and obtaining current information is costly, and in some instances may be impossible. The Department's proposed mining recordation bill will go a long way towards solving the title problems. It would tremendously hasten the whole process, and I am aware of the fact, I might as well be blunt about it, that some of the mining industry people who are attached to the oil law and do not want it changed are opposed to this. They have said so quite directly. I want to make it clear, too, that their opposition is holding back shale oil development, in my opinion.

It would materially enhance the process of locating and serving claimants, closing out abandoned claims, bringing title questions to

issue, and resolving such issues properly, if we could move quickly in making our policy determinations and if we could get the help of the Congress in this situation. We therefore urge this committee to give its earliest consideration to S. 1651.

That completes my direct statement, Mr. Chairman, and I hope we have been frank with the committee. We will be glad to answer any questions.

The CHAIRMAN. Thank you, Mr. Secretary. I want to compliment you again, as I did in my opening statement. Your statement this morning has been extremely helpful to us.

It seems to me that what we are dealing with is, of course, a proven reserve in which the state of the technology to convert this reserve to oil has made some progress but still has a substantial way to go. It is most difficult to reach a final conclusion until the extent of the development of the technology to extract this product is known. It is obvious that the number one problem we face is to get that information.

As I understand it, your regulations propose to bring to bear everything that is within our free enterprise system to ascertain what is the most economical and feasible means by which the oil shale can be extracted and converted to petroleum products. I think this is a sound, logical approach, because you cannot really determine what the return to the Government should be unless you know what the potential return will be to those who operate on the public lands.

Mr. Secretary, I wanted to ask you one question with reference to net profit-sharing on the royalties under the proposed regulations. It is true, is it not, that some of the companies could have a pretty high cash flow which would not show up in their net income return which might not be adequately covered by the proposed regulations?

Mr. UDALL. Senator, I think I would have to say that this is possible. It is one of the things that I think we need to give further scrutiny to, in terms of knowing how sound our proposal was.

The CHAIRMAN. This is an area in which I do not know the answers. I am just posing the question.

Mr. UDALL. Yes.

The CHAIRMAN. The royalty relates to net income, and, of course, you could have a fattening of the company, so to speak—a cash flow—which would not be reflected in the net profits. I wish that the Department would take a close look at this problem. I think it is important that we have a pretty good index as to the true return that is being obtained regardless of method of accounting and bookkeeping practices.

That is all I have for right now. I want to compliment the Secretary.

Senator Allott?

Senator ALLOTT. Thank you, Mr. Chairman.

Mr. Secretary, I want to say one thing to begin with. I compliment you on moving forward in this area, even though there are points in your statement and your proposals about which we feel differently. At least we are moving ahead, and we have something concrete now before us which we can analyze and discuss and get the opinion of people who are on the other side of the fence, so to speak, the people in business whose judgments on how this would affect the development of the oil shale industry would be very valuable.

Unfortunately Mr. Chairman, I am afraid that in a sense we are all affected with the Teapot Dome Syndrome. I am sure that neither the Secretary nor any of his assistants nor his administration are going to be involved in anything which would effect a situation which would result in a monopoly or a windfall to any company if it can possibly be avoided.

I am just as positive that there is no member of this committee, the full committee, or in the Senate, who is going to abide by such a result, if they can possibly avoid it.

So I hope that this syndrome, which seems to pervade much of your discussion and thinking, can be discarded with the concept that no one that I know of, including the possible developers, the business people in this country, who might possibly develop a viable industry here, are of a state of mind where they are looking for such a windfall.

Mr. UDALL. Senator, I wonder if I might have a colloquy with you on that.

Senator ALLOTT. Yes.

Mr. UDALL. Because I want to make it plain that is the reason I said what I did at the outset—that we genuinely welcome these hearings. In fact, if this set of hearings does not satisfy the committee, let us have another one. My people live under, and I live under, what I think I would describe as using your figure of speech, a permanent Capitol dome syndrome. I think this is quite proper, because the Congress of the United States is our overseer. You have oversight over our responsibility, that is the reason that the more you understand what our thinking is; what is before us; what plans we are considering, what arguments are present; the less the chance there will be of a bad public policy being made or of there being serious criticism. I think, for purposes of people downtown, the Capitol Hill syndrome is a very good one. I suggest we consider it in that light.

Senator ALLOTT. Now we can get out of the area of psychiatry and into a discussion of some other matters. I must say that my questions will be few, Mr. Chairman, because I think many, if not most of the things I want to ask questions about will be developed by other witnesses.

Mr. Secretary, at your former appearance here, we discussed in some great detail the clearing up of the situation with respect to the other minerals, particularly in the Green River formation, such as dawsonite and nahcolite. I would like to ask what has been done with respect to the various mining claims that have been filed as against the prospect for leases and so forth? What has been accomplished on that?

Mr. UDALL. You are referring, Senator, to all the new claims that were filed or about the general picture?

Senator ALLOTT. No. Let me make this clear, Mr. Secretary. What I am asking about is the new claims arising out of other minerals, not the old claims arising under the laws prior to 1920.

Mr. UDALL. Well, we are moving as rapidly as the legal system, the limitations of the legal system—and its mills grind slowly, as we all know—to establish the basis for determinations and to get ourselves in a position where we can resolve these issues.

We are also crippled in this, however, I should stress, by the fact that we have relatively limited information considering what we should have, as to the nature of some of these claims. We are moving as aggressively as we can on this. We have some matters that may be in litigation and I think as soon as we get some baseline determinations on this, it will be relatively easy to deal with the large general problem.

Senator ALLOTT. Well, to delineate this problem as it applies to the situation in Colorado, the approximate area of the oil shale land is, I believe, 700,000 acres; is that correct?

Mr. UDALL. I think something in that order.

Senator ALLOTT. And approximately 20 percent of the 700,000 acres is in private holding, I mean it is actually fee land now.

Mr. UDALL. This is a rough figure we have used, 15 to 20 percent.

Senator ALLOTT. 15 to 20 percent.

So that that would leave us in the neighborhood of over 500,000 acres in the public domain.

Now, of this remainder, from your findings, how much of that involves the lands which have been filed on or applications of one sort or another, prospecting permits or leases, have been made with respect to dawsonite and nahcolite?

Mr. UDALL. Senator, I cannot give you that offhand. I would like to furnish it to the committee and we can do so very quickly, I think.

I can say to you generally that it reaches areas that have some of the richest, thickest deposits of oil shale. Generally this area was blanketed with them. But I can give you a precise figure.

Senator ALLOTT. I would appreciate it if you would supply as far as possible what percentage this would be.

(The information requested is as follows:)

Out of approximately 1,096,000 acres, the Federal Government retains ownership of 852,000 acres or 77.7 percent of the total. Sodium prospecting permit and lease applications have been filed on the following acreages:

		Acres in applications	*Percent of Federal lands*
8	Preference right lease applications	19,109	2.2
88	Sodium prospecting permit applications	197,479	23.2
5	Sodium prospecting permit applications in conflict with 1 lease application	12,663	1.5
1	Lease application in conflict with 5 sodium prospecting permit applications (5,125)	------	----
	Total lands under applications for lease or permit	229,251	26.9

Senator ALLOTT. Since we started out on this question of monopoly, I think the contract made by you, the Secretary, for research at Anvil Points was a very fortuitous one in that it opened up the participation in that research facility at Anvil Points operated under the Colorado School of Mines Research Foundation to anyone who wanted to bear their share of the cost of that research facility. That is correct, is it not?

Mr. UDALL. Yes, and this was a very good sort of open ended approach—we invited anybody to come in who wanted to and your very fine school of mines was involved in it and it is a very good example, I think, of a cooperative research venture.

Senator ALLOTT. So that in no sense could this have been considered a monopoly, because by the terms of the contract itself everyone had a period of—what was it, 6 months or 1 year?

Mr. UDALL. Six months.

Senator ALLOTT. To come into that, and anyone who was interested enough and wanted to participate could have.

I would like to ask you in this respect whether you have had any ~~other proposals for research~~ at Anvil Points outside of the present consortium?

Mr. UDALL. No. Once everyone came in who wanted to, and we put it together, I do not think there have been any new entrants into this research venture.

Senator ALLOTT. But you would agree, I am sure, that the bill which transferred the jurisdiction back to the Department of the Interior of this area—and the legislative history makes it clear—that anyone else could come to the Secretary and that the Secretary has the authority and the power to contract for any additional research. So it is wide open.

Mr. UDALL. Yes, I think that is very clear.

Senator ALLOTT. This is the point I am trying to make, that it is wide open to anybody who wishes to do it.

Mr. UDALL. Yes.

Senator ALLOTT. It seems to me that we are in sort of a "chicken and an egg" process at this point. On page 6 of your statement you say:

> When the applicant completed his research within the 10-year term and satisfied this department that he had developed a commercial process he would be authorized to begin commercial production.

It is my opinion that at the end of that time we will still be in the chicken and the egg process because, until somebody takes that long jump into the cold waters, we will never know whether it is actually a commercial process.

You are aware of the various processes that have been worked upon in research, and some of these, I am sure, will be discussed by the people who testify later. It seems to me that what we need to do is to also provide with certainty the concept that a man or a company or a group of companies will be able to secure a lease at some time in the future. The department might believe that he did not or they did not have a commercial process. They might believe implicitly that they did and be willing to put their money back of their judgment, and this same situation, I think, is reflected in your royalty proposal. I do agree with the statement of the senior Senator from Utah. I think we are at a place where we can proceed but the determination has to be made now so that anyone who goes further with the processes that they now have and decides to lay as much as $100 million or $125 million on the line—and I take these figures from the hearings that were recently held before the Subcommittee on the Judiciary—can be assured that they are going to have a right of development.

Mr. UDALL. Well, Senator, you have certainly put your finger on a key point and maybe we should clarify the record on this with regard to our own thinking, and maybe as presently stated we stated it too conservatively. Of course, when we talk about a commercial process, depending upon, of course, where a particular project is, we may be talking about just not extracting oil from oil shale but the minerals as well. I think I can say that we are not considering it would be our position that if a company had done research and is willing to invest large amounts of money—this is what it will take—that this is a real test.

We should take at that point not a very conservative view in terms of whether they had a process or not, but if they have a process that they show is sufficiently good that they are willing to investigate $100 million or $200 million, I know enough about the way American industry operates to know that in all likelihood this would be a process that could be shown to be satisfactory from our point of view. I think that is the decisive thing.

But I still think we are going to have to have, because of this multimineral aspect, some reserved judgment on this.

Senator ALLOTT. Well, when you refer to Government-sponsored research, what is your concept of what such Government-sponsored research should be, Mr. Secretary?

Mr. UDALL. Well, I think the Government-sponsored research probably should be in the *in situ* field. Obviously we are going to have the Atomic Energy Commission in that in any event. I think that there are some of these particular aspects of the problem where the Government research effort, as the protector of the long-term interest of the Nation as a whole, ought to be in the direction of maximum utilization of the resource.

I would expect in the first stages that some company's interest might be in a more narrow band of interest, and what our research ought to try to do is to enlarge the usefulness of the resource. We should also be active in the development of the technology where the Government must inherently be involved; such as, in the case where nuclear fracturing or anything of that kind is involved.

Senator ALLOTT. Certainly in the case of any *in situ* retorting by the way of nuclear power, the Government would have to be involved, and I agree we have to keep our eyes open for the maximum development and maximum utilization.

In this respect now it is true that under the authority under which you promulgated these proposed regulations the most that any one person could hope to lease would be 5,120 acres; is it not?

Mr. UDALL. Yes, that is true, Senator; but this is written into the law. This is a limitation we have not laid down. This is the basic minimal leasing statute.

Senator ALLOTT. This is right. Under the authority you now have.

Mr. UDALL. That is right.

Senator ALLOTT. You could not do more than this.

Mr. UDALL. In any event, that is correct.

Senator ALLOTT. And more than that, under the revised Mineral Leasing or revised Leasing Act of 1961—I believe it is 1961—this is all that it could be. This is the maximum acreage with respect to oil shale that anyone could hold in the United States. In other words, no one person or a corporation could hold more than 5,120 acres of shale land. He could not pick up 5,120 in Colorado, another 5,120 in Wyoming, and another 5,120 in Utah; is that correct?

Mr. UDALL. Well, I think you are correct.

Senator ALLOTT. So if we can conceive of six companies—and, of course, the companies who are interested in developing this are primarily oil companies because they are the ones who need the oil that pours into our automobile fuel tanks as gasoline—if six companies decided to gamble—I should say invest, although it may turn out to be a

gamble—$100 million or $125 million in the Colorado area, which is the area in which most of the development has taken place, we would still only be talking about 30,000 acres, a little over 30,000 acres, out of approximately 500,000 acres which lie in the Federal domain.

Mr. UDALL. That is correct, Senator. It is a very small fraction.

Let me try to express this situation, if I can, for the benefit of the record. Of course, under the oil leasing statute on the Continental Shelves there are no acreage limitations per company. There is a highest bidder proposition, and this is in areas, of course, where we have some knowledge of what we expect might be there, and companies can and do bid for more than one block, the total acreage of which may be much greater than 5,120 acres. But oil shale is covered under the Mineral Leasing Act, and under a special section of that Act, and, therefore, the 5,120-acre limitation is a limitation by law.

Now, once we have the process developed, once we have the technology, once all the unknowns are known, we may arrive at a point where it may be in the public interest to come back to Congress and to have that specific acreage limitation reconsidered. But I think for the time being it is probably a sound limitation and that this means that oil shale is treated differently, it is treated as a mineral and not as petroleum on the Outer Continental Shelf is treated.

Senator ALLOTT. Well, because of your answer, I will have to make my own position clear. I am not contending, Mr. Udall, that it should be larger than this, but I just wanted to get on the record what we are dealing with.

With respect to patents—and I forget just where you covered this in your statement—I think we make an error here in considering this on a separate basis from any other resource. I have contended for many years, while many others kept quiet in the Senate, that development of oil shale was in the national interest, in the public interest. When I discussed the possibility of the curbs on imports that might occur because of the Suez or Arab-Israel crisis, people looked at me like I was having pipedreams. But this has come about and it has affected particularly Europe, it has affected us, Mr. Secretary, as you well know. It seems to me that in the area of process patents that the greatest deterrent to oil shale development would be for the Government to insist that because the people are working on a public resource that any patents developed would belong to the Federal Government.

If we take this same analogy back to our mining laws, then all of the patents developed during the long tedious years of developing mining in this country—gold, silver, lead, and zinc, the whole thing that your State has, as well as mine, and most Western States—all of these patents should also probably have belonged just as logically, using your line of reasoning, in the public domain.

It occurs to me—and I would like to have your comments on this—that we cannot regard this in the same light as we do any one of the two dozen fields in which the Government puts up a major portion of research costs—we are now putting some $17 billion a year into research. In those instances the government is actually financing the research, whereas in this instance the private companies are financing the research and, frankly, I think this patent policy will be one of the

greatest deterrents to developing an industry, where a company has devoted not just the last year or the last two years but many companies have devoted many years and invested many millions of dollars looking down the road to ultimate oil shale development, that we will end up by placing a road block in the path of development.

Mr. UDALL. Senator, let me be very candid in reply. I will be interested in what some of the large petroleum companies have to say on this issue.

Senator ALLOTT. So will I.

Mr. UDALL. My Department, because we are custodian of much of the resources, has been very rigorous in terms of the present patent laws, more so than some other departments in the past. I think there is good reason for this. Let me give you some examples. In the Anvil Points oil shale research project our patent policy was made applicable.

Another example, in another area this committee is very familiar with, is our water desalting program. Of course this is the Federal Government in this instance itself investing the money in research in contracts with everybody. In that instance, even though some of these companies, as for example, Westinghouse, are doing research on their own, have generally accepted our patent policy. Why? In this instance what the Nation wants through our desalting research program is an alternate source of water supply at reasonable cost. We want to have processes that will give the people the cheapest water possible—indeed the President has offered to share whatever we have with the world in this field. Our patent policy is designed to accomplish this.

When we get to the oil shale, it is true, as you suggest, and that may make it somewhat different, that some of the money invested under what we are talking about would be the money of private firms.

On the other hand, they are going to be experimenting with a resource that the public owns. Some of these companies have private holdings of their own, many do not. It is an access to that resource which is provided. The ultimate objective of the whole program is the full and maximum development of this resource, and when we keep in mind the long-term national interest and the consumer interest and these other things, then the strict patent policy, if you want to call it that, is best and it is soundest because the patent policy question bears upon the question of monopoly or antimonopoly. I would urge that you look at the statement of Senator Hart because this is an aspect they have a very legitimate interest in, and they took a strong position on this issue after inquiring into it.

I know it may not appear as clear cut as the desalting, for example, where the Federal Government is putting up all the money. I would be interested in knowing what the companies think about this issue really. I do not think it is going to be an impediment, quite frankly.

Senator ALLOTT. Well, this raises a question, Mr. Chairman. I did not insert a statement into this record because I did testify before the Hart committee at some length. I think I shall have to ask that the statement which I made before that committee be included in these hearings at this point.

The CHAIRMAN. Without objection, the statement of the senior Senator from Colorado made before the Hart Subcommittee on Antitrust and Monopoly will be included at this point in the record.

(The statement referred to follows:)

STATEMENT OF SENATOR GORDON ALLOTT BEFORE ANTITRUST AND MONOPOLY SUBCOMMITTEE OF THE SENATE JUDICIARY COMMITTEE, APRIL 26, 1967

Mr. Chairman, I appreciate this opportunity to make these remarks before the subcommittee, and I hope it will serve a useful purpose.

Inasmuch as the bulk of the oil shale resource is in my own State of Colorado I have followed these hearings with some interest. I have had an opportunity to briefly read the transcript of the hearings held last week on Tuesday, Wednesday and Thursday. As a result, I noticed that the scope of these hearings is such that I felt it might be useful for me to comment on the subject.

As the Chairman knows, the Interior and Insular Affairs Committee, on which I serve, has held two sets of hearings on oil shale. While I understand that the February 1967 hearings are soon to be printed, they were not completed. Those hearings were adjourned subject to the call of the Chair. While I cannot speak for the Chairman, it was my understanding and belief that further hearings would be scheduled as developments warrant. During those hearings I specifically asked the Secretary of the Interior if he thought that separate hearings on just the leasing aspect of oil shale would be helpful and advisable. He agreed that they would be useful at the right time. The Secretary then explained what he believed the "right time" would be. Rather than paraphrase him, I shall quote him directly from the transcript:

"Once we have put out our regulations, once we have had comments from industry and from others, once we have then made our regulations final, and we are moving on into the development of the new leasing techniques, if they are new, we are not sure they will be, I think this would be a time when it would be useful to us to have the Committee get into this picture."

The Secretary and I share the belief that the more public discussion there is of the issues and problems involved the more likely we are to find the best and most appropriate answer.

In this respect, Mr. Chairman, these hearings before this Subcommittee can be helpful. The more light that is shed on the subject the better our chances will be of separating the wheat from the chaff, of discerning fact from fiction, of determining what is substance and what is fantasy. It would be most unfortunate if either the Congress and/or the Department of Interior based its policy decisions on fantasy rather than fact. As you pointed out in your opening statement, Mr. Chairman, the overall problem rests within the jurisdiction of the Interior and Insular Affairs Committee, but I am sure that the record developed here with respect to competition and monopoly will be carefully reviewed by the Interior Committee when circumstances and developments are such that the overall policy can be appropriately considered.

I am fully in accord with the belief ". . . that the fastest development of oil shale will come about when a program is developed which encourages maximum competiton." Obviously, the problem is how to develop such a program. To simply open up the land to unbridled leasing may not only create a giant speculative leasing flurry, but may also tend to retard development by securing mining rights to those who are not seriously interested in development and denying them to those who do wish to develop oil shale. Such leases are sometimes characterized as "nuisance leases". On the other hand, to delay in coming up with a leasing program increases the chances of concentration, because it affords those with abundant capital an opportunity to solidify their position by acquiring certain necessary and associated rights, such as water rights, patent rights to technology, etc., tending to eliminate those not having the staying power that large amounts of capital affords. It is for this reason that I have been urging the Secretary of Interior to promulgate leasing regulations with research and development requirements at the earliest possible time. I must say, however, that my urgings have gone largely unheeded, for with the exception of the Secretary's announced Five Point Oil Shale Development Program, dated January 27, 1967, nothing in this regard has come from the Department. As announced, the Secretary's proposal would appear to be within

the concepts of our economy, and would seem to meet the requirements for a competitive industry. However, the Secretary's proposal as set forth in his January 27, news release, was apparently primarily a broad statement of objectives. There was simply not enough detail for me to comment on whether the proposal would be successful in obtaining those objectives. As soon as there is enough detail available, I will ask the Chairman of the Interior Committee to schedule additional hearings on the proposal.

Earlier in these hearings, concern was expressed that the Secretary of the Interior ". . . believes that he can move ahead without specific legislative authority . . ." to establish rules for development and production of oil shale. In fairness to the Secretary, I believe that it should be pointed out that the Secretary of the Interior does have such statutory authority under Title 30, Section 241 of the United States Code (Mineral Leasing Act of 1920), and has had such authority for more than 47 years. The statute places certain limitations on the Secretary, and prescribes that there shall be an annual rental paid for the lease, and in addition, a royalty shall be paid on production. The Secretary is also empowered to impose covenants relative to methods of mining, prevention of waste, and productive development. Further, there is an acreage limitation with respect to oil shale in that no person or corporation may hold more than one lease, and no lease shall be for more than 5,120 acres. Simply as a point of reference, the limitation on the number of acres of coal lands that one person or corporation may hold, as enacted in 1964, is 46,080 acres in any one State, with the provision for additional acreage in other States to that same person or corporation of up to 5,120 acres per State.

There has been testimony earlier, that there are 3,676,000 acres of Federal land containing not less than a 15-foot ledge of shale containing 15 gallons of oil per ton—of course, much of it contains much more. But considering the acreage limitation which I have just mentioned, this would be sufficient to allow 717 separate individuals or companies to take lease of the maximum size—5,120 acres. 5,120 acres is the maximum size of an oil shale lease, as I read the law; the Secretary has authority to grant leases of lesser acreage. As I pointed out in the May 1965 hearings before the Interior Committee, the number of acres has little meaning with relation to the quantity of oil underlying it, and perhaps a better guide would involve considerations of the richness of the shale, thickness of the bed, and the amount of overburden. Taken in this light, it would appear that there is room for a great number of developers.

As has been pointed out by other witnesses, between 15 and 20% of the oil shale is on private land. This being a fact, one might reasonable ask oneself why there is a need for a Federal leasing policy. Actually, there are several reasons. First, without a Federal leasing policy competition is effectively limited to those who now own the mineral estates of the private oil shale land, or who have sufficient capital to out-bid their competitors and acquire mineral rights. Such a situation would obviously affect the ultimate cost of shale oil and its price to the consumer. Second, the possibility of a leasing policy to be announced at a later date would tend to discourage development on private lands, because the developer might be caught in a disadvantageous competitive position with subsequent Federal lessees. Third, a Federal leasing policy is the only practical way to ensure that opportunity is available to a large number of potential developers who are serious about developing a viable oil shale industry.

It has been brought to the Subcommittee's attention that a rather serious problem exists with respect to the Government's title to much of the oil shale land. Unfortunately, the problem has become greater with the passage of time and the discovery of sodium minerals intermingled with the oil shale. Dawsonite, which is one of the sodium minerals present, may become an important source of aluminum to this country. We rely heavily on imports to supply our industry with this important metal; over 90% of our supply is imported. According the Bureau of Mines Commodity Data Summary, our import sources for bauxite for the years 1962–1965 were: Jamaica, 57%; Surinam (or Dutch Guiana), 28%; Dominican Republic, 7%; Haita, 4%; Guyana (formerly British Guiana), 3%; and other countries, 1%. Just a reading of the names of these countries in light of the present world situation makes one wonder as to just how much reliance we can place on these sources in the next decade or so. It would be difficult to over-rate the importance of aluminum to our national defense, and due to the intermingling of dawsonite with the oil shale, it becomes apparent that the early development of oil shale to obtain the dawsonite becomes

a matter of importance to national defense without even considering the need for the shale oil.

The title problems are two-fold: First, there is the question of the disposition of the pre-1920 placer oil shale claims; and, second, there is now the question of the post-1964 dawsonite claims and sodium lease applications. With respect to the first, the Secretary of Interior stated in the February 21, 1967, hearings that the ". . . task of clearing away a half-century of legal underbrush will be time-consuming, vexatious and difficult. But is a necessary prerequisite to the long-term development of the lands in question." In my opinion, the Secretary's evaluation is both fair and accurate. In the past two Congresses I have introduced legislation which was intended to give the Secretary a bag of tools with which he could commence to dispose of the pre-1920 title encumbrances in a much more speedy fashion than through the long and cumbersome method of taking each claim to court. It would have been most helpful if the Department had given me and the Interior Committee the benefit of their thinking on such legislation; however, despite repeated requests for departmental reports none were ever received, nor were any comments, suggestions or criticisms registered. As a lawyer, I am sure that you know and understand, Mr. Chairman, that such legislation is not easy to draw, because, contrary to a suggestion made earlier in the hearings, Congress must stay within the confines of the Constitution with respect to the taking of private property interests, and so long as the "Bill of Rights" is a part of our Constitution, we cannot and should not act in a cavalier fashion by riding rough-shod over the property rights of individuals. We also have a duty to be fair, for so long as the final authority of the Government resides in the people, unfairness to one is unfairness to all.

With respect to the second encumbrance on the land, that is the overlaying dawsonite mining claims and sodium lease applications, the issue is presently before the Secretary. In the present posture, Congress can be of little help or no help until the Secretary has made the initial decisions which he is required to make by law. But these decisions must be made before any long-range development program can be launched.

On Tuesday, Dr. Orlo Childs, President of the Colorado School of Mines, gave what I believe to be a very clear explanation of the need for an oil shale industry. As Dr. Childs pointed out, while we now have excess producing capacity that could now off-set our imports, our demands are growing at such a rate that our domestic production will be 4.2 million barrels per day short of our requirements by 1977. Dr. Childs based this upon a conservative estimate of 2 to 3% per year increase in demand over the next decade. I believe that his estimate was on the conservative side for I would point out to the Subcommittee that our demand in 1965 was 3.59% greater than it was in 1964, and that in 1966 was registered a 4.8% increase in demand over 1965.

I have some tables on oil consumption, production, imports, reserves and drilling activity, which were furnished to me by the Office of Oil and Gas which I believe are pertinent to this matter of need, and I ask that they be included in the record. I would like to direct your attention to the table showing total U.S. consumption and the table showing proved reserves of total liquid hydrocarbons. In comparing the total demand figures with the total proved reserves, including both reserves of crude oil and natural gas liquids, a trend is apparent. Total demand in 1946 was 1,945,909,000 barrels and total reserves were 24,016,779,000 barrels; or, the total reserves were about 12⅓ times the annual demand for 1946. By 1966 total demand had increased to 4,397,469,000 barrels (about 126%) while total reserves had increased only to 39,780,254,000 barrels (about 65%); or, the total reserves were only about 9 times the annual demand. In other words, our demand rate increased 61 percent more than our reserves increased. Increases in reserves have not kept pace with increases in demand. I am not suggesting that we are out of conventional oil or that we will be in the next few years, but the trend is evident and if it should continue, and indications are that it will, we shall become a crude deficient country. As Captain Howard Moore, USN, Director of the Naval Petroleum and Oil Shale Reserves underscored in his statement before the Interior Committee on February 21 of this year: "It is obvious from the standpoint of national defense that if the Oil Shale Reserves are to make a significant contribution, there must exist at that time a viable oil shale industry."

I think this is very true, and we must consider the lead-time involved in getting the oil shale industry into the economic mainstream of the energy industry. For example, if we assume that the oil shale resource could contribute just ten percent

of our present needs, and as I pointed out earlier, these needs are increasing at a rather rapid rate, based on 1966 consumption there would have to be a production of 439,746,900 barrels of oil per year. To fill this need it would require 24 retorts and upgrading with a daily capacity of 50,000 barrels. To put it another way, if we had relied on oil shale to take care of just the increase in demand in 1966 over the demand for 1965 (approximately 203,723,000 barrels), it would have required 11 retorts with a daily capacity of 50,000 barrels.

As has been pointed out earlier in the hearings, a single plant having a 50,000 barrel per day capacity involves an investment of $100 million or more. So we are talking about some very sizeable investments, and also we are talking about some very large operating expenses.

As I said earlier, there would seem to be plenty of room for everyone sincerely interested in developing an oil shale industry both in terms of shale land and in terms of market opportunity. However, in the final analysis the need for and the emergence of an oil shale industry will be determined on a basis of economics. Oil shale will have to compete with other energy sources and fuels. If it cannot compete, other sources of energy will take over the market. This is as it should be. But it would be most unfortunate if oil shale's inability to compete was as a result of either government action or government inaction, because it would deny us the many benefits that could result from such an industry.

Mr. Chairman, I think that all of us can agree with the basic objective of encouraging competition and preventing undeserved windfalls. But I should like to point out that an exclusive government development program would very likely result in a windfall to the large users of petroleum products, assuming that the price would be less if the government produced the shale oil, and I believe that this is an assumption that is not necessarily supported by fact and experience in other fields. In effect, huge subsidies would be granted to the large users of petroleum by selling a commodity developed and produced with government capital, and sold at reduced costs, because the government would pay no state, local or federal taxes, and it would not distribute dividends to its shareholders which in turn would be taxable. Railroads, steamship lines, power generating companies, manufacturers, companies using large numbers of motor vehicles, in fact every company having large demands for petroleum or its products would be the disproportionate and primary beneficiaries of this Federal largesse. The benefits going to the average man on the street would be infinitesimal by comparison, if indeed there were any benefits at all.

In addition, a government program or a quasi-government corporation program of research and development has the same basic flaw that turning the whole program over to a single company would have, that is that only one approach would likely be followed. This is because someone has to be in charge and has to make the decision as to what approach will be pursued. I certainly would not suggest that this program be turned over to one company, and I doubt that any of the members of this Subcommittee would do so, because by doing so would be to deny the people of this country the benefits that can be derived from vigorous competition—that is the achievement of the best and most economical method of producing petroleum products. The benefits of competition come about through many different views on how to do some thing and each view being pursued vigorously by its proponent. The best one will win supremacy, but that supremacy may be only temporary because it is constantly being challenged by new developments. As the Chairman well knows, this is the genius of competition that has served us so well for such a long time.

As the Subcommittee is aware, several different approaches are presently being pursued to achieve an economical method of extracting shale oil from oil shale. Some may appear to be more promising than others. But as even a cursory examination of industrial development will disclose, a later development—perhaps occurring in an unrelated industry—may cause the discarding of a process and the resurrection of another process which had been formerly shelved.

I noted with interest the listing which you attached to your opening statement, Mr. Chairman, which indicated that of the 500 largest industrial corporations in 1965, 20 of the largest oil companies were included. With 20 oil companies in such favorable financial condition, it would appear that the prospects of competition are good. It is also interesting to note that while automobiles are probably the largest consumers of the products of the oil companies, there are only four remaining manufacturers in this country.

Competition is an essential element of our economy, and I believe that this Subcommittee has performed a useful function in publicly airing the situation with respect to the prospective oil shale industry and its competitive atmosphere. I believe that when the record is complete, it will show that competition is present in oil shale, and that the prospects are for very vigorous competition in the future, providing we act wisely in making oil shale available to an emerging industry. In this regard, the objectives set forth in the Secretary's five point proposal is a good initial step.

I thank the Chairman and the Subcommittee for this opportunity to testify and comment on the matter before it, and I am confident that the Interior Committee will find the record made here useful in its deliberations when it delves into the matter of oil shale leasing policy.

Senator ALLOTT. The reason I am approaching this, Mr. Udall, at this point, is that I think we are actually at the point here where we may lose the development of the oil shale industry.

I have before me an editorial of the Denver Post, which has long been known for its pretty liberal point of view with respect to these things, of August 31, 1967, the title of which is "Oil Shale Losing Out to Coal," and I will ask, Mr. Chairman, that this be inserted in the record.

The CHAIRMAN. Without objection, it is so ordered.

(The editorial referred to follows:)

[From the Denver Post, Aug. 31, 1967]

OIL SHALE LOSING OUT TO COAL

The cavalry charge against oil shale, led by Harvard economist John Kenneth Galbraith, appears to have hit home. The chances of developing oil shale are now poorer than they were a year ago. But what Galbraith & Co. may have done is put coal in the driver's seat.

American oil companies feel they must develop substitute fuels for Arabian oil. Shale oil looked like a good possibility until the economists began talking of protecting it from "another Teapot Dome."

We've asked on this page many times where the evidence is that the U.S. Interior Department is about to take bribes, a la Teapot Dome. The economists remain silent on this matter.

Still, they've managed by innuendo to create a shadow on oil shale; the result is that Interior Secretary Stewart Udall now appears more intent on not developing oil shale than on developing it. To some extent, we can't blame him for not wanting to stick his head in Galbraith's noose.

But what the "tunnel vision" of Galbraith and others fails to note is that there are perfectly respectable and legal methods of developing other minerals on public lands which have been in use for many years. Phosphates and other industrial minerals can be developed on a lease and royalty basis. Firms that do so make a good deal of money and nobody shouts "Teapot Dome!"

So it is only obvious that oil firms should turn to the tried and true mineral procedures for fuel and chemical resource developing. There are huge quantities of coal on public lands which have been developed under lease and royalty for many years and there is more available, particularly in the West. By a commercially-proven hydrogenation process, this coal can be turned into gasoline and diesel fuel.

And this is the direction oil firms are taking. Oil shale might have been attractive six months ago. But we're inclined to think that oilmen are human enough to want to avoid stigmatization as robber barons for doing with oil shale what they can do with coal with everybody's approval.

We're assured that closure of much of the private research effort at the Rifle oil shale experiment station is simply according to plan. Research has been completed, so people are moving out. But we suspect that if the firms really wanted oil shale development they'd be expanding, not contracting, their shale research.

Meanwhile there is a heavy play in coal leases all over the United States by oil companies. Humble Oil & Refining Co. leased 15,000 acres of coal land in Wyoming recently. One 5,000-acre block went to Humble for bonus bid of $165 per acre plus royalties of less than 25 cents per ton on production.

That is a lot different than the confiscatory royalty system advanced by Udall as a tentative approach to oil shale development. Oil shale is fantastically richer per acre than most coal seams but a firm doesn't have to submit to public abuse to make its bid.

There are more oil shale hearings scheduled in Congress in September. The Senate Interior Committee, headed by Sen. Henry M. Jackson, D-Wash., is to follow the anti-trust committee hearings held earlier by Sen. Philip Hart, D-Mich. We hope the Jackson hearings are constructive; we'd hate to see oil shale lose out to coal simply because it was a larger windmill for Professor Galbraith's lance.

Senator ALLOTT. One of the paragraphs reads as follows:

So it is only obvious that oil firms should turn to the tried and true mineral procedures for fuel and chemical resource developing. There are huge quantities of coal on public lands which have been developed under lease and royalty for many years and there is more available, particularly in the west. By a commercially-proven hydrogenation process, this coal can be turned into gasoline and diesel fuel.

In other words, without belaboring the point, I am very strongly of the opinion that we are at the point where, unless we can provide sufficient incentives to private industry, those people who would normally be interested in the development of an oil shale process will turn to coal because of blocks put in their way, and that therefore, and as a result of this, our oil shale industry may be wrapped up for years or at least until the coal hydrogenation becomes uneconomic. It might even be wrapped up forever and completely bypassed in favor of other energy sources. I am sure the Secretary does not want to see this happen any more than I do.

Mr. UDALL. Well, Senator, my best judgment—I may be wrong—but on the basis of the advice of my people, I seriously doubt at this point that the type of patent policy that we propose would be a serious impediment.

Now some of the spokesmen for some of the companies may say so because they would prefer not to have it, but I do not think it is really going to be a serious impediment. As I say, I may be wrong, and I am willing to listen to arguments on this, but I do think that the long-term national interest in a vast resource—there is no resource like the United States oil shale in the world—requires that we have the best policy.

Senator ALLOTT. Well, I should have included also in my statement about the coal the Athabascan Tar Sands. There is also an article in the Scientific American for Februray of 1966, a very comprehensive and fine article, about the development of the tar sands and oil shales, both, and I am raising this question with you now, because while I have not seen any of the statements that will be made, I would hope that these questions will be discussed by the industry when they appear. I think that is all I have at this time, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Allott.

Mr. Secretary, I want to ask you, with reference to the proposed Federal recordation bill, which I introduced, on the filing of mining claims, whether or not it might be possible, at least on an interim basis, to limit its application to the States or counties involved in oil shale development? There has been considerable opposition expressed from some of the other States, and as an interim measure, I would ask whether or not the department would be willing to go along on that approach as a compromise in order to get some early action on the proposed bill and the present problem?

Mr. UDALL. Well, Senator, this is a constructive thought. We think the law, a general law, would be very much in the public interest. You could even narrow it further to oil shale in these States. That could be done to further eliminate controversy. I would like to see it enacted and I wish we could develop a consensus on this. I think the Congressmen and Senators from the three States, if there is any one thing I would ask them to help us with, would be the recordation bill. It will help us clear the decks. You want action. This is one thing you could do. Maybe we could work out a compromise, a consensus type compromise, and get a bill quickly through that would have limited applications. I think this is a very fine thought, Senator.

The CHAIRMAN. I will ask the staff of the committee to explore this with the Secretary's staff and the appropriate departments and see if something can be worked out.

Senator Moss?

Senator Moss. Mr. Secretary, pursuing further this colloquy about the patenting rights to any system developed, suppose that there was in existence now a patent, unproved but patented, and the person then made a lease and tried it out and it worked. Would this patent then be open to the public by reason of the fact that he tried it out on Federal land?

Mr. UDALL. Well, no. In fact this may very well be the case, I do not know, with the oil shale corporation, the one group that is active in the field and have been doing field scale applications. They may have some patents. You may very well end up with several processes, as a matter of fact. This is probably the likely end result. But if someone has a patent, and they have done work on it, our patent policy does not apply that way. It is the patents that grow out of research and development activity involving a contribution of some kind by the Federal Government which our patent policy is designed to make fully available for use by the public. Thus, as to anyone who has obtained a patent unrelated to a Federal research support, we cannot reasonably ask them, as a matter of policy, to surrender existing rights they have.

Senator Moss. By a contribution of the Federal Government, I take it that you mean more of a contribution than just leasing the land to them. Does this involve some monetary advance by the Federal Government?

Mr. UDALL. No. It is our view that with a resource as valuable as this, as unique as this is, that the land itself constitutes or is equivalent to the Federal Government putting actual appropriated money into this research effort. That is our rationale, Senator. That is our rationale of the justification of the patent policy, yes.

Senator Moss. You indicate that there are about 30,000 acres that you would lease out under this research and development period, and this would be about 10 years. Is there anything magic in the 10 years? What if you got a breakthrough in the first year?

Mr. UDALL. No, the 10 years only is a limit, Senator. We want action. If it comes through in a year that is fine. The quicker the better. But we do not want to give out leases to people who do not want to move, do not want to get into an action program. So this is an action provision and not an inaction provision. If it turns out to be a year or 2 years, that is just fine and dandy with us.