technology for public use. So, in addition to a substantial commercial royalty rate, the exactment is imposed of dedication to the public of the technology which is produced. Yet, the regulation appears to provide that only those who do not have other assets or reserves, shall have opportunity to use the public domain.

In urging as we do, that these and other similar requirements render the proposed regulations unusable by industry, we do not mean in any way to suggest that the Department has intended that result. On the contrary, it is apparent that much careful and imaginative labor has gone into the preparation of this first step, with the intention that the result be a constructive program.

In arriving at these proposed regulations, the Department has unavoidably been subject to conflicting pressures from every side, beginning with the conflicting advice offered by the members of the Oil Shale Advisory Board, appointed in 1964. Much of the commentary has, of course, been constructive, but too much of it has been as irresponsible as it is vocal and inaccurate. The specter of Teapot Dome, in which Government officials were found in criminal default, has been resurrected and cited by some commentators, without regard to the whole successful history of Federal mineral leasing which has since taken place.

Without regard to any of the facts, the value of the public domain reserves has been irresponsibly exaggerated, the threat of an imaginative flood of oil disruptive of existing markets has been asserted, and deep concerns have been stated over nonexistent dangers of spoliation of a largely vacant wilderness.

In short, the situation in which the Department has nevertheless had the courage to act is one in which a vocal and ill-informed minority has created an atmosphere of exaggerated mistrust of industry, and of the Department's ability to provide for the public interest. It is perhaps surprising that in such an atmosphere the Department has been able to propose regulations as nearly viable as these.

Senator Moss (presiding). Can you summarize this a little bit more concisely for us? We are running terribly short of time.

Mr. WINSTON. Very well; I was about to close.

What we think is required from the industry, generally, from this committee and others in Congress and the administration, is firm support for the policy on which the Department has begun to act—that the national interest requires that reasonable steps now be taken to foster the orderly development of oil shale production. The facts which we have presented, and which have been urged by others, leads to that conclusion. In our view, it is the most constructive step that the committee can take.

Senator Moss. Thank you very much, Mr. Winston. Your entire statement, as Senator Allott ordered, will, of course, be in the record.

It is a very comprehensive and very thoughtful document, for which we thank you. It does make our record very meaningful. We appreciate all of the fine work that has gone into it. We have much work yet to do in the oil shale industry. I am in full concurrence with your urging that we move ahead and get meaningful production going as soon as we can in this field. I thank you.

I believe that Senator Allott and Senator Hansen have some comments or questions.

Senator Allott.

Senator ALLOTT. In view of the time, Mr. Chairman, I would just like to pin down only one point. It is the view of TOSCO, as I listened to your statement, that you do not feel that you can safely proceed in this whole area of production without knowing the ground rules for production leases, and you have emphasized to some extent the matter of escalating royalties, and the question of granting leases upon the basis of need, rather than need for production. I think that this is a very vital point, because it really lies, as I see it, at the basis to the general objection to the proposed regulations. Am I summarizing your situation fairly accurately?

Mr. WINSTON. Yes, Senator. We have no doubt that the absence of such ground rules is restraining development.

Senator ALLOTT. Thank you. I would like to discuss this in greater detail, if time made it possible.

Thank you.

Senator Moss. Senator Hansen.

Senator HANSEN. Just one question that I would like to ask you, sir. Here on page 12 of your testimony, you state, "The product stream must be treated for recovery of valuable byproducts; and the crude oil, which contains significant amounts of nitrogen and sulfur," et cetera.

Somehow I got the impression in listening to previous testimony that oil from shale would be low in sulfur content. Is that correct?

Mr. WINSTON. I will try to be very brief. There is a substantial amount of sulfur in the raw material, say about one-half of 1 percent in the first produced raw oil. That is not a lot of sulfur against other sulfur crudes found elsewhere in the world, but definitely it is there.

Nitrogen removal is automatically required at the same time you are working on the sulfur. At least one party has pointed out that hydrogen-treated oil would be sulfur free.

Senator HANSEN. That is approximately what I had in mind. Thank you.

Senator Moss. Thank you, Mr. Winston. We appreciate this very much, and your full statement will be included.

Mr. WINSTON. Thank you.

STATEMENT OF MORTON M. WINSTON, EXECUTIVE VICE PRESIDENT, THE OIL SHALE CORP.

Some Aspects of Public Domain Oil Shale Policy

Mr. Chairman and Members of the Committee, I am Morton M. Winston. I am an Executive Vice President of The Oil Shale Corporation, known as "TOSCO," which is a company holding substantial oil shale reserves in Western Colorado and Utah, and which is in the final stages of a ten-year development program to initiate commercial shale oil production in the United States.

On behalf of my company, I would like to thank the Chairman and Staff for inviting us to be here today to express our views on various questions affecting use of the public domain oil shale reserves in the developing domestic oil shale industry. We understand that though the Committee's interest is a continuing one, the specific occasion for these hearings was Secretary of the Interior Udall's promulgation, on May 10, 1967, of Proposed Regulations (under the Mineral Leasing Act) covering a limited program of leasing a small portion of the public domain reserves for production research and development.

Without doubt, any leasing policy adopted by the Department of the Interior must affect the development of the oil shale industry, since the Department is the custodian of the approximately 84% of the reserves which are in the public domain. To a lesser extent, but nevertheless significantly, policies of other De-

partments of the government will also affect oil shale industry development, and I will mention one of them specifically in the course of these remarks.

Before turning to a discussion of the merits of the questions of leasing policy which are raised by the matters which have been excluded from, and those which have been included in, the Proposed Regulations, I would like to review with you briefly some of the facts concerning the oil shale industry, its reserves and technology, which we think are relevant to the formulation of the policy. Let me apologize in advance for repeating much that is very likely already obvious to you.

THE NEED FOR SHALE OIL

The first and most evident fact is that there is not today shale oil production in the United States on a commercial scale. This fact leads inevitably to the consideration of the additional facts which can provide an answer to the question whether there ought to be such commercial production. Any formulation of Federal leasing policy concerning the public domain reserves must take into account the answer to that question.

We think that domestic shale oil production is not only desirable but necessary; and in the light of the status of domestic petroleum supplies it has been too long delayed. This was the view of my company in 1957, when it commenced pilot plant operations. The evidence of a deterioration of the domestic crude oil supply position which has accumulated since that time is extensive.

Out of the maze of petroleum statistics, we have set out some of the evidence in Appendixes A and B, which are attached to this Statement. In general, our source has been the American Petroleum Institute-American Gas Association annual survey, and the Bureau of Mines reports.

The relevant facts are these: Demand for liquid petroleum, which in 1966 reached just over twelve million barrels per day, has been steadily increasing at an average of more than 3.5% per year for the past twelve years, and shows no sign of tapering off. (Appendix A—Table 1) However, drilling costs per foot have been steadily rising, the depth of wells has been steadily increasing, and in 1966 the amount of exploratory drilling hit its lowest point since World War II. (Appendix B—Tables 1–3)

As a result of increasing demand and decreasing finding rate, net additions to proved liquid petroleum reserves had practically ceased to exist by 1957, and no significant net addition has occurred since 1959. In the ten years from 1956 through 1966, four years saw declines in net reserves, one saw no increase, and only one, 1959, saw an increase of more than 3%. (Appendix A—Tables 2–3)

When these patterns are projected forward to 1980, the prognosis for domestic petroleum supplies is poor. Liquids demand will have by then reached at least seventeen million daily barrels, or about six billion barrels annually. Even if proved liquid reserves could be maintained in the face of increasing demand by a steadily *increased* finding rate, the present 39.7 billion barrels of total proved liquid petroleum reserves would in 1980 represent under seven years supply.

But, there is no indication that such a steady increase in finding rate is likely to occur; instead, the opposite seems probable. The amount of oil which would have to be added in order to maintain proved crude oil reserves at their present levels through 1980 is approximately equal to the entire amount of crude oil (80 billion barrels) which has been produced to date in the entire history of the United States domestic petroleum industry. Such a goal is more than merely ambitious.

In summary, it is apparent that if we rely, as we now do, upon conventional domestic sources to satisfy about 80% of our liquid petroleum demand through 1980, we will, by that time, be plainly deficient in liquid petroleum by any standard we have until now used to test petroleum supplies. (Appendix A—Table 4)

This is not our conclusion alone. The same conclusion has been voiced in recent months, not without alarm, and with surprising unanimity, by many distinguished Government and industry figures.

Apart from turning to oil shale, and other unconventional sources, there are three obvious means of reducing the rate at which our liquid petroleum sources are waning.

The most obvious is an increase in economic incentives to exploration. However, putting aside the substantial questions of policy affecting increased economic incentives from the public sector, there is, as I have said, little indication that even substantially increased exploration investment could really meet the needs of steadily increasing demand. A second obvious method of improving the projections is to divert demand from petroleum to other elements of the energy

mix, such as atomic energy and the projected automotive fuel cell. However, it is difficult to foresee how such diversions could take place soon enough to affect materially the seventeen million daily barrels of demand in 1980 or how they would be likely to reduce that demand thereafter. Finally, there is always the alternative of conservation of domestic reserves by attempts to rely increasingly on foreign sources of supply. Yet, the uncertainties of economic cost and even of availability which are unavoidably entailed in reliance upon non-domestic sources have recently been emphasized by the sad events in the Middle East. We are not today, and are not likely to become again, truly petroleum independent. For reasons of supply as well as of trade and other external policies, nondomestic production will continue to play a role in satisfying domestic demand. But, deliberate increases in such reliance must take into account the resulting unavoidable insecurity.

It was recently suggested that it is "possible that there will never be a need" for shale oil. Anything, of course, may be possible. But, it is difficult to believe that the petroleum policy of the United States will be planned on the basis of what is *possible* rather than what all of our germane experience shows to be *probable*.

The experience of recent years does not indicate that we will fail as a nation to meet our domestic petroleum needs. It indicates, instead, that our inventiveness and capital must, as they have often in the past in the cases of other needs, be devoted to rendering the unconventional useful.

MAXIMUM DAILY SHALE OIL PRODUCTION

However, it would be wrong to suggest that the oil that can and will be produced from the oil shale deposits of Western Colorado, Utah and Wyoming is likely to supply the whole answer to domestic needs. I would like to examine with you briefly what the contribution of shale oil to domestic production seems to us likely to be.

It has often been remarked that the tri-State oil shale deposits contain in the neighborhood of two trillion barrels of oil. While the statement is probably correct, it is, for planning purposes, unhappily irrelevant. The reserves of principal economic interest today lie mainly in Western Colorado. The Oil Shale Corporation has estimated that there are approximately four hundred and eighty billion barrels of oil in place of economically attractive grade in the Colorado reserves. However, even that number can be misleading if it is carelessly extrapolated into probable rates of production. Much of the oil in high grade ore is found as much as two thousand feet below the surface and in horizons in some areas of the Basin as thick as fourteen hundred feet. Such a distribution of reserves combined with the resulting limitations of access and the severe limitations of terrain make it most unlikely, in our view, that the Colorado reserves will yield at any time a daily production of more than 2.5 million barrels.

Nor is that production likely to arise swiftly. If the first 50,000 daily barrels of shale oil production comes onstream in 1970, and 100,000 daily barrels is added every year thereafter through 1980, shale oil will, in 1980, be supplying less than 6% of the conservatively estimated seventeen million daily barrels of 1980 demand, and only about 20% of the *increase* in demand which is expected to occur between now and 1980. Moreover as to the rate of build-up of production, it should be recognized that with present technology the development of one million daily barrels of production from high quality reserves requires an investment of approximately $2 billion in production facilities alone, exclusive of pre-refining treatment of the oil.

These facts, we think, make it plain that two comments often voiced in recent months are without any substantial foundation. I refer to the expressions of concern that shale oil will inundate markets; and to the more sweeping suggestion that the value of the reserves could retire the national debt, and pay a substantial cash bonus to all of us who are citizens and would be delighted to receive it. Shale oil, even if production is rapidly developed, will supply at most a portion of the incremental future demand; and at any conceivable royalty rate for the reserves and any conceivable evaluation of the final crude oil product, the revenues from the full 2.5 million daily barrels of production would not suffice to pay even the interest on the national debt.

We began with the question whether the commencement of shale oil production is desirable. The answer is yes. Shale oil is needed and will be useful and significant supplement to waning domestic supplies. But, it is also apparent that from

the standpoint of energy planing, shale oil is not the entire answer to the preservation of our petroleum independence. Instead, every source of liquid petroleum will be heavily taxed to meet our domestic needs.

STATUS OF THE OIL SHALE INDUSTRY

So much, then, for the need for new domestic liquid petroleum supplies and the related need for shale oil. In the light of those needs it is timely to examine the facts as we understand them concerning the present status of the development of the shale oil industry.

Those facts divide into two categories: The status of technology and the status of reserves.

Status—Technology

The technology needed for commercial shale oil production is not merely the retorting technology required to heat the oil shale so as to produce condensible and non-condensible vapors yielding liquid and gaseous petroleum. Before the material can be retorted, it must first be obtained by a mining operation on an unprecedently large scale. When the material is obtained, it must be crushed to appropriate size. Having been crushed, it is retorted and the valuable products of retorting are collected but the remaining material, as much as ninety weight per cent of the original feed, must then be disposed of consistently with contemporary high standards of the purity of air and streams. The product stream must be treated for recovery of valuable by-products; and the crude oil, which contains significant amounts of nitrogen and sulphur, must be further treated with established techniques, either by the producer or a refiner, to render it suitable for conventional catalytic refining processes.

Mining, retorting, recovery, waste disposal and pre-refining treatment are the component operations and costs of shale oil production.

In 1964, The Oil Shale Corporation joined together with an experienced mining company and an experienced oil company to establish definitively the operability and economics of a TOSCO-developed system for shale oil production. The results of that work are now substantially all in hand. The feasibility and costs of mining the material have been established to a high level of certainty, and well within original projections, notwithstanding adjustments in the national economy in the intervening years. A development mine has been and is being operated, and more than 500,000 tons have been mined to date.

In June, 1965, the three companies completed construction of a semi-works retorting facility designed to operate at 1,000 tons per day of rock throughput. The plant represented a design scale-up from pilot plant operations carried out by TOSCO from 1957 onward at twenty-four tons per day. The semi-works retorting operation, originally scheduled for completion early in 1966, encountered difficulties associated both with the problems of joint management and of the initial operability of the facility. As a result, in September, 1966, TOSCO assumed sole operating responsibility for the plant. Since that time, albeit well over a year behind schedule, the objectives of the retorting and shale disposal operations have been met. The process, called the TOSCO II SYSTEM, operates continuously at yields of above 105 volume per cent of the so-called modified Fischer assay, and continuing operations indicate further improvements. The oil is produced substantially free of solid sediments and well within original specifications. The plant is mechanically reliable and simple to operate. Spent shale disposal operations have been achieved consistently with high standards of air and stream pollution control and the preservation of wilderness and wild life. The current operating program, which is devoted to further process optimization, is nearing completion.

Based upon these operations, and utilizing only equipment of a type proved in these semi-works scale operations, TOSCO in the fall of 1966 commissioned a distinguished and experienced contracting company to design the commercial plant, including final plans and specifications for its construction. The contractor's resulting "definitive estimate" is now complete. The plant will process 66,000 tons per day of rock throughput The cost of the plant, including all expenses associated with achieving full operation, is under $130 Million, including hydrotreating and by-product recovery facilities. Without hydrotreating and related facilities, the same plant, to produce raw shale oil suitable for pipelining, will cost under $100 Million.

These costs are slightly above those originally projected, principally on account of increases in equipment and related costs since 1964. However, the increases are offset by increased capacity over that originally estimated, as well as by substantially increased product and by-product recoveries and values. In short, the criteria established for the project in 1963 have now been met.

TOSCO's program calls for the first 58,000 daily barrels of production to be onstream in 1970, and we believe that this objective is reasonable and attainable.

The funds already expanded by TOSCO and its associates in furtherance of this commercial production venture are some indication of its magnitude. TOSCO has itself expended more than $21.5 Million. In addition, approximately $26 Million has been spent by its associates. Of the total approximately $47.5 Million, approximately $23.5 Million has been devoted to acquisition of reserves, principally to those susceptible of immediate commercial development and capable of producing more than 200,000 daily barrels for over twenty-five years. The remaining funds have been expended to carry the technology to its present state of readiness.

The mining, retorting and related technologies which have thus been proved and will be commercially applied are, by agreement, under the sole control of TOSCO as exclusive licensor. As licensor, TOSCO has embarked upon a free and open licensing policy under which it will make all or any part of the technology available to bona fide licensees under terms reasonable and customary in the trade. Such a free and open licensing policy is consistent with the widespread practice of the petroleum industry, a practice which experience has shown stimulates competition, production and revenues.

Nor is TOSCO alone in the field of technology. The Committee has had the benefit today of the views of the Union Oil Company of California and is surely aware of Union's sizeable contributions. In addition, there is the work, Bureau of Mines through its various research facilities, and, more recently, of the group of companies associated together under the management of Mobil Oil Company at the former Bureau of Mines facility at Anvil Points in Rifle, Colorado. Some, and perhaps all, of these efforts in above-ground processing technology will undoubtedly prove not only successful but sufficiently attractive to permit industrial application.

The development of technology for processing the material "in place" today, as I have mentioned, has become unclear because of reports of the presence of other minerals as well as because of formidable technical problems. However, as a nation, we have learned to expect that we will develop technology to meet our needs. Suitable methods for in situ processing in at least some of the deposits will likely ultimately be developed.

Status—Reserves

Because of their high quality, the most prominently discussed of the oil shale reserves are those found in Western Colorado. By high quality we mean reserves averaging, in a continuous horizon of at least 100 feet, 25 gallons or more per ton by the modified Fischer assay technique. I would like to concentrate my brief remarks on three aspects of these reserves: (1) their physical distribution in the deposit; (2) the question of ownership; and (3) the relationship between physical distribution of the reserves and the application of existing or future technology.

For purposes of illustration only, it can be said that the Colorado deposit, reportedly the result of deposition in an inland sea, is shaped like a man's inverted hat filled to the brim with oil bearing marlstone. In the brim of the hat, which is the rim of the deposit, the horizon of high quality reserves is relatively thin, and is ovelain by a few hundred feet of additional material. But, as one proceeds across the brim of the hat towards its center, the high quality horizon thickens and deepens until near the center, as much as 1400 continuous feet of high quality material has been reported reaching to depths as far as 2200 feet below the irregular surface. By far the overwhelming percentage of the oil found in ore of high quality is found, therefore, towards the center of the hat and not at the brim. (Appendix C).

In general, private ownership of the reserves exists around the rim of the deposit, which was the area in which the oil bearing marlstone of high quality was most readily accessible to the locators who, before the advent of the Mineral Leasing Act in 1920, created under the Mining Laws private rights in the public domain. In general, the deep and far more extensive center of the basin remained in the public domain, with the important exception of homestead rights

acquired under the Homestead Acts prior to the introduction of exceptions for minerals. These fee ranch properties lie principally in the creek beds which form the drainage pattern of the center of the basin. Such privately owned properties, which generally follow the irregularly long, narrow pattern of the creeks, create capricious and irregular divisions of the surrounding public domain. It is evident that the orderly utilization of the public domain demands that they be consolidated.

TOSCO estimates that approximately 65% of the acreage containing approximately 84% of the oil in place is in the public domain and the Naval reserve properties. Approximately 22% of the acreage, containing only approximately 11% of the oil, is incontestably privately owned. The remaining 13% of the acreage, containing about 5% of the oil, is affected by disputes between private claimants and the Department of the Interior concerning oil shale mining claims. (Additional portions of the public domain may now be affected by various mining claims covering other minerals.)

Expressed in terms of estimates of barrels in place, the total of high quality reserves in Colorado is estimated by TOSCO to be approximately 481 billion barrels, of which 406 billion is in the public domain and Naval reserve, 51.5 billion is privately owned, and 23.5 billion is contested.

The reserves at the rim of the basin are generally well adapted to mining operations followed by above-ground retorting, but are unsuited to processing "in place" for a variety of reasons, chief among which are the relatively narrow horizon of high quality material and the absence of sufficient cap rock to contain processing operations.

By contrast, the reserves towards the center of the basin being both deeper and thicker may, if a suitable technique is evolved, be susceptible of retorting in place. Whether they ultimately are or not, it is apparent that they are technologically susceptible of mining and above-ground retorting operations. The cost of such retorting operations has been established. Preliminary study by TOSCO of the economics of suitable mining and disposal in the terrain in the center of the basin has produced encouraging results.

In short, although in situ techniques may ultimately prove useful in the center portion of the basin, they are not likely to be applicable to the rim; while above-ground mining and retorting operations appear to be universally applicable, subject only to detailed analysis of the costs of particular locations. If the reports of other minerals particularly of sodium and aluminum compounds extensive in amount and requiring treatment at the surface of the ground are borne out, mining and above-ground retorting at such locations seems the only course.

FEDERAL LEASING POLICY—THE PROPOSED REGULATIONS

Against the background of this brief statement of some of the revelant facts, it is appropriate to turn to the questions of policy, first to those raised by the proposed Leasing Regulations. In response to the Department's invitation to interested parties to submit comments on the Proposed Regulations, we have submitted to the Department our comments in some detail. For the Committee's convenience and possible interest, we are attaching to these remarks and submit for the record a copy of our Comments.

I would like to devote the time available today to consideration not of details but of some of the broader questions of policy which we feel arise out of the program embodied in the Proposed Regulations.

I shall discuss two matters. The first concerns the need, which we think is amply established by the facts, for the prompt commencement of an additional program of leasing for commercial production. Such a program is not embodied in the Proposed Regulations. The second concerns the research and development leasing which is embodied in the Proposed Regulations. Despite the large efforts and constructive intentions of the Department, the program in our view fails to meet its stated objective of stimulating production research and industrial development.

Leasing for Commercial Production

The Proposed Regulations embody the view, which we share, that it is appropriate to encourage future production research and development by making available public domain reserves for research, and, thereafter, for production. We are unable to reconcile that view, however, with the absence of provision for produc-

tion leases which would permit the application of existing technology, developed by industry without Government participation or incentive. If new techniques should be commercially applied if and when they are successfully developed on public domain reserves, why should the successful fruits of extensive past labors be ignored or discriminated against?

The question is not merely whether those of us who have successfully developed technology should be offered the same opportunity of utilization of public reserves as those who now undertake research, although that is to us an important matter. The broader concern is that the modest increases in domestic supplies which shale oil can provide are necessary, and the public domain reserves should be available to those who are actually prepared to go forward to production with existing technology in order to meet that need.

There are, to be sure, problems of mechanics; but, with due regard to the opposing views of some distinguished commentators outside the industry, it should be stated clearly that there are no mechanical problems which will not yield to past leasing practice and ingenuity A combination of modest fixed royalty rates and competitive bidding can assure fair recognition of the value of the public ownership of reserves. Production requirements, or rentals which escalate sharply with time, can assure that no lessee can acquire a leasehold except for purposes of production.

The Legislature of Colorado has recently enacted broad new pollution regulations. Quite apart from constructive contributions by the Department, it may be anticipated that those regulations will be enforced and refined to meet Colorado's needs in regulating the developing industry. Moreover, negotiations or discussions between the Department and industry, in light of existing technology, would provide substantial guidelines for requirements designed to serve any additional Federal interests in conservation and pollution control

These and other mechanical questions can be fairly and effectively resolved if once the decision is made that we think the facts call for, namely, that a program for commercial production oil shale leases is now timely.

The Proposed Research Leasing Regulations

The stated objective of the Proposed Regulations is to encourage production research and development. In proposing the Regulations, the Department has taken the first constructive step in this field in the thirty-seven years which have elapsed since the oil shale lands were withdrawn by President Hoover's Executive Order. For having taken this first step, the Department and the Secretary deserve the approval and support of all who, like this Committee, have an interest in planning and providing for the nation's petroleum needs.

Neverthless, we believe that the Proposed Regulations do not, in fact, meet their stated objective and will not encourage utilization of the public domain reserves. There are many reasons why that conclusion must be reached and we have stated them in detail in our attached Comments. Among the most important are: the indefiniteness of the assurance offered to a research lessee that if it is prepared for production, it will, in fact, receive a commercial production lease; the indefiniteness of the extent of the commercial leasehold, if it is actually granted; the inappropirately high fixed and escalating royalty rates, which are reported to have been designed to be equivalent to rates applicable to established conventional production; and the extraordinary requirement of surrender without compensation of the fruits of all new research, as well as surrender of control over technology previously developed by the lessee.

In urging, as we do, that these and other similar requirements render the Proposed Regulations unusable by industry, we do not mean in any way to suggest that the Department has intended that result. On the contrary, it is apparent that much careful and imaginative labor has gone into the preparation of this first step, with the intention that the result be a constructive program.

In arriving at these Proposed Regulations, the Department has unavoidably been subject to conflicting pressures from every side, beginning with the conflicting advice offered by the members of the Oil Shale Advisory Board, appointed in 1964. Much of the commentary has of course been constructive. But too much of it has been as irresponsible as it is vocal and inaccurate. The specter of Teapot Dome, in which government officials were found in criminal default, has been resurrected and cited by some commentators, without regard to the whole successful history of Federal mineral leasing which has since taken place. Without regard to any of the facts, the value of the public domain reserves has

been irresponsibly exaggerated, the threat of an imagined flood of oil disruptive of existing markets has been asserted, and deep concerns have been stated over non-existent dangers of spoilation of a largely vacant wilderness.

In short, the situation in which the Department has nevertheless had the courage to act is one in which a vocal and ill-informed minority has created an atmosphere of exaggerated mistrust of industry, and of the Department's ability to provide for the public interest. It is perhaps surprising that in such an atmosphere the Department has been able to propose Regulations as nearly viable as these.

In our detailed comments to the Department, we have stated our views of the incentives which are necessary to make the proposed program effective, as well as of certain amendments of language or structure which may make the Final Regulations legally and administratively more effective. But, these are not, we think, matters on which the Department is really in need of guidance or support.

What we think is required from the industry generally, from this Committee and others in the Congress and the administaration, is firm support for the policy on which the Department has begun to act—that the national interest requires that reasonable steps now be taken to foster the orderly development of oil shale production. The fact that our domestic liquid suplies are waning because demand is increasing and additions to reserves are not keeping pace; the fact that any substantially increased reliance, above the present approximately twenty per cent of demand, on foreign sources of supply entails severe risks of rising costs and unreliability of supply; and the fact that even without such risks, the long term impact of increasing petroleum imports on our balance of trade and balance of payments will be increasingly severe—all these facts dictate the need for prompt development of oil sale and other novel sources of liquid petroleum supplies.

In the light of such a policy, the alleged risks of commercial production leasing and research leasing will be seen in perspective, and the need for reasonable incentives adequately defined will be readily apparent. No one formula for research incentives or for commercial leasing is indispensible. We have made some suggestions, and others will doubtless make different and equally workable ones. But no suggestion is likely to become effective in the absence of a realization by all who are responsible for policy that the basic decision of policy upon which the Department has begun to act is a vital part of national petroleum planning.

We trust that out of this Committee's consideration will come appropriate support for this fundamental policy decision.

THE PROPOSED BLOCKING UP REGULATIONS

All that we have said today and in our Comments to the Department about the facts underlying the need for shale oil production, causes us to applaud the further step which the Department has taken in promulgating Proposed Regulations for exchanges of public and private oil shale lands. The objective of the Regulations is to rid the public domain of interfering private holdings, which are generally not situated so as to be viable for development, and to consolidate the private holdings in a manner which will enable them to be utilized.

The basic principles for such exchanges, and the power to carry them out, are well established in the Department's long experience under the Taylor Grazing Act. We trust that the program will go forward under the criteria established in the Proposed Regulations without delay.

OTHER QUESTIONS OF FEDERAL POLICY

It is evident that there are areas of Government policy not encompassed in the Proposed Regulations which will affect the rate of growth of the oil shale industry. I would like to mention to you two of the most important of those areas in closing.

Important Quota—Qualification of Shale Crude

The first concerns the relationship between the import quota system and shale crude oil. Under the present Regulations of the Oil Import Administration, it is not clear that domestic sale crude oil qualifies as a refinery input for purposes of the allocation of the import quotas to domestic refiners. If it were not to qualify, domestic shale crude oil would suffer an economic penalty. It is reasonably clear,

for the reasons set out briefly in Appendix "E", that the present language of the Regulations is an inadvertence and that a penalty for shale oil is not intended. However, the Oil Import Administration is a part of the Department of the Interior, and there appears to be no reason why, as a part of its policy, the Department should not promptly remove the cloud of nuclear regulatory language. It is relevant for TOSCO to add that in all of its economics on commercial production, it has been forced by prudence to assume against itself the resolution of this unnecessary question, and shale oil production planning has therefore been needlessly impaired.

Depletion Deduction

No discussion of this new petroleum source would be complete without at least a mention of the discriminatory treatment which shale crude oil produced by above-ground retorting is presently subject to for purposes of the depletion deduction under Federal income tax laws. The problem is stated separately, for your convenience, in Appendix "D". It can be summarized briefly as follows.

Today it is the stated position of the Internal Revenue Service that the Internal Revenue Code confines the depletion rate applicable to shale oil to 15%; and, perhaps more important, that it confines the application of the rate to the value of mined and crushed shale rock rather than to the value of the first oil produced at the retort. The costs of mining and crushing are approximately one-half the cost of production of the first oil product. Under the law then, the value of the mined and crushed rock would be approximately one-half the value of the oil. The result is anomalous. The significant value of oil shale lies in its contained kerogen which is extracted as petroleum. No practical way is known today to extract the kerogen other than retorting to produce petroleum. The anomaly is heightened when the depletion treatment of oil shale as a petroleum source is compared to the treatment of conventional petroleum; and it is still worse when shale oil that is mined and retorted is compared to shale oil produced by in situ retorting techniques. In the case of in situ, the principal product is the petroleum recovered at the surface of the ground so that value of the petroleum would have to be the point of application of the depletion rate.

We are not here concerned with the divisive question whether percentage depletion in mineral production is or is not a desirable policy. What we are concerned with is that this material must compete as petroleum in the marketplace. If we are to have a depletion policy, it must surely not discriminate among competing products. Precisely that point was made in the deliberations of the Senate on the Gore Amendment which became Section 613(c) of the Internal Revenue Code in 1960, and which governs this question.

It is worth noting that the imposition of such an economic penalty on shale oil producers will ultimately affect the small producer more severly than the large, which is merely an illustration of the fact that this question is one of competitive inequity and not one of fundamental depletion policy.

APPENDIX A

TABLE 1.—*U.S. petroleum demand,[1] 1954–66*

[Thousands of barrels per day]

Year:	
1954	7,760
1955	8,460
1956	8,779
1957	8,818
1958	9,083
1959	9,451
1960	9,661
1961	9,806
1962	10,234
1963	10,551
1964	10,816
1965	11,304
1966	[2] 12,080

[1] Demand is satisfied by domestic crude oil production, natural gas liquids production, and net imports of crude oil and refined products.
[2] Preliminary.

Source: U.S. Bureau of Mines.

TABLE 2.—*Proved crude oil reserves and net additions—1936–66*

Year	Billions of barrels	Net additions over previous year		Net reserve increase over 1936 (percent)
		Billions of barrels	Percent	
1936	13.1			
1937	15.5	2.44	18.6	18.6
1938	17.3	1.84	11.9	32.0
1939	18.5	1.13	6.5	41.2
1940	19.0	.54	2.9	45.0
1941	19.6	.56	2.9	49.5
1942	20.1	.49	2.5	53.4
1943	20.1	−.02		53.4
1944	20.5	.39	1.9	56.4
1945	20.8	.37	1.8	58.7
1946 [1]	20.9	.93	4.5	59.5
1947	21.5	.61	2.9	64.0
1948	23.3	1.79	8.3	77.8
1949	24.6	1.37	5.9	87.7
1950	25.2	.62	2.5	92.3
1951	27.5	2.20	8.7	109.8
1952	28.0	.49	1.8	113.6
1953	28.9	.98	3.5	120.5
1954	29.6	.62	2.1	125.8
1955	30.0	.45	1.5	128.9
1956	30.4	.42	1.4	132.0
1957	30.3	−.13	−.4	131.0
1958	30.5	.24	.8	132.7
1959	31.7	1.18	3.9	141.9
1960	31.6	−.11	−.4	141.1
1961	31.8	.15	.5	142.6
1962	31.4	−.37	−1.2	139.6
1963	31.0	−.42	−1.3	136.5
1964	31.0	.02		136.5
1965	31.4	.36	1.2	139.7
1966	31.5	.10	.3	140.5

[1] Prior to 1946 reported figures contain some natural gas liquids.

Source: API–AGA Annual Survey.

TABLE 3.—*U.S. crude oil production rate, 1954–66*

[Thousands of barrels per day]

Year:	
1954	6,342
1955	6,807
1956	7,151
1957	7,170
1958	6,710
1959	7,054
1960	7,035
1961	7,183
1962	7,332
1963	7,542
1964	7,614
1965	7,804
1966	[1] 8,334

[1] Preliminary.

Source: U.S. Bureau of Mines.

TABLE 4.—*Net imports of crude oil and refined products as percent of total annual domestic demand*

	Total domestic demand (millions)	Net imports of crude and required products (millions)	Net imports percent of total domestic demand
1958	3,315	520	15.7
1959	3,450	572	16.6
1960	3,536	591	16.7
1961	3,579	637	17.8
1962	3,736	700	18.7
1963	3,851	699	18.2
1964	3,958	753	19.0
1965	4,125	832	20.2
1966—Preliminary	4,409	867	19.7

Source: American Petroleum Institute as compiled by the U.S. Bureau of Mines.

APPENDIX B

U.S. PETROLEUM DRILLING ACTIVITY AND COSTS—SUMMARY

The number of wells drilled increased from 49,279 in 1953 to 58,160 in 1956, the peak drilling year. After 1956, drilling activity has steadily fallen off to a total of 43,653 wells in 1963, and to 36,628 in 1966, the lowest point since World War II. The depth of drilling has steadily increased. (See Table 2.)

In spite of this increase in drilling during the 1953–56 period, only 1.5 billion net barrels were added to the 1956 reserves over 1953, and only 1.1 billion barrels have been added from 1956 to the present. (See Appendix A—Table 2.)

The net result is that the oil industry has been drilling deeper at a higher cost per well and has barely been able to keep ahead of production demands.

During the same time, the average cost of drilling a well has increased. (See Table 1.) Most of this increase in well cost is due to the yearly increase in the average depth of a well. As is well known in the oil industry, the drilling cost of a well per foot drilled increases with the depth of drilling. For example, as illustrated in Table 3, in 1963 the cost of an incremental foot of well at the 2,500 foot level was $10.69 per foot vs. $74.78 per foot at the 12,500 foot level.

TABLE 1.—*Yearly average cost per well and average cost per foot* [1]

	Productive wells		Dry wells		Total wells	
	Average cost	Average cost per foot	Average cost	Average cost per foot	Average cost	Average cost per foot
1955	(2)	$12.94	(2)	$9.21	(2)	(2)
1956	(2)	13.64	(2)	10.26	(2)	(2)
1959	$60,000	14.70	$43,000	10.13	$53,500	$12.90
1960	62,200	14.60	44,000	10.56	54,900	13.01
1961	60,400	14.33	45,200	10.56	54,500	12.85
1962	63,400	14.66	50,800	11.20	58,600	13.31

[1] Source: Compiled by American Petroleum Institute, Independent Petroleum Association of America, and the Mid-Continent Oil & Gas Association.
[2] Not reported.

TABLE 2.—*Yearly number and average depth of U.S. wells drilled*

Year	Total U.S. wells drilled [1]	Average depth (feet)	Year	Total U.S. wells drilled [1]	Average depth (feet)
1953	49,279	4,035	1960	46,751	4,079
1954	53,930	4,061	1961	46,962	4,091
1955	56,682	3,992	1962	46,179	4,300
1956	58,160	4,022	1963	43,653	4,223
1957	53,838	4,122	1964	45,236	4,198
1958	49,111	4,019	1965	41,432	4,380
1959	51,764	4,092	1966	36,628	4,351

[1] Includes crude oil, gas, dry, condensate, and service wells.

Source: Oil and Gas Journal, Annual January Survey.

TABLE 3.—*Effect of depth on drilling costs (cost per foot of productive wells, 1963)* [1]

Depth (ft.):	Incremental cost (per foot)
0 to 1,250	$9.33
1,251 to 2,500	10.69
2,501 to 3,750	13.28
3,751 to 5,000	14.59
5,001 to 7,500	22.22
7,501 to 10,000	41.04
10,001 to 12,500	74.78
12,501 to 15,000	103.60
Over 15,000	

[1] Compiled by American Petroleum Institute, Independent Petroleum Association of America, and the Mid-Continent Oil & Gas Association.

APPENDIX C

Status of Colorado oil shale lands of varying thickness

Average thickness of 25 gal.-tons of shale (feet) [1]	Acres (thousands)			Percent of land of average thickness		
	U.S. Government [2]	Patented claims	Unpatented oil shale claims	U.S. Government [3]	Patented claims	Unpatented oil shale claims
1,900	4.3	0.2	0	95.1	4.9	0
1,700	26.7	2.6	0	91.0	9.0	0
1,250	68.7	4.3	0	94.7	5.3	0
625	99.1	7.1	1.7	91.8	6.6	1.6
200 [3]	52.4	11.7	39.6	50.5	11.3	38.2
175 [4]	54.5	5.4	3.1	86.6	8.5	4.9
125 [5]	42.3	85.9	28.2	27.1	54.9	18.0
Total	348.0	117.2	72.6			

[1] From fig. 5, Bulletin 611, Bureau of Mines, 100-ft. thickness and greater.
[2] Includes naval reserve lands of 21,000 acres.
[3] Area between 150- and 250-ft. thickness isopachs south of T. 2 S.
[4] Area between 100- and 250-ft. thickness isopachs north of T. 2 S.
[5] Area between 100- and 150-ft. thickness isopachs south of T. 2 S.

APPENDIX D

DEPLETION ALLOWANCE FOR OIL SHALE

I. The Question

Under the existing federal income tax laws, the extractive mineral industries are permitted, in determining their federal income taxes, to deduct from gross income an amount which is designed to compensate them for the depletion of the mineral reserve. This deduction, familiarly known as the depletion allowance, is calculated by (1) applying a percentage which is provided for in the Internal Revenue Code to (2) the sales price of the mineral product. To illustrate with perhaps the most familiar example: In the case of crude petroleum recovered from underground reservoirs by means of wells, the depletion percentage is 27.5%, and the amount to which the percentage is applied is the sales price of the crude oil at the well-head. The Internal Revenue Service has ruled on both aspects of the depletion allowance computation for the oil shale industry (in other words, on both the percentage rate and the depletion base figure).

The ruling that the percentage rates is 15%.—In a published ruling in 1957 (Rev. Rul. 57–529), the Internal Revenue Service took the position that oil shale was in the category, "all other minerals," contained in Section 613(b)(6) of the Code, and that consequently the applicabe percentage depletion rate was 15%. In other words, the Service ruled that the oil shale industry was not to be entitled to the 27.5% rate allowed to the rest of the petroleum industry.

The ruling that the depletion base figure does not include the retorting process.—In 1961, the Internal Revenue Service took the position, in an unpublished ruling, that the retorting of oil shale was not a "treament process considered as mining." Under this ruling, the costs attributable to the retorting necessary to produce crude oil would be excluded from the depletion base, and the oil shale industry would be forced to compute depletion on the value or market price of the crushed oil shale rock rather than of the crude oil product. Since there is no market for mined, crushed oil shale rock, the unpublished ruling obviously contemplates that a theoretical sales price or value should be assigned to the mined and crushed rock by extrapolation from the sales price of the crude oil.

This appendix will discuss only the situation created by the ruling that percentage depletion should be calculated on the value of mined and crushed rock, rather than of oil. Although it is discriminatory for a lower percentage depletion rate to be applied to shale crude oil than is applied to crude oil from conventional sources, it is a far greater discrimination to bar depletion based on the real product—the oil—and to confine it to the unmarketable rock. The statutory background will be reviewed to indicate the reasons why the Service's position is an incorrect interpretation of the purpose of the Congress, and one which, because it is wrong and discriminatory, should be promptly corrected by appropriate legislative or administrative action.

II. Conclusions

In TOSCO's view, the position taken by the Service in its unpublished ruling is an incorrect interpretation of existing law, since it is plain from the text and history of the relevant provision of the Code (enacted as an amendment to Section 613 in 1960) that the Congress did not intend, and made provision to avoid, such gross discrimination against one group of producers as contrasted with competing producers of the same mineral product from other sources. The Service's position is unlikely to be corrected by it, and could be revised either by revision of existing Treasury Regulations by the Commissioner of Internal Revenue, or by corrective legislative action.

Corrective, clarifying legislation was introduced in the second session of the 88th Congress, by Congressman Aspinall of Colorado, Chairman of the Interior Committee. He introduced a bill (H.R. 10869) whose sole purpose is to make it clear that the point-of-application of the percentage rate is to be the shale oil produced from the retort.

III. Discussion

Under the applicable statutory provision (Section 613 of the Code), the allowance for depletion is a specified percentage, multiplied by the "gross income from the property" (with certain exclusions and limitations not pertinent for this discussion). The term "gross income from the property" is defined to mean "the gross income from mining". "Mining" is defined, in detail, to include "the treatment processes considered as mining."

The definitions of "mining" and the lists of allowable and non-allowable treatment processes in Section 613(c) of the present Code were created by an amendment to the Code in the summer of 1960 (the so-called "Gore amendment"). Prior to that time the statue had provided that "mining" included the "ordinary treatment processes normally applied by mine owners or operators in order to obtain the commercially marketable or industrial product"; ordinary treatment processes were defined to include a lengthy list of allowable treatment processes for various minerals. But the list of allowable treatment processes for particular minerals was subsidiary to the "commercially marketable" product test.

Under the law as it existed prior to 1960, it is reasonably clear that the retorting of oil shale would have been a treatment process considered as mining, and depletion would have been calculated on the oil. It is clear, in other words, that mined, crushed oil shale rock is not a "commercially marketable or industrial product," and that the first obtainable "commercially marketable" product is shale crude oil, after retorting. Any contrary position which might then have been taken by the Internal Revenue Service would have failed, against a demonstration that the crushed oil shale rock is not "suitable for industrial use or consumption" [1] and that consequently oil shale rock would not have been a "commercially marketable" product.

Shale rock is not such a product because the amount of oil-bearing kerogen which is found in any given weight or volume of rock is too minute to permit economical transportation of rock. (Rock coming from mine is approximately 90% waste matter, even in high grade oil shale.) It is therefore not possible to obtain the oil-bearing kerogen from the rock economically except by on-site retorting, which requires integrated mining and retorting operations.

As amended in 1960, subsection 613 (c) provides that the treatment processes considered as mining shall be those "described in paragraph (4) and the treatment processes necessary or incidental thereto." Paragraph (4) of subsection 613 (c) contains a specific list of the allowable treatment processes in substantially the form of prior law, and paragraph (5) contains a less detailed list of treatment processes which shall not be allowable "unless they are otherwise provided for in paragraph (4)" or are necesary or incidental to processes so provided for.

Because the Gore amendment, which enacted the pertinent provisions of Section 613 (c), was a floor amendment added to the Tax-Rate Extension Bill, it was hastily enacted with that Bill, which was designed to avoid an impending lapse of certain tax rates. Senator Gore had introduced his amendment prior to the Supreme Court's decision in the *Cannelton* case, and had explained the purpose of his amendment in terms of the brick and tile depletion problem (the very dispute which was before the Supreme Court). He said specifically that the amendment was intended to prevent the computation of depletion allowances on finished industrial products. There was no report on the amendment by the Senate Finance Committee, and no hearings were held by the Senate Finance Committee on the text. Congressman Mills noted, in his discussion of the Conference Report on the floor of the House (Cong. Rec. p. 14546), that the Gore amendment contained some complicated new language which might produce unintended results, and that the language used in the Conference bill followed the language of the prior law in order to avoid such effects.

Since hearings had not been held on the amended text by the House or Senate Committee there is not an extensive legislative history on this provision. There is little question, however, that oil shale falls within the provisions of subparagraph (D).[2] In commenting on subparagraph (D) in his explanation of the Conference Report (Cong. Rec. p. 14514), Senator Byrd stated that,

"In the case of subparagraph (D) which deals with certain named minerals, as well as those not customarily sold in the form of crude mineral products, the named processes are substantially the same as under the Gore amendment and under present law."

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[1] The "commercially marketable" language produced considerable litigation, particularly in the brick and tile, refractory and cement industries. In *U.S.* v. *Cannelton Sewer Pipe Co.*, 364 U.S. 76 (1960) the Supreme Court decided that the cutoff point should be "where the mineral first became suitable for industrial use or consumption." See *Riddell* v. *Monolith Portland Cement Co.* 371 U.S. 537 (1963).

[2] Since it is an ore or a mineral which is "not customarily sold in the form of the crude mineral product."

Senator Byrd's statement indicates that in the case of minerals "not customarily sold in the form of the crude mineral products" (and which were not specifically provided for in other subparagraphs), substantially the same processes as those allowable under the "commercially marketable" test of prior law were to be allowable: In the words of the Supreme Court, depletion allowances for these minerals would be cut off "at the point where the minerals first became suitable for industrial use or consumption."[3] Accordingly, Senator Byrd's explanation of the Conference Report demonstrates that the retorting process for oil shale should be held to be an allowable treatment process, and that the Service's position is in error.

Moreover, allowance of retorting as a mining process does not produce the vice at which the Gore amendment was aimed. It is clear that the intent of the Gore amendment is to prevent depletion from being computed on the *finished manufactured product*, or in other words, to eliminate from the depletion base manufacturing processes applied to mineral products which are marketable in a cruder form. The retorting process for oil shale is not a manufacturing process applied to a mineral which could be sold in a cruder form, since there is not, and in the foreseeable future cannot be, a market for oil shale rock.

APPENDIX E

IMPORT QUOTAS—QUALIFIED INPUTS

The oil import quota system is based upon Presidential Proclamation 3279 (March 10, 1959), as amended, and regulations issued by the Secretary of the Interior implementing the Proclamation. The Proclamation recited a Presidential findings that "crude oil and the principal crude oil derivatives and products are being imported in such quantities and under such circumstances as to threaten to impair the national security. * * *" The threat, as reported on February 27, 1959, in a Memorandum to the President by the Directors of the Office of Civil Defense and Mobilization, was that imports discouraged domestic exploration and development of petroleum reserves and, if unregulated, would impair the nation's productive capacity. To counter this danger, the Proclamation forbade importation of crude oil, unfinished oils, and oil products unless licensed by the Secretary of the Interior, and set forth a formula for determining the maximum level of imports that the Secretary would authorize.

The Proclamation required that import licenses be issued only to domestic refiners, and gave the Secretary discretion to allocate allowable imports among refiners in a manner "fair and equitable" in relation to "refinery inputs", a term not defined by the Proclamation.

The Secretary has implemented the Proclamation with Regulations (32A C.F.R., Ch. X) authorizing issuance of import licenses for specified percentages of "refinery inputs." The Regulations defined "refinery inputs" as including only "crude oil" and "imported unfinished oil" used as refinery feedstocks. Because of the manner in which the Regulations defined "crude oil", there is some uncertainty whether raw shale crude oil would qualify as a "crude oil" refinery input for purposes of computing the import quota of a refiner who used shale crude rather than conventionally produced crude.

The Proclamation defined "crude oil" as follows: "'Crude oil' means crude petroleum as it is produced at the well-head." The Regulations adopted this definition of "crude oil" for purposes of determining refinery inputs, and thus of determining each refiner's import quota. If the phase "as it is produced at the well-head" is construed to mean only crude oil actually produced by means of wells, shale crude oil produced by means of above-ground retorting would not qualify as a "refinery input", although shale crude oil produced from wells by in situ techniques would qualify.

If shale crude does not qualify as a "refinery input", refiners who use it rather than conventional crude as a feedstock will suffer a reduction in their import quotas. Since the quotas have substantial value, the import quota system would then be operating to penalize the value of shale crude oil, and so to discourage domestic production of shale crude. Such a result would be anomalous, since the purpose of the import quota system as stated in the Proclamation itself is to encourage increases in domestic petroleum production and productive capacity.

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[3] *Riddell* v. *Monolith Portland Cement Co.*, 371 U.S. 537.

The preferable construction of the phrase appears to be that it simply designates the physical and chemical characteristics of "crude oil," as distinct from the characteristics of "unfinished oils and oil products". Under such a construction shale crude would apparently qualify as a "refinery input", a result consistent with the desire, embodied in the Proclamation, to foster domestic production. However, the matter ought not to be left clouded.

Clarification can, of course, be achieved by amendment of the Regulations. The Secretary has in fact recently expanded the definition of "crude oil" to include certain liquids recovered from vaporous hydrocarbons. A further regulatory amendment would be the most expeditious way of making shale crude clearly eligible as a "refinery input".

COMMENTS OF THE OIL SHALE CORPORATION ON PROPOSED REGULATIONS OF THE DEPARTMENT OF THE INTERIOR CONCERNING OIL SHALE LEASING

INTRODUCTION

TOSCO welcomes the Secretary's promulgation of the proposed oil shale leasing Regulations and this opportunity to express its views while the Department's consideration is still pending. From the recent public statements of the Secretary and other officers of the Department, it is apparent that the Proposed Regulations are intended by the Department to make public domain reserves available to industry for processing research, and thereafter for production development, on terms which give recognition to the costs and risks of experimental programs, and to the value of the availability of public reserves.

Unfortunately, an equitable balance of interests is not easily accomplished. In our view, the Proposed Regulations do not achieve the goals which the Secretary has expressed for them. They fall short because they make use of the public domain reserves for research so disadvantageous that it is probable that competent companies without oil shale reserves, who are prepared to develop solid hydrocarbon sources for liquid petroleum, will continue to be excluded from this important resource.

The Regulations do not give meaningful recognition to the risk entailed in expenditures of money and effort in production research, and thereafter in production development. They provide that the research and development lessee, in return for its funds and labor, will not receive any proprietary interest in the technology, should one be successfully developed; will surrender its normal control over its past technological developments; will receive no benefit that is not also available to those who merely wait; and will, if the research is successful, pay royalties which escalate so sharply with profit that the remaining possibility of gain is heavily overborne by the risks of loss of the research funds and the production capital investment.

These are difficulties that cannot be overcome by adjustments in matters of detail, although the matters of detail discussed below are significant. The fundamental failure of the Regulations to give fair recognition to the costs and risks of research and development, and the undue value they apparently attribute to the rental of public domain lands for research, would preclude us and, we think, others from a serious interest.

We believe that the Department has not intended this result, and we trust that the comments which follow and the comments of other interested persons and companies will provide the Department with a sufficient basis for constructive revisions to permit the program to go forward.

The remainder of this text is devoted to our comments on those aspects of the Proposed Regulations with which we are in disagreement. This is an appropriate opportunity to take note of the thoughtful and imaginative labors which have given rise to this initial proposal. For thirty-seven years, prior administrations took no significant steps towards utilization of these public domain reserves. The Department's present foresight and energy should not go unnoticed in the critical debate which follows upon this first step.

THE REGULATIONS—IN GENERAL

There are four matters affecting the whole of the Regulations upon which we think it is appropriate to comment before turning to more detailed analysis. They are: (1) the failure of the Regulations to make available reserves for commercial production to those who already have, or who do hereafter, carry

out successful research programs on privately owned reserves; (2) the absence of any provision for production leases without research; (3) the apparent requirement that only the fruits of a lessee's own research may be applied under its commercial production lease; and (4) the failure to define any procedures for adjudication under which disagreements may be promptly and fairly resolved.

1. The Absence of Provision for Production Leases

The Proposed Regulations make no provision for leases for commercial production, without a prior research lease. The absence of such provision significantly impairs the fairness and utility of the Proposed Regulations.

Among others, this Corporation has announced the availability of retorting and related processes suitable for commercial application. By requiring every federal lessee to carry out research in advance of production, the achievements of past research and development, privately financed without public assistance of any kind, are excluded from application to the public domain reserves. As a result, an incentive in the form of the promise of a federal leasehold (a promise which the Final Regulations will presumably make substantial) is created for additional technological development, without regard to the achievements of the past.

This Corporation has embarked upon an active program of licensing its technologies. It is perhaps desirable that the Proposed Regulations give recognition to the value of future research. But, it is improvident to create an incentive to research to the exclusion of the utilization of existing technology.

Moreover, in the absence of proposed terms for a commercial production lease, the implication arises that the terms would be the same as those of a lease following upon research. That implication creates a disincentive to the proposed research, because the Regulations propose that the research lessee will derive no other advantage than the ability to enter production. Since the technological fruits of the research will be made available to others without reimbursement to the researcher, research may permit the researching company to enter production; but it will also permit its competitors to do so on equally advantageous terms and without any of the risks attendant on research and development of the required magnitude. The research costs we are discussing are high. For example, this Corporation, as of this date, has expended well in excess of $16 Million (exclusive of its investments in reserves) in pursuit of the technology which it has successfully developed, and others associated with it have expended more than $7 Million.

2. Discrimination Against Research on Private Reserves

The Proposed Regulations apparently intend to stimulate production research by making available public domain reserves for research, and by rewarding the research with some assurance of public domain reserves for commercial production. However, this Corporation and others have, without any such incentive, already expended large sums in production process development on privately owned reserves. Others will very likely do so in the future.

If public domain reserves for commercial production are to be made available to those who now carry out research on the public domain, then those who have labored on their own should have similar access to the public domain reserves for production.

Provision should be made for the granting of production leaseholds to any company which, after the Regulations become effective, submits a proposal for the construction and operation of commercial facilities, utilizing technology which it has developed.

3. Limitation of Follow-On Production Leases to the Results of the Research Program

The Proposed Regulations appear to say—though not without some ambiguity—that the research lessee will be entitled to follow-on production lease only if the results of its own research program justify commercial application. (We shall discuss below the separate question of how readiness for commercial production should be determined.) It is impossible to say what public interest justifies requiring a research lessee to continue its own research program in order to enter the commercial production phase, even though it is prepared to commence production with the fruits of research carried out by others.

The failure of the Regulations to provide that a research lessee may apply the fruits of other research to enter commercial production is similar in its effect to the absence of provision for commercial production leases without research. The risks of undertaking research are increased, since the possibility of success is confined to the researcher's own efforts and since even apparently successful efforts by him may be less successful than those of others.

The apparent requirement that a particular reearch project be carried to its own conclusion regardless of the achievements of others is, in short, a substantial disincentive to the commencement of a research program. It is a disincentive which serves no public interest and will frustrate development.

4. The Absence of Procedures for Settlement of Disputes

Throughout the Proposed Regulations, there are, as there must inevitably be, many points at which differences of view could arise between the lessee and the lessor. (We shall comment specifically on some of them below.) Among them are such questions as whether research is being carried out in compliance with the original program, or whether it should be; whether the program has been successfully completed; whether the program ought to be modified; whether commercial production is "justified"; what the extent of the production lease should be; whether conservation measures proposed to be taken are adequate; and a host of others. Each such question has its own substantive difficulties. But it is possible to say of every such question that a fair procedural mechanism for the prompt adjudication of differences of view will ameliorate the substantive difficulty, even though it does not remove it.

So far as the Proposed Regulations indicate, only the federal courts would be available as an alternative to unsuccessful negotiations to resolve differences. In an on-going program of research and development, the sole alternative of recourse to the courts is inadequate.

Provision must be made for procedurally prompt, definite and fair arbitration of all such differences, utilizing an arbitration system which is, in fact, independent of the Department and the lessee.

To the extent that such a procedural system is not incorporated in the Regulations, the vesting of discretion in the Department to grant or not grant production leases, and to control or prevent operations is, in our view, a substantial obstacle to research leasing.

THE REGULATIONS—PARTICULAR PROBLEMS

The following numbered sections set out our comments on some particular matters with which the Proposed Regulations deal. For purposes of organization, we have grouped our comments in the order in which the problems discussed would be likely to arise in actual leasing practice. We begin, therefore, with entitlement to a research lease and conclude with the provisions governing the payment of royalties.

We have not sought to deal with every potential problem which the structure or language of the proposal suggests. Instead, we have confined even these detailed comments to matters which we believe will have an important effect on the usefulness of the Regulations when they are made final.

A. Selection of Leaseholds

Sections 3170 and 3171.—It appears that the selection of public domain acreage to be included in the up to 30,000 acres which will be available for disposition under the Final Regulations is to be unilaterally made by the Secretary in the light of what the Department conceives to be potentially fruitful research and development. This method of proceeding fails to take advantage of the expertise available from industry in the variety of technological areas which may be involved.

There is nothing in the mere limitation to 30,000 acres which requires that the Secretray select the acreage. Section 3171.2(10) and (12) provides that the applicant must specify its program for research and its provisional plans for commercial development. It is, therefore, more reasonable that the lands be first selected by the applicant in the light of its proposed program, rather than by the Secretary in advance of application. Means are readily available to resolve problems which could arise from conflicting selections, or from other sources. What should be paramount is to utilize the capabilities of industry in the selection of suitable reserves for research.

B. Entitlement to a Research Lease

Sections 3172.2 and 3171.3.—These two sections specify the criteria on which lessees are to be selected. Their principal defect is that they appear designed to exclude from participation those who have privately acquired reserves.

For example, parts (d) and (f) of Section 3117.3 require that the applicant's "need" for leased lands for research and production, and its "need" for the minerals to be produced, are criteria to be taken into account in the awarding of leases. The implication is clear that the possession of privately owned reserves is to be a bar to the acquisition of a federal leasehold under these Regulations.

The basic aim of these Regulations, to stimulate research and enable participation of those who have no access to suitable reserves, does not require that companies holding reserves be excluded. Indeed, to exclude them is inconsistent with the objective of fostering technological development. The criterion of "need" for reserves should therefore be eliminated.

There is a separate and novel problem inherent in part (f), which requires that an applicant's "need" for the minerals to be *produced* from the leasehold be taken into account. To the extent that an applicant's "need" for minerals to be produced raises the same questions as its "need" for reserves in place, part (f) is merely cumulative of part (d).

Although it is difficult to conceive how an applicant could "need" reserves of minerals and yet not "need" the minerals produced, it is possible that an applicant's "need" for produced minerals is meant to introduce a separate criterion, under which the Department would attempt to evaluate the desirability of the ulimate use to which the applicant would put the minerals. Such a criterion would be unavoidably arbitrary.

For example, a mineral may be assumed to be needed if it is consumed by the producer in its existing operations. But, is the extent of those operations or the extent of his other reserves of similar minerals to be taken into account? Is "need" established by a program to expand such operations? What ratio of present reserves to project consumption will establish "need"?

Similarly, is "need" to be established by an intention to diversify into the production of a new mineral or by the intention to produce a mineral solely for sale to others? Since the minerals which will be *produced* under a research and development proposal will not be oil shale, but rather principally crude oil, is an applicant's "need" for crude oil to be taken into account, or only its "need" for this kind of reserve of crude oil? The same question is obviously present as to the other minerals, such as the sources of alumina which are sometimes found in the deposit.

It is apparent that the criterior of "need" for produced minerals cannot be administered unless an elaborate definition is given to the concept of "need." But, such a definition could only be framed in the light of the public interest that the application of the criterion is intended to protect.

The fundamental difficulty with part (f) is that no public interest relevant to these Regulations is involved in the applicant's "need" for produced minerals. The only relationship between the concept of "need" and the leasing process that we are able to discern is the remote possibility that leasing may result in undue concentrations of reserves in the hands of a few. But that problem cannot arise under these extremely limited Regulations, which will dispose of, at most, a small fraction of the public domain reserves. Moreover, for purposes of these Regulations, or of successor regulations of more general effect, a limitation on the acreage an applicant can acquire is a more effective and administrable bar to concentration of reserves than any contrived concept of "need" could be.

The proposal that a criterion of "need" be applied to lease applications is one of many instances in these Regulations where the absence of a procedure for contesting a determination is significant. In the absence of a fair procedure, the potential for arbitrary administration of so vague a standard is unnecessarily aggravated.

C. The Right to a Commercial Production Lease

Section 3172.2 (a) and (b).—Part (a) of this section provides that the Secretary shall designate the research term of the lease, which is not to exceed ten (10) years. Although the Regulations are not clear, it is apparent that as a practical matter the designation must be made at the commencement of the research lease term. However, if the period designated is less than ten years, no reason appears why the term should not be extended to ten years solely upon a showing that the lessee has been and is diligently pursuing a substantial program of research.

It is arguable that there is a public interest in seeing an end to research even though the lessee is prepared to continue substantial expenditures to carry it on; but if some lessees are to have a term of ten years, all lessees who are prepared to continue their projects for that time should have the opportunity to do so.

More difficult and more important is the provision of part (b) of this section, under which the right of a research lessee to commence commercial production is subject to determinations to be made by the Secretary. The Secretary must decide, among other matters, whether the lessee has conducted its research in accordance with a program at some stage approved by the Secretary; whether it has developed a method which is both commercially feasible and provides for optimum recovery of the contained minerals; and whether it shows evidence of the ability to comply with as yet unannounced standards of pollution control and preservation of wildlife and aesthetic values, to be fixed at some later date by the Secretary.

The requirement of such future and indefinite determinations by the Secretary casts a serious cloud over the assurance that a research lessee will in fact be entitled to proceed with commercial production. Yet nothing is accomplished by the method of Secretarial determination after the conclusion of research that could not be accomplished by earlier and less potentially arbitrary decisions.

For example, if a lessee is prepared to invest in the development of a leasehold the very substantial sums that are required for commercial production, it would appear to make no difference to the public interest whether its research activities were conducted "substantially in accordance with the plan submitted" in the application. Moreover, the lessee's preparedness to invest such sums would preclude any determination by the Department that the developed processes are not commercially feasible. In short, neither of these requirements appears to protect any valid public interest, and each contains possibilities for confusion and perhaps inadvertent abuse.

The remaining requirements—of optimum mineral recovery and compliance with conservation standards—ought to be made known to the research lessee before it begins research expenditures, rather than after it believes they are completed. Such standards should be incorporated in these Regulations and eventually in leasing regulations of more general effect. For the present, it is at the least necessary that minimum standards be set out in the research lease itself, so that the research lessee may give a rational definition to its research objectives and economic evaluations. If the lessee meets the minimum standards stated in his lease, it should be entitled to produce if it is prepared to do so. Administrative discretion should enter only if the standards included in the lease prove unworkably severe, and if a case can be made by the lessee for modification of them.

If the standards included in the initial research leases proved instead to be too modest because other lessees (or others not utilizing public lands) achieve better recoveries or design more efficient practices for conservation of other values, the research lessee should at least have the opportunity to use in its commercial production those other processes and methods. It should make no difference that they were not developed by him in the court of his research. Indeed, the use of such other processes or techniques by the lessee might well be encouraged under the lease by an amelioration of lease royalties to the extent, if any, which royalties are paid to others for such use.

The Secretary must also determine, in order to grant a production term for the lease, that "the lessee has complied with all the terms of the lease." We assume that this requirement is not intended to mean quite what it says: that, in other words, immaterial failures of the research lessee to comply with technological or other requirements of the research lease could not be made a bar by the Secretary to extension of the lease term for production. The defect here is apparently only one of draftsmanship. But once again, the threat that such a provision will be interpreted to the serious disadvantage of the lessee is enhanced by the failure of the Regulations to provide fair procedures for him to challenge an adverse determination.

D. The Extent of the Production Lease

Section 3172.3.—Although part (a) of this section provides that no lease may exceed 5,120 acres, no definition is provided for the extent of the leasehold which will actually be granted, either for research or for commercial production.

The physical extent of required areas for research is likely to be relatively small, and the selection of research acreage under the lease should not present

serious problems. At all events, in practice the selection would necessarily be resolved at the time of granting of the lease.

The extent of the commercial production leasehold is more important. But under the Regulations, it is not ascertainable at the commencement of the research term. The only standard provided in the Regulations is that the Secretary "will determine the quantity of mineral deposits needed for commercial production, allowing reasonable reserves." The effect of this provision is that a research lessee, after as many as ten years of substantial research expenditures, will have no other assurance of the extent of his leasehold than that the then Secretary of Interior regards the extent of the awarded reserves as "reasonable." (Here, again, the uncertainty is aggravated by the absence of any procedure under the Regulations by which the lessee might effectively challenge the award as insufficient and unreasonable.)

This initial leasing program, confined as it is to a minute portion of public domain reserves, should provide the potential research lessee with a definite assurance of a significant number of years of reserves to support commercial production at whatever rate is proposed by him for the production facilities; thirty years would hardly be a disproportionately large assurance. Not only must the lessee be able to amortize the predictably large investment in production facilities, despite the proposed escalating royalty rates; it must also be able to amortize the cost of up to ten years of research. The regulation (see below) propose to deny to the lessee any revenues from licensing of the technology it develops; and even propose to confine its rate of profit by a sharply escalating royalty scale. It is unreasonable that they should also deprive the lessee of the certainty of a substantial term of years for recovery of and return on its investments in research and production.

The very small portion of the public domain reserves which is to be subject to those Proposed Regulations opens no threat of undue concentration of reserves in the hands of a single holder. The public interest which is affected is simply that it may be undesirable that any lessee acquire control of public domain reserves to hold them for an indefinite time after research without commitments to production. To protect the public interest on that score, it is desirable only that the lessee undertake a program of construction of facilities—if it so desires, perhaps several of them—sufficient to utilize the allocated reserves. Since the proposed lease terms require production to hold the lease, all risks to the only public interest affected would thereby be removed.

This subject matter is one specific example of the failure of the Regulations to appraise adequately the risks and costs of research and development. The optimum size of commercial production leaseholds will only be definitely known after a variety of techniques has been developed and applied commercially. The purpose of these Regulations must be to encourage the research that will lead to development, so that industry and the Department may learn from production experience what is necessary and what is fair to the public and private interest. That purpose cannot be achieved unless the program grants the research lessee, who takes the risk of development, a positive assurance of a leasehold of substantial extent.

E. Disposition of Technology

Section 3172.9 (d) and (e).—The cumulative effect of these two provisions is to dedicate all technology developed under research leases to the public without compensation to the lessee; and to require the lessee to make available, under regulation of the Department, additional technologies owned by the lessee which "are necessary to permit others to practice inventions made in the course of or under the research term of the lease." (Provision is made for exceptions to this latter requirement to be written into the research lease if a "proper showing of exceptional circumstances is made.")

The heart of the matter here is that these provisions are unfair. But before considering their substantive terms, it should be noted again that in the absence of speedy and equitable procedures to resolve the multitude of controversies which could arise between the Department and any lessee which has conducted prior research, the provisions are so burdensome as to be unworkable. (Who, for example, is to determine what is "necessary"?)

It seems probable that the Department believed these provisions to be required by President Kennedy's "Statement of Government Patent Policy," to which the Proposed Regulations refer. If that is so, the Department has misconceived that

policy, and as a result the Regulations impose excessive requirements not contemplated by the Statement.

It is apparent from the "Basic Considerations" which preface the "Statement," and from Section 1 of the "Policy" itself, that public proprietorship of technology developed under government contracts is to be imposed where there have been large financial contributions by government to the technological development. For example, the first Basic Consideration states:

"The government expends large sums for the conduct of research and development which results in a considerable number of inventions and discoveries."

No government expenditure of any kind for oil shale research is contemplated in these Proposed Regulations. The public contribution consists only of the renting, at the rate of 50¢ per acre per year, of very small fragments of the public domain for research purposes. As to the commercial production phase, the royalties and other requirements proposed in these Regulations assure the public of a very high rate of payment for the production of public domain minerals. Nowhere is there involved any uncompensated "contribution" by the public, or any financial contribution whatever.

These provisions concerning technology are the clearest instance in the Proposed Regulations of their failure to meet the purposes stated for them by the Secretary and others. The Regulations were intended to "encourage" technological development in the interest of increasing the reliability of domestic liquid petroleum supplies. In so doing, they would also assure the public that its large oil shale reserves would not lie fallow and would instead generate tax and other revenues and produce substantial new employment and economic development. Instead, the Regulations so burden the use of the public domain reserves for research and development, and offer so little possibility of a return adequate to justify the risks of such programs, that they seem inadvertently designed to discourage rather than encourage utilization.

The Statement of Patent Policy has no relevance in this mineral leasing context, where the value of the public "contribution" is fairly, if not unduly, compensated by proposed rentals and royalties. Moreover, the practice of the petroleum industry to make useful technology readily available through widespread open licensing practices is sufficient assurance that any useful technology developed will be widely applied.

F. Royalties

In 1964, when this Corporation appeared before the Oil Shale Advisory Board appointed by the Secretary, it took the position that despite the absence of commercial production experience, the Department could enter into production leases without fear of overreaching or being overreached. We said there were several established devices to achieve this result and mentioned the net profits lease an an example.

The Proposed Regulations provide for determination of lease royalties in relation to profits through the device of an artificially defined "net income." Although the net profits lease is not the only available method, and would be poorly suited to a general program of commercial production leasing, we believe that it is acceptable to protect the public and private interests in production growing out of initial experimental leases.

However, two problems are raised by the manner in which the net profits concept has been embodied in the Proposed Regulations. The first concerns the economic costs imposed upon the producer; the second concerns the incompleteness of mechanics proposed for actual determination of payments.

In our view, the charges that would be imposed by the Proposed Regulations are unduly burdensome. The imposition of a minimum 3% royalty, regardless of cost or profit, will unavoidably tend to discourage the commercial production phase, even when the results of research are promising. A fixed royalty rate is a customary course where the economics of production are generally established (although it has been noted that the rate may prevent the continuation of production on marginal reserves). But to establish a fixed minimum royalty rate when production economics of new techniques are uncertain, may prevent the inception of production which would otherwise begin. They royalty would therefore frustrate the fundamental objectives of the proposed program.

Nor is the lessee's risk that the fixed rate may make production impossible offset by the possibility of substantial profit. Under the Proposed Regulations, that possibility is severely diminished by the alternative royalty rates, which escalate sharply.

The escalating rates proposed reportedly are similar in their effect to the royalty rates established in recent Outer Continental Shelf Leasing practice. We will assume for purposes of these Comments that that relationship does exist. However, while such a relationship seems to assure the fairness of the proposed rates, in fact it does the opposite. Any formula of rates created for production from conventional sources necessarily leaves out of account the large risks and costs associated with the creation of new processing techniques and novel sources of petroleum. In this case, what is left out of account is that the research lessee could have expended as many as ten years of research funds and effort before it even commences production development; and when it commences production development, the Regulations apparently require that it apply only its own newly developed, unproved techniques with the accompanying risks of capital and other resources. Rates appropriate to establish production with established techniques are inappropriate in such an experimental contest.

As a result, these provisions appear inconsistent with the intention of Section 21 of the Mineral Leasing Act, under which authority these Regulations are proposed. Under Section 21 the Secretary is granted discretion to suspend all royalties for up to five years so as to encourage development of this resource. We do not believe that such an incentive is in fact required at this time. But the purpose of the Section to encourage development is inconsistent with the imposition of very large royalty burdens which discourage it.

The minimum royalty should either be eliminated or made the exclusive royalty to be paid under these initial experimental leases. If it is eliminated, and the net profit royalty system is retained, then rates under that system should be revised. All will comment on some specific revisions in the course of the following analysis of the mechanics of determination of the actual royalty.

Several ambiguities in the royalty provisions make it difficult to determine what effective royalty rate is proposed. For example, both as to the minimum royalty and the "net income" royalty, the income to which the royalty rate is to be applied is determined by the value of mineral products at "the point of shipment to market." While that standard seems at first glance a definable one, it is not.

One example should suffice to make this point clear. Crude shale oil, as it is first extracted from the rock matrix by heating, and recovered by condensation, contains substantial quantities of nitrogen and significant amounts of sulphur. In addition, it tends to have a pour point which, without additional treatment, would prevent conventional transportation of it. Accordingly, the producer has several options available to him for further treatment. He may, as this Corporation can under its patented process, reduce the pour point and so transport the raw oil to market. He may, however, prefer to remove the contained sulphur and nitrogen at the production site so as to offer for sale a high quality sweet premium crude oil. Such processing would ordinarily entail coking of the bottom portion of the oil and up-grading of the remainder by hydrogen treatment with attendant recovery of sulphur and ammonia as by-products.

These well established processing techniques, though economically viable because they substantially increase the value of the products, entail substantial capital investment and operating costs.

In short, one producer under this experimental program may have a raw crude shale oil "at the point of shipment to market" while another may, by virtue of substantial additional investments and costs, have a high quality premium product of substantially greater value. It is evident that without further refinement the Regulations would penalize the second producer severely.

We doubt that such penalties are intended, and assume therefore that a suitable method will be included for ascertaining the value of first raw crude oil (and related or other mineral products) produced by each producer so that the royalty may be payable only in respect of that value.

Another significant ambiguity arises out of the mechanism for determining the "net annual income royalty." For that purpose, the Regulations require determination of "investment," which is defined as "the original cost less depreciation of capital assets used in the aforesaid production and processing of oil shale."

It is not clear whether "investment" includes only the original "cost" of "capital assets," or even how that cost is to be determined. For example, this Corporation estimates that the installed equipment cost for a plant to process 66,000 tons per day of oil shale and produce 52,000 barrels per calendar day of

hydro-treated permium oil and by-products is approximately $106,000,000. But the final installed cost of erecting and commencing operation of such a facility is approximately $128,000,000. What, in short, is the "original cost" of "capital assets used"? Moreover, which capital assets are to be included as part of the investment on the basis of which royalties are to be calculated? This question obviously relates to the prior question of the selection point at which the value of products is to be determined.

The "original cost" is to be diminished by "depreciation." By what method?

Apart from these ambiguities, the definition of investment appears deliberately to exclude the costs of up to ten years of research. Yet it is difficult to believe that the Department intends that the research lessee should have no opportunity to recover its predictably large "investment" in research, an investment which the proposed provisions on technology (see above) dedicates to the public.

Senator Moss. Our next witness is Mr. Royce A. Hardy, vice president, Duval Corp. It is necessary for him to leave town today, and we will make sure that we get to hear him.

Senator ALLOTT. I want to say that it is a pleasure to see a former Assistant Secretary of the Interior before us. We are glad to have you with us again.

Senator Moss. Indeed, we are.

STATEMENT OF ROYCE A. HARDY, VICE PRESIDENT, DUVAL CORP.

Mr. HARDY. Thank you, Senator Allott.

Mr. Chairman and members of the committee, I am Royce A. Hardy, vice president of Duval Corp. I appreciate the opportunity to appear before this committee.

Duval Corp. is in the solid minerals business, engaged primarily in the mining and milling of copper, molybdenum, and potash ores, the marketing of the resulting products and the mining and marketing of crude sulfur. Duval is the mining company affiliate of a group of companies principally engaged in oil and gas activities; namely, United Gas Corp. and Pennzoil Co. and their subsidiaries. As a mineral resource company, Duval is interested in the development of oil shale, which of course, appears in nature as a solid.

My professional experience in the mineral industry extends over a period of 21 years, during which time I spent approximately 3½ years in the Department of the Interior in the mineral resource area.

At the outset, I should like to point out that many of the technical aspects of mining, transporting and crushing oil shale are not unlike those applicable to other solid minerals. In fact, in many respects oil shale is more analogous to potassium, sodium, phosphate, coal, and other solid mineral reserves than to liquid and gaseous hydrocarbons.

The Department of the Interior is to be commended for proposing regulations for the development of federally owned oil shale reserves. The regulations specifically recognize the need for development of this important resource. Establishing the Government's policies with respect to the vast reserves in the public domain should also remove the primary existing obstacle to development of privately owned shale lands.

In order that the important objectives envisioned by the Department's regulations may in fact be realized, it is imperative in my opinion that manifest uncertainties now present in the proposed regulations be eliminated. Briefly, the chief uncertainties are the amount of royalties payable to the Government, the duration of the research

term, whether the Secretary of the Interior will extend the term of the lease to permit commercial production, and the areas which will be designated for leasing.

The regulations, as presently drafted, provide for a research program and do not adequately define what the future will be for development. Actually, a substantial amount of research has been done and some companies are undoubtedly at a state, from a technical standpoint, to proceed with development activities. Thus, the regulations should not only provide for research but also permit development.

Uncertainties exist as to what area will be designated for research development and the 30,000-acre limitation is unduly restrictive. The regulations should provide for selection of acreage by any qualified applicant.

Uncertainties exist as to the form of the lease. A reasonable form should be prescribed.

The royalties to the Government are uncertain in amount and should be fixed at a level and reasonable rate.

The benefits from research are illusory in that the Government will acquire title to all discoveries. This feature of the regulations should be eliminated and rewritten to provide for a fair license to others by any company developing an invention.

As I stated earlier, oil shale is physically analogous to potassium, sodium, phosphate, and other solid mineral reserves. Similarly, many of the technological and business problems in development are parallel. Accordingly, I suggest that the regulations governing oil shale be promulgated in the light of precedents established in the Department's regulations for potassium, sodium, and phosphate leases on federally owned lands.

In my opinion, such regulations have been generally accepted as reasonable and workable, and the concepts can be adapted to oil shale lands with few adjustments.

It is my considered opinion that American industry, given an opportunity under terms and conditions for competitive leasing arrangements, will be in a position to develop the reserves of oil shale in this country.

Moreover, I feel that the public interest in the economic development of oil shale reserves can be best served by Government creating an atmosphere for competition among private companies. Such competition engenders improved technology and historically results in lower costs to consumers.

Thank you for the opportunity to appear before this committee.

Senator Moss. Thank you, Mr. Hardy, for appearing before us. Your experience in government, coupled with your experience in the practical field of mining, commend you to us, and we appreciate your testimony here and your suggestions as to how the proposed regulations should be modified to make them more workable and to bring about actual production in this field.

Senator Allott.

Senator Allott. Well, I again say, Mr. Hardy, we are very happy to have your very short and concise suggestions with respect to this matter. I think you have placed your finger on the same items that

others who have testified before you have touched, and particularly with the concept that in the overall development of our mineral leasing in this country we have well-tried techniques of leasing and handling it, and the fact that this happens to be a little larger resource than any known deposit of any mineral in the country, I think, does not necessarily call for us to move out into experimental methods of handling it and developing it.

I appreciate your statement very much.

Mr. HARDY. Thank you, sir.

Senator Moss. Senator Hansen.

Senator HANSEN. Mr. Chairman, I cannot add anything to the questions which have already been asked and the comments which have been made. You did make a very fine statement and I compliment you on being able to be so precise.

Mr. HARDY. Thank you, Senator Hansen.

Senator Moss. Our next witness will be Mr. Russell Cameron, President of Cameron & Jones, oil shale consultants. Mr. Cameron is also a member of the Governor of Colorado's Oil Shale Advisory Board. We are very happy to have you, Mr. Cameron. You have been in attendance during all of these hearings, and we now look forward to hearing from you.

STATEMENT OF RUSSELL J. CAMERON, PRESIDENT, CAMERON & JONES, INC., DENVER, COLO.

Mr. CAMERON. Thank you, Mr. Chairman.

I have a moderately brief prepared statement which I hope to make even briefer by eliminating certain parts of it in my oral testimony.

Senator Moss. If you are able to do that, the entire statement will be in the record. You highlight it any way you see fit.

Mr. CAMERON. Very good, sir.

Oil shale is beset by many problems—technological, legal, and economic. Some are real; some are not. And I was happy to have Mr. Barry this morning confirm my opinion that dawsonite claims are not one of the real problems. All are compounded by prejudice, emotion, and ignorance. But none are beyond solution.

To solve these problems for the benefit of all concerned, the public not the least, private industry, and all three branches of government have a job to do. Industry must assume, without equivocation, its traditional responsibility for resource development by supplying capital, technology, and management, and government must afford it the opportunity to do so by fair and equitable rules. The Congress must establish, with unmistakable clarity, the policy under which the resource is to be developed. The executive branch must administer these policies with wisdom and justice. The courts must resolve expeditiously the perplexing legal problems that carry over from the past. Only by such measures will the Nation benefit fully from this resource.

Almost everyone agrees that oil shale will be needed by this country to supply a part of its future oil demand. Differences of opinion occur as to timing. Need also is a relative term. Perhaps we don't need shale oil today because there is no actual shortage and we may not lack oil in an absolute sense a decade from now. But what about the strategic value of an oil shale industry at the next interruption of Mideast oil?

In his press conference August 18, President Johnson correctly and succinctly said that shale oil will play no part in the oil disruption brought on by the current Arab-Israeli conflict. If oil shale is a feasible source of oil, and I believe it is, we should establish this fact and make our billions or trillions of barrels of shale oil an active deterrent to interruptions in oil supply. The tendency toward political unrest many places in the world will increase as our dependence on overseas oil increases and conversely will decrease with the ability to supply our needs from domestic sources.

In my opinion, industry is ready to proceed promptly to commercial shale oil production. By beginning large-scale operations and by this means only, will we know how much dependence should be placed on shale oil, and only an industry in being is of any use in an emergency. At least a decade will be needed to attain a significant flow of oil from oil shale if we start now. I believe it to be in the public interest for the Federal Government to encourage the early initiation of shale oil production.

Federal policy favors the use of coal as a source of oil and gas and provides direct Federal assistance through the Office of Coal Research. Of the more than $50 million of contracted research by the Office of Coal Research about 90 percent is for projects to convert coal to oil and gas. Conventional petroleum operates under a system of State and Federal regulation that encourages the maintenance of a strong domestic industry, including sufficient productive capacity to meet extraordinary needs.

But where is the encouragement for what is admitted to be our largest petroleum resource—oil shale? Where else do we have the potential for hundreds of billions of barrels of oil and ultimately even trillions? Furthermore, industry has indicated its willingness to develop shale oil without the expenditure of Government funds. Yet our policies discriminate against oil shale (1) by a significant differential in tax treatment, (2) by highly restrictive provisions in the proposed Federal leasing regulations, and (3) by a suspicious and hostile attitude toward private enterprise as the vehicle for shale oil development.

I have another section in my prepared statement that relates to interfuel competition, and I think this was covered very well this morning by Mr. Winger, so I will not discuss it further other than to say that I think that shale oil, oil from coal, oil from tar sands, oil from all sources should be given an equal chance to compete for the market, because this type of competition has one sure winner, and that is the consumer.

On Federal oil shale leasing, our company has responded to Secretary Udall's invitation to comment, and a copy of our statement is attached.

In summary we have told the Department:

(1) That a limited opening of Federal oil shale lands is needed to prevent windfall profits, to promote competition in oil shale, and to accelerate the development of the resource.

(2) We have told him that leases should be granted under a competitive bidding procedure with due diligence requirements to maintain the lease, and a provision to credit a part of the bonus payment

against royalties during the first 10 years of the lease to encourage higher bids and early development.

(3) That the election of production or research be that of the lessee since some companies already have acquired shale oil production technology.

I would say, Mr. Chairman, that is the point where I depart most from the intent of the Secretary's regulation. His regulation quite obviously is to encourage research and development, but nowhere in the regulation is it mentioned that he intends to encourage production. As I indicated earlier, it is only by initiating production that we can depend on the supply of oil in any emergency. I also commented that the Government should not attempt to own or control the technology thereby removing the competitive force created by the better mousetrap philosophy.

(5) That research by the lessee be allowed the same confidential status as exploration for oil, gas, and other minerals on public lands with appropriate Government agencies having access to information needed for efficient administration of the lease.

(6) That the method of applying royalty under these initial leases conform to conventional practice, leaving to the Public Land Law Review Commission and the Congress the responsibility for changes in concept; further, that the royalty burden be moderate so as not to discourage the heavy investment of capital that is needed.

(7) Finally, we recommended, as discussed earlier in this statement, a policy of encouragement rather than restriction, since oil shale, though large in potential, is still a low grade mineral that will require the greatest ingenuity technologically to create from it any wealth whatsoever. We also urged that private enterprise, not only in words but in fact, be assigned primary responsibility for oil shale development and that wherever possible competition be demanded in all endeavors associated with the establishment of the industry.

One point that I want to discuss in addition to the leasing regulation, and that is conservation, a problem that is of concern to the Secretary, to members of this committee, to the industry, and to the public—conservation, pollution, alteration of the environment, prevention of waste, et cetera.

We all know, especially those of us who live in Colorado, Utah, and Wyoming, that we can tolerate no conditions in an oil shale industry such as have been created in the past by the indifference to damage to the surroundings by some mining and milling operations. At the same time, we must recognize that any large industry will change the ecology.

We should not fear this because, since little industry exists in the areas involved, we have an opportunity to build a model industrial community. Nor should we fear mining as such. As long as we extract minerals from the ground and treat them for the recovery of valuable components, the digging of ores and the disposal of solid, liquid, and gaseous wastes will be with us.

There are methods now, and others are being developed, to prevent the problems that have seemed to be an inseparable part of heavy industry, mining in particular. It is in this area that federally supported research and State and Federal regulations should be channeled.

We can and do have mining operations that are assets, not only financially, but in a scenic and esthetic sense, and I refer to the Bingham Pit as one of the outstanding tourist and other attractions that I know of. Oil shale can and should be developed in the same way.

I have emphasized mining as the basic approach to oil shale utilization. *In situ* or in place treatment of oil shale, both with and without the application of nuclear explosions, is held out as the means to avoid the necessity for mining.

As I discussed with you at the earlier hearings, we do not have a practical *in situ* retorting method, nor is there certainty that one can be developed. In some ways the technological problems are as tough as those encountered in space exploration, and with oil shale there are economic bounds within which one must stay. We should continue researching the concepts for *in situ* retorting because certain of our deposits do not seem amenable to mining by present methods. By the same token, large reserves are not recoverable by an *in situ* retorting method approach, by any in situ method approach now being considered. This is especially true of nuclear *in situ* methods.

My point is that we must necessarily proceed with the oil shale development using a mining approach. Strict discipline and control must be exercised to assure that long-term pollution and despoilment problems are not created. Even if practical in situ methods are developed, mining is going to be a part of the industry, but this should not be cause for alarm. Thank you very much, Mr. Chairman.

Senator Moss. Thank you, Mr. Cameron, for a very fine statement. Attached to it are the comments that have already been submitted to the Secretary, and those will also be included in the record. Your summary of the recommendations which you make is very helpful, and they sound very reasonable to me.

Again, as so many of our witnesses have come forward to say, what we need is a reasonable, practical approach that will get this show on the road, as it were.

We seem to have spent so much time to guard against feared abuses that it has the effect of just holding everything in abeyance rather than getting it moving in this field.

Mr. CAMERON. Very well stated, sir.

Senator Moss. Senator Allott.

Senator ALLOTT. Well, it is exactly this last remark of the Senator from Utah that I wanted to address myself to.

First of all, I must say Mr. Cameron is well-known to this committee and to the country as an outstanding engineer, probably the outstanding engineer in this area for his work not only in this country, but in Brazil, which he has been kind enough to keep me informed about off and on for 7 years——

Mr. CAMERON. Twelve years.

Senator ALLOTT. Twelve years—time flies—I have appreciated it very much. While you did not read your statement concerning your own qualifications I know they are impressive, and one of them is your firm has now completed the engineering for a 2,500-ton per day semicommercial oil shale retort in Brazil which, if proved successful, as we hope, might even help the taxpayers of this country by helping the deficit flow of moneys from Brazil of some $350 million a year to other countries. We would be glad to see that.

But you used the word "windfall" in your statement at one point, Mr. Cameron, and this has bothered me because it goes back to the Teapot Dome syndrome I was talking about yesterday, which Senator Moss just referred to in another way. With your long knowledge in this, beginning back as a member of the Bureau of Mines Research team at Anvil Points, can you see any possibility, considering all of the indefinite factors which must come into play in one of these things, a windfall to any person—unless they would just simply give a lease to one company?

Mr. CAMERON. I can see no possibility for windfalls in the production and development of oil shale. The windfall to which I referred was what the Secretary will create if he continues the de facto withholding of oil shale lands, because he is creating an artificial shortage of developable properties.

Senator ALLOTT. In that respect, the so-called need criteria that he has placed in his regulations might very definitely result in a windfall, coupled with his regulations concerning patents in that someone who had exerted no effort in this field could step in and, perhaps, if you are down the road in a production lease, utilize the patents which others gambled their money to develop, and their only criteria for such a lease would be their need, in that they did not presently have any available acreage.

Mr. CAMERON. I would agree with that, sir.

Senator ALLOTT. So that the other factor in this—which seems to be forgotten by those who feel constrained to comment on this—is that into this must go the millions of dollars of research. We have had some evidence on that here. Mr. Jones said yesterday that he thought it would go well over $100 million in research, and from that evidence the total looked for here by the private sector might well go into hundreds of millions of dollars for research into this area, plus the actual construction of the retorts and mine operation, plus the continuing expense of mining and operating of the mines, plus the expense of retorting, plus the expense of hydrogenation and the elimination of undesirable qualities in the crude that you get. So that, in the total product that could be expected from this, about the most that would be expected under the acreage limitations provided under law, are that a company could provide itself with reserves, but in the production of those reserves it could hardly be expected to find any such thing as a "windfall." Is that true?

Mr. CAMERON. That is exactly true.

I have been in this oil shale business for almost 20 years, and for about 19 of them I have had to explain to almost everyone why I thought shale oil could be produced economically. In the last year I have been astounded that I have had to explain why there was no bonanza in it.

Senator ALLOTT. Now, just one other comment I would like to make. I would like to compliment you particularly on your statement with respect to conservation. I know of no company that is interested in oil shale development which is not fully aware of the need to take care of conservation, and to provide against air or water pollution in this area.

However, as you point out, the ecology of this country, if an oil shale development actually occurs, is going to be modified somewhat,

and that is inevitable. But, it is somewhat ironical that some of the people who raised this question are most of the same people who go out to paint our old mine shafts and mining properties in Colorado, and consider them of great value.

I do not advocate that. I think we can take care of it, and I am sure, as I said, that every company involved and interested is aware of this. I will say further that I think public opinion of the country is such that they would not stand for a despoilation of the countryside, such as occurred in the coal mining areas of some of our Eastern States.

Thanks very much for your very fine statement.

Mr. CAMERON. Senator, I think you hit on an important point there—public opinion. You know, oil companies sell gasoline to a very broad cross section of the public, and I cannot believe that any company would be immune to the type of criticism that would occur if it were the company that polluted the air in western Colorado or created a nuisance there. I think this is one of the things that, despite any other form of regulation, public opinion, the consumer, will force the companies to do a much better job in keeping this industry a clean one that we have ever had in the past.

Senator ALLOTT. I agree with that wholeheartedly. Thank you.

Senator Moss. Senator Hansen.

Senator HANSEN. First, let me compliment you, Mr. Cameron, for a very able and learned presentation. I think your testimony displays great objectivity and great intelligence.

I also recognize you as a man who has been associated with this business occupying all of your time perhaps longer than anyone I know, and that I can only assume, if you are not a great deal older than you appear to be, that most of your adult life you have been engaged in this great search to see how we can develop a source of energy from this natural resource that we have.

I would like to say that your opinions will be of real aid and value to the Congress, in my judgment, in helping to develop a policy that will best serve the national interest.

You said, I believe, that the industry is ready to proceed promptly to commercial shale oil production. By that are you implying that the problems of waste disposal and conservation of the resource and pollution of air and water are now susceptible to economic solution?

Mr. CAMERON. Yes, sir; I think so.

Senator HANSEN. Well, that is very encouraging news to get because I know that all of us are becoming far more conscious of the need to consider the problems that we created in the context of our whole environment, and that is good news.

Mr. CAMERON. I think over the past few years most of the companies who have been working on oil shale have recognized the importance of this. I am certain that the Oil Shale Corp.—I believe they mentioned this—has this problem well in mind and has at least one solution to it.

Senator HANSEN. You made some reference, I believe, to improved solid mining techniques. How does waste disposal fit into this technique as you envision the operation?

Mr. CAMERON. I believe perhaps you may be referring to the mining technique that I described to the committee at an earlier hearing. This would be a block cave-in system in which the oil shale would be re-

moved and the surface would subside into the hole. Then the spent shale, the residues, would be put back into the hole, so that when you get through you would have replaced the oil shale with the spent shale. We have discussed this method, which I first suggested here, with several countries, and we find that there is considerable interest in it. We had been hopeful that the Secretary's leasing proposal would, perhaps, make available some of these lands on which this would be applicable for experimentation and if successful, development of such a method.

Senator HANSEN. Very exciting.

You said, and I think I quote you correctly:

> In short I would like to see a vigorous competition for the energy market by all forms of energy, gaseous, liquid, electrical, or magnetic if Dick Tracy is right, and by all potential sources of energy, petroleum, natural gas, oil shale, tar sands, nuclear, solar, and hydro. Inter-fuel competition has one sure winner—the consumer.

That was very refreshing to me to hear you say that, because I think at times some of us tend to become obsessed with the specter of someone coming in and stealing a great national wealth.

I gather from this statement that you feel very vigorous competition within the various sources of energy will result in the consumer being the winner. Would you care to amplify that last statement?

Mr. CAMERON. Well, I do not think there is any question about that. This was in part of the statement that I did not read. I say that the cost of electric power has continued to decrease over the last two or three decades mainly because of competition, and the competition was from different sources of energy—nuclear, coal, natural gas, oil. Mr. Winger very nicely presented that and showed where oil has lost out in the electric power business almost entirely as a result of the competition.

I do not think this represented any disaster to have oil lose this market. I think the consumer benefited, which has definitely been shown by the decrease in his cost of electric power. If, in the liquid fuel market, we can bring in the competition that may be offered by oil from oil shale and other sources, we certainly will benefit from it as a nation and as consumers, and I think that the conventional petroleum industry will benefit from it because they are not going to give up easy. They are going to find more oil. They are going to find it cheaper, and with all due respect to my friends and customers in the petroleum industry, petroleum exploration needs competition, it really needs it.

Senator HANSEN. I could not agree more with you.

In discussing alternative sources of energy, do you believe that equal ground rules for development, leasing rentals, and royalties must be established in order best to promote our national interest?

Mr. CAMERON. Absolutely. This, I think, is the reason that oil shale—and Mr. Hartley said this yesterday—was not started when they completed their research project in the midfifties, that the ground rules are not the same for oil shale as they were for other sources of oil.

Senator HANSEN. One of the most exciting developments when we contemplate our reactions to a crisis such as the Mideast crisis earlier this year, is to look around and see what potentials we have in this country or in this hemisphere. In that search I think all of us have focused attention upon the Athabasca tar sands, and recognizing as

we all do, the extremely close relations between Canada and our Government, it seems as if there has been great interest, not only by our Canadian friends, but by the American interests as well in the money they have invested, so I am told, in the Athabasca tar sands.

Could you tell us what has gone on up there as you understand it, what are the prospects for some real sources of supply coming from those sands?

Mr. CAMERON. Well, as you know, Senator there is a commercial tar sands plant which is in operation right now and is expected to reach full capacity of 45,000 barrels per day during this fall. There are applications before the Province of Alberta for two additional projects, each of 100,000 barrels per day. The Province has held back these others to see how this first one comes out and to protect its domestic oil industry.

But I get the impression that the Mideast situation has been reviewed carefully by the Province with the lessees of the tar sands lands in Alberta, and that there may very well be some change in policy in the wind which will essentially open up the tar sands for development. If we see this, and it would not surprise me, we can see 200,000 or 300,000 barrels a day of tar sands production developed in the reasonably near future, and the investment of well over a billion dollars to do this.

Senator HANSEN. Is some of that American capital?

Mr. CAMERON. I would say it is all American capital.

Senator HANSEN. May I infer from what you say, then, that this American capital is not necessarily going to be invested in the Green River Plateau unless the probabilities of a profitable return on investment would indicate that that has prospect and real possibility out there as compared with other areas; is this a fair statement?

Mr. CAMERON. There are two points. One is return on investment, and certainly punitive regulations which increase costs and reduces return on investment will hurt oil shale.

The second is—and I think this is important—that the North American continent needs new large sources of oil. The statistics we have heard here at these hearings indicate this very clearly. If the companies are foreclosed from moving ahead in oil shale, I think it is their obligation to go somewhere else to make sure that the North American continent has an adequate supply of oil. So they must go to the next available and most profitable operation, and tar sands may be this next one.

Senator HANSEN. Do they have substantial reserves insofar as present evidence indicates?

Mr. CAMERON. Yes. They are of the same order of magnitude as oil shale.

Senator HANSEN. I would like to ask, Mr. Chairman, if I may, that if Mr. Cameron has any additional information on this particular subject he would like to submit for the record, that you choose the manner in which you might wish to present that information.

Mr. CAMERON. Fine.

Senator MOSS. That will be granted. The record will be open for at least a week.

(The information requested is as follows:)

CAMERON & JONES, INC.,
Denver, Colo., September 21, 1967.

Subject: Hearings on Oil Shale, September 14 and 15, 1967

Hon. H. M. JACKSON,
Chairman, Committee on Interior and Insular Affairs,
U.S. Senate, Washington, D.C.

DEAR SENATOR JACKSON: During my testimony at the hearings Senator Hansen requested that I submit additional information on the development of the Athabasca tar sands in Canada, as this relates to future competition for shale oil.

Exhibit A is a list of the companies holding tar sands rights in the Province of Alberta together with acreages held by each company or group of companies. Exhibit B is a map of the bituminous sands area of the Province of Alberta giving the lease numbers for each tar sands lease now outstanding. These numbers key to Exhibit A. Essentially all major U.S. oil companies have tar sands leases.

The following is my understanding of the oil sands development policy of the Province of Alberta and the possible changes in this policy now being considered.

In October, 1962, the government announced its policy for the development of the Athabasca and related tar sands. The essential features of this policy are as follows:

1. Beyond Reach Markets

Applications for oil sands production "able to reach markets clearly beyond present or foreseeable reach of Alberta's conventional industry" would not be limited providing the development program meets conservation and related requirements of the Oil and Gas Conservation Board.

2. Within Reach Markets

Applications involving the marketing of tar sands production "within reach of Alberta's conventional industry" would:

A. For initial development be restricted to a volume in the order of five percent of the total market for Alberta crude oil and

B. For subsequent development be restricted to ensure that "market growth" enables "the conventional industry to produce at a greater proportion of its productive capacity" and with respect to the scale and timing of incremental oil saids production by relating such production to "the life index of proven reserves of conventional oil . . . ".

The government's intent in the policy was to provide for the orderly development of the oil sands in such a manner as to supplement but not displace production from the conventional industry.

Under 2.A above the Province approved the application of Great Canadian Oil Sands Company, Ltd. for the first commercial plant with an authorized capacity of 45,000 barrels per day. Construction of this plant has been completed and the $240,000,000 installation is to be dedicated September 30, 1967. Two applications for 100,000 barrels per day each are pending.

During the last year the government has received presentations from several companies requesting modifications of the existing policy to permit additional production. These modifications are as follows:

1. Redefine "within reach" and "beyond reach" to broaden "beyond reach" from a strictly geographical meaning to one that would include any markets which Alberta's conventional industry is not now serving or can hardly be expected to serve in the foreseeable future because of price, quality or other reasons.

2. Where it can be demonstrated that the applicant's marketing proposal would provide additional growth by the development of a "new" market, tar sands could share in this market to the extent of 50 to 75% even though the market fell into the definition of "within reach". Tar sands production under this modification to the "within reach" limitation will be restricted to 100,000 barrels per day unless the international situation should dictate otherwise, in which case their limit may be increased.

These changes in policy, if put into effect, will allow most if not all those companies with firm plans to go ahead with production. Over $1 billion in new plants have been proposed.

It is apparent that the Province of Alberta is moving expeditiously to develop their tar sands resources in consonance with the demands of the market and the desires of industry to provide supplemental sources of oil for North America.

It was a pleasure to appear before your committee and if I can be of any further service please call on me.

Very truly yours,

RUSSELL J. CAMERON,
President.

EXHIBIT A

Tar sand leases and prospecting permits in the Athabasca Tar Sands area of Alberta, Canada

TAR SAND LEASES

Company name	Lease No.	Acreage
Aquitaine Co. of Canada, Ltd	39	49,742
Arrowhead Exploration Co., Ltd	23	36,937
Atlantic Richfield Co	40	[1] 22,054
	54	49,483
	55	26,002
	56	23,377
	57	49,451
	58	36,042
	59	45,414
	60	31,250
	61	26,641
	63	43,562
	65	49,467
	66	49,419
	70	46,802
	71	36,492
	72	41,618
Atlantic Richfield Co. and Imperial Oil Ltd., and Cities Service Athabasca Ltd	79	27,265
	81	41,954
	42	21,729
Bailey Selburn Oil & Gas Ltd	19	18,758
Bailey Selburn Oil & Gas Ltd., and Whitehall Canadian Oils Ltd	20	13,657
	25	49,964
Great Plains Petroleum Ltd., and Colorado Oil & Gas Corp	5	5,874
Can-Amera Oil Sands Development Ltd	43	49,784
Canadian Fina Oil Ltd	6	6,440
	7	2,866
	8	1,393
	9	5,601
	11	2,483
	12	4,174
	33	22,700
	34	9,129
	82	48,489
	35	49,904
Canadian Husky Oil Ltd, and Husky Oil Co	15	2,094
Canex Gas, Ltd	17	49,788
	22	49,591
Cities Service Athabasca, Inc. and Atlantic Richfield Co. and Imperial Oil Ltd., and Royalite Oil Co., Ltd., c/o Synerude Canada, Ltd	29	49,722
	31	49,870
	32	11,365
	41	18,491
	78	36,086
Colorado Oil and Gas Corp. (See Great Plains Petroleum Ltd.)		
French Petroleum Co. of Canada, Ltd	50	32,824
Great Canadian Oil Sands, Ltd	14	4,177
Home Oil Company, Ltd	30	37,715
Husky Oil Co. (See Canadian Husky Oil, Ltd.)		
Imperial Oil, Ltd. See Cities Service Athabasca, Inc.		
Imperial Oil Limited and Cities Service Athabasca, Inc., Atlantic Richfield Co., Royalite Oil Co., c/o Atlantic Richfield Co., 650 Guinness House, 727 7th Ave., Southwest, Calgary, Alberta	40	[1] 22,054
Mic Mac Oils Ltd	18	49,969
Mobil Oil of Canada, Ltd	16	5,824
	21	2,584
	36	12,156
	37	49,751
	38	26,339
	73	49,931
Pan American Petroleum Corp	76	49,837
	67	25,969
Regent Refining Ltd	68	46,154
	69	23,377
Royalite Oil Co., Ltd. (See Cities Service Athabasca.)		

See footnote at end of table, p. 433.

EXHIBIT A—Continued

Tar sand leases and prospecting permits in the Athabasca Tar Sands area of Alberta, Canada—Continued

TAR SAND LEASES—Continued

Company name	Lease No.	Acreage
Shell Canada Ltd	13	49, 872
	26	23, 506
	28	40, 642
Sinclair Canada Oil Co	42–A	16, 209
	45	49, 731
	53	49, 419
Sun Oil Company, Ltd	52	35, 109
	74	23, 353
	75	25, 945
	10	11, 227
	27	49, 994
	83	624
Supertest Petroleum Corp	84	49, 379
Syncrude Canada Ltd. (See Cities Service Athabasca).	85	49, 419
Tenneco Oil Co	[2] 86	3, 898
Texaco Exploration Co	24	49, 941
	87	49, 427
	44	49, 775
	46	49, 751
	47	49, 735
	48	49, 763
Whitehall Canadian Oil Ltd. (See Bailey Selburn Oil).	49	49, 727
Wood Oil Co	51	49, 503
	77	6, 792

TAR SANDS PROSPECTING PERMITS

Company name	Permit No.	Acreage
Amerada Petroleum Corp	127	35, 258
	128	28, 734
	129	11, 918

[1] Represents changes since map was published.
[2] Formerly Lease No. 4, renewed as Lease No. 86.

Senator HANSEN. One further question. I appreciate that I have taken a long time, but I think what you have said is of such importance that we ought not to pass over it hurriedly.

We are not the only nation in the world with oil shale; isn't that true?

Mr. CAMERON. That is correct.

Senator HANSEN. What other country has significant oil shale deposits?

Mr. CAMERON. Brazil probably has the second largest, but both the Soviet Union and Estonia and mainland China in Manchuria have deposits that are being produced commercially.

Senator HANSEN. You say they are being produced commercially?

Mr. CAMERON. Yes, sir.

Senator HANSEN. Is the Soviet Union actually producing oil?

Mr. CAMERON. Yes, sir; they are producing both oil and gas and chemicals. I might add for your information, Senator, that there will be a technical meeting in the Soviet Union sponsored by the United Nations, an oil shale meeting, next August, in which the broad spectrum of technological papers would be given on oil shale. This may be our first opportunity to observe firsthand some of the Soviet developments in this area.

Senator HANSEN. Well, that is certainly very interesting.

Let me compliment you again on a very excellent and comprehensive statement, Mr. Cameron.

Mr. CAMERON. Thank you.

Senator MOSS. Thank you very much, Mr. Cameron. Your testimony has been good, and we appreciate it. Your prepared statement will be included at this point.

(The statement referred to follows:)

STATEMENT OF RUSSELL J. CAMERON, PRESIDENT, CAMERON & JONES, INC., DENVER, COLORADO

Mr. Chairman, I appreciate this opportunity to appear again at your Committee's hearings on oil shale. You may recall that I presented the statement of Mr. Richard T. Eckles for the State of Colorado at your earlier hearings in February of this year. Today I am here as a representative of my company, Cameron and Jones, Inc., an engineering consulting organization that for many years has been engaged in activities relating to the development of oil shale. We also have a strong interest in the conversion of coal into liquid and gaseous fuels and the production of oil from other bituminous minerals such as tar sands. Our staff of about 20 scientists and engineers are specialists in synthetic fuels and ours is one of the largest organizations in this field.

I am a chemical engineer by training and was a member of the staff of the Bureau of Mines oil shale project at Rifle, Colorado from 1948 until 1955. During the last twelve years my company has been consultant for the Brazilian government in its oil shale development program. We have this past year completed the engineering for a 2,500 ton per day semi-commercial oil shale retort now under construction.

We have also served as consultants for various state and Federal agencies of this country and for many private companies, organizations and individuals. I am a member of Governor John A. Love's Oil Shale Advisory Committee and a member and director of the Rocky Mountain Oil and Gas Association whose oil shale committee has carefully studied the problem of leasing the Federal oil shale lands.

Before discussing the leasing of Federal oil shale lands I would like to make a few comments about oil shale in some of its broader aspects.

Oil shale is beset by many problems—technological, legal and economic. Some are real, some are not. All are compounded by prejudice, emotion and ignorance. But none are beyond solution.

To solve these problems for the benefit of all concerned, the public not the least, private industry and all three branches of government have a job to do. Industry must assume, without equivocation, its traditional responsibility for resource development by supplying capital, technology and management, and government must afford it the opportunity to do so by fair and equitable rules. The Congress must establish, with unmistakable clarity, the policy under which the resource is to be developed. The Executive branch must administer these policies with wisdom and justice. The Courts must resolve expeditiously the perplexing legal problems that carry over from the past. Only by such measures will the nation benefit fully from this resource.

Almost everyone agrees that oil shale will be needed by this country to supply a part of its future oil demand. Differences of opinion occur as to timing. Need also is a relative term. Perhaps we don't *need* shale oil today because there is no actual shortage and we may not lack oil in an absolute sense a decade from now. But what about the strategic value of an oil shale industry at the next interruption of Mideast oil?

In his press conference August 18, President Johnson correctly and succinctly said that shale oil will play no part in the oil disruption brought on by the current Arab-Israeli conflict. If oil shale is a feasible source of oil, and I believe it is, we should establish this fact and make our billions or trillions of barrels of shale oil an active deterrent to interruptions in oil supply. The tendency toward political unrest many places in the world will increase as our dependence on overseas oil increases and conversely will decrease with the ability to supply our needs from domestic sources.

In my opinion industry is ready to proceed promptly to commercial shale oil production. By beginning large scale operations and by this means only, will we

know how much dependence should be placed on shale oil, and only an industry in being is of any use in an emergency. At least a decade will be needed to attain a significant flow of oil from oil shale if we start now. I believe it to be in the public interest for the Federal government to encourage the early initiation of shale oil production.

Federal policy favors the use of coal as a source of oil and gas and provides direct Federal assistance through the Office of Coal Research. Of the more than $50 million of contracted research by OCR about 90% is for projects to convert coal to oil and gas. Conventional petroleum operates under a system of state and Federal regulation that encourages the mainitenance of a strong domestic industry, including sufficient productive capacity to meet extraordinary needs.

But where is the encouragement for what is admitted to be our largest petroleum resource—oil shale? Where else do we have the potential for hundreds of billions of barrels of oil and ultimately even trillions? Furthermore, industry has indicated its willingness to develop shale oil without the expenditure of government funds. Yet our policies discriminate against oil shale (1) by a significant differential in tax treatment, (2) by highly restrictive provisions in the proposed Federal leasing regulations, and (3) by a suspicious and hostile attitude toward private enterprise as the vehicle for shale oil development.

I would like to mention one other facet of the overall energy supply problem—competition. Electric power is produced from oil, gas, coal, uranium and falling water. This competition has reduced electric power costs despite the inflationary trend. Coal, thought once to be on the way out, is now a solid competitor of nuclear energy thanks for improved technology. Coal miners, by the way, are the third highest paid group in industry.

The market for liquid fuels on the other hand, gasoline being the most important, has been the sole province of petroleum. If coal is to be brought into this competition, why a de facto exclusion of oil shale? There has been a suggestion from time to time that shale oil should be "phased" into the energy supply. Why not open the competition and make it effective by establishing ground rules that give each source an even break?

In short, I would like to see a vigorous competition for the energy market by all forms of energy—gaseous, liquid, electrical (or magnetic, if Dick Tracy is right) and by all potential sources of energy—petroleum, natural gas, coal, oil shale, tar sands, nuclear, solar and hydro. Inter-fuel competition has one sure winner—the consumer.

FEDERAL OIL SHALE LEASING

Our company responded to Secretary Udall's invitation to comment on the proposed oil shale leasing regulation, Mr. Chairman, and I have attached to this statement a copy of our comments which I offer for the record of your hearings. In summary we have told the Department:

(1) That a limited opening of Federal oil shale lands is needed to prevent windfall profits, to promote competition in oil shale and to accelerate the development of the resource.

(2) That leases should be granted under a competitive bidding procedure with due dilligence requirements to maintain the lease, and a provision to credit a part of the bonus payment against royalties during the first 10 years of the lease to encourage higher bids and early development.

(3) That the election of production or research be that of the lessee since some companies already have acquired shale oil production technology.

(4) That government not attempt to own or control the technology thereby removing the competitive force created by the "better mousetrap" philosophy.

(5) That research by the lessee be allowed the same confidential status as exploration for oil, gas and other minerals on public lands with appropriate government agencies having access to information needed for efficient administration of the lease.

(6) That the method of applying royalty under these initial leases conform to conventional practice, leaving to the Public Land Law Review Commission and the Congress the responsibility for changes in concept; further, that the royalty burden be moderate so as not to discourage the heavy investment of capital that is needed.

(7) Finally, we recommended, as discussed earlier in this statement, a policy of encouragement rather than restriction, since oil shale, though large

in potential, is still a low grade mineral that will require the greatest ingenuity technologically to create from it any wealth whatsoever. We also urged that private enterprise, not only in words but in fact, be assigned primary responsibility for oil shale development and that wherever possible competition be demanded in all endeavors associated with the establishment of the industry.

CONSERVATION

Before concluding this statement there is one additional aspect of oil shale development on which I should like to comment, a problem that is of concern to the Secretary, to the members of this Committee, to the industry and to the public. That is the subject of pollution, of alteration of the environment, of the prevention of waste, and other matters that are described by the term *conservation.*

We all know, especially those of us who live in Colorado, Utah and Wyoming, that we can tolerate no conditions in an oil shale industry such as have been created in the past by the indifference to damage to the surroundings by some mining and milling operations. At the same time we must recognize that any large industry will change the ecology. We should not fear this because, since little industry exists in the areas involved, we have an opportunity to build a model industrial community.

Nor should we fear mining as such. As long as we extract minerals from the ground and treat them for the recovery of valuable components, the digging of ores and the disposal of solid, liquid and gaseous wastes will be with us. There are methods now and others are being developed to prevent the problems that have seemed to be an inseparable part of heavy industry, mining in particular. It is in this area that Federally-supported research and state and Federal regulation should be channeled. We can and do have mining operations that are assets not only financially but in a scenic and aesthetic sense. Oil shale can and should be developed in this same way.

I have emphasized mining as the basic approach to oil shale utilization. *In situ* or in place treatment of oil shale both with and without the application of nuclear explosions, is held out as the means to avoid the necessity of mining. As I discussed with you at the earlier hearings we do not have a practical *in situ* retorting method nor is there a certainty that one can be developed. In some ways the technological problems are as tough as those encountered in space exploration and with oil shale there are economic bounds within which one must stay.

We should continue research into concepts for *in situ* retorting because certain of our deposits do not seem amenable to present mining methods. By the same token large reserves are not recoverable by an *in situ* retorting approach now being considered. This is especially true of nuclear *in situ* methods.

My point is that we must necessarily proceed with oil shale development using a mining approach. Strict discipline and control must be exercised to ensure that long term pollution and despoilment problems are not created. Even if practical *in situ* methods are devleoped, mining is going to be a part of the industry by this should not be cause for alarm.

COMMENTS ON THE PROPOSED FEDERAL OIL SHALE LEASING REGULATION

(Prepared by Cameron & Jones, Inc., Denver, Colo.)

CAMERON & JONES., INC.,
Denver, Colo., August 14, 1967.

DIRECTOR, BUREAU OF LAND MANAGEMENT,
Department of the Interior,
Washington, D.C.

DEAR SIR: In accordance with Notice of Proposed Rule Making published in the Federal Register, Vol. 32, No. 90, Wednesday, May 10, 1967, page 7086 (43 CFR, Part 3170) OIL SHALE, and the extension of time for comment, Federal Register, Vol. 32, No. 115, Thursday, June 15, 1967, we are pleased to present comments and recommendations for your consideration in amending the subject regulation.

For your information, Cameron and Jones, Incorporated is an engineering consulting organization with a full-time staff of 18 practicing registered professional engineers whose primary interest and activity is in the field of oil shale technology. The company has headquarters in Denver, Colorado and operates world wide. It has, over a period of more than twelve years, acted as consultants in oil shale matters for many clients including the States of Colorado and Utah; the Department of the Navy; Petroleo Brasiliero, S.A. (the national oil company of Brazil); the Oil and Gas Conservation Board of Alberta, Canada, many of the petroleum producing and marketing corporations of the United States; and other companies, individuals, and organizations interested in shale oil and other minerals in oil shale. A brochure describing more fully the background and activities of the company is attached.

The comments we offer are submitted in the belief that some modification of the proposed regulation is needed to make this instrument effective, not only in the development of the public oil shale lands, but in the early establishment of a viable oil shale industry While we hope the attached report will explain fully our viewpoint, I am available to supplement these comments verbally if you so desire.

Respectfully submitted.

RUSSELL J. CAMERON,
President.

COMMENTS ON THE PROPOSED FEDERAL OIL SHALE LEASING REGULATION

Since we are engineers and not lawyers or technicians of leasing form and practice, our comments will deal with those areas in which we feel some competence, generally the technology and economics of oil shale utilization. The extensive background of our staff in both government and industrial research also qualifies us we believe, to comment on aspects of the proposed regulation concerned with research and development.

We have attempted to look at the regulation without preformed opinion or doctrinaire attitude. However, as representatives of the private sector of our society, our opinions may carry a certain bias in favor of competitive free enterprise. For this we make no apology since we do not believe such bias to be in any way alien to the public interest.

We are in no sense acting for any of our clientele and the opinions, comments and recommendations given are our own. Furthermore, since we played a part in the discovery of the saline minerals in the Piceance Creek oil shale deposit and are an interested party in a contest now before your office regarding a sodium prospecting permit, we shall refrain from comment on this aspect of oil shale leasing.

THE LEASING QUESTION

We 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 our 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. We 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.

We believe the commercial development of the private lands will precede that on Federal leases. Within 5 years initial large-scale production will begin. However, there probably are only a half-dozen companies with holdings suitable for immediate development. A sizable percentage of the private lands are of marginal quality, in small tracts, in litigation over title, or combine some or all of these deficiencies. An estimate of private land holdings with an indication of their quality is shown in Table 1.

TABLE 1.—*Privately held oil shale reserves*

[A—Colorado, 25 gallons per ton or better, rim deposits, owned in fee simple; B—Colorado, 25 gallons per ton or better, deep deposits, owned in fee simple; C—Colorado, 25 gallons per ton or better, rim or deep, unpatented claims; D—Utah, 15 gallons per ton or better, fee land; E—Utah, 15 gallons per ton or better, State leases]

Company	Shale oil reserves (billions of barrels)					
	A	B	C	D	E	Total
Integrated oil companies:						
Standard Oil Co. (Ohio)	[1] 2.6			[1] 0.8		3.4
Sinclair Oil Corp	1.2	3.7				4.9
Mobil Oil Corp	3.6				3.2	3.6
Standard Oil Co. (Indiana)	.2			.2	2.3	3.4
Atlantic Richfield Co			5.0			2.5
Union Oil Co	5.0					10.0
Cities Service Co	1.5	2.8	[1] 2.9		8.2	1.5
Shell Oil Co						13.9
Standard Oil Co. (California)	7.8					7.8
Continental Oil Co	.3	2.0				.3
Marathon Oil Co						2.0
Gulf Oil Corp	.1			1.2		.1
Texaco, Inc	1.6					2.8
Tenneco Oil Co	.1					.1
Getty Oil Co	4.2					4.2
Humble Oil & Refining Co	.8	6.2	2.1			9.1
Independents and others:						
Amerada Petroleum Corp			.6	[1] .6		.6
Cleveland Cliffs Iron Co	[1] 2.					2.6
Equity Oil Co	2.	3.6	.6		2.4	6.2
Husky Oil Co						2.4
Louisiana Land & Exploration Co			.6			.6
Skyline Oil Co				.4		.4
Superior Oil Co	.5	1.8			.5	2.3
Shamrock Oil & Gas Corp						.5
The Oil Shale Corp	[1] 2.	1.5	[1] 4.6	[1] .6		8.7
Union Pacific Railroad Co	[2]	[2]	[2]	[2] [3] 1.1	[2]	[2]
Utah Shale Land Co					11.8	1.1
Western Oil Shale Co					11.2	11.8
Others	.4		?			+11.6

[1] Most or all under purchase options or contracts from owners.
[2] Very large, low-grade Wyoming reserves.
[3] Shale grade is better than 20 gallons per ton.

To limit development now to those with adequate land positions excludes some of the most capable research-minded companies and almost all of the independents. It has been argued that anyone seriously interested in oil shale can purchase reserves. Even if possible, the price would be high adding an unnecessary element of cost to an already marginal economic situation.

We believe it timely to remedy the artificial shortage of oil shale lands and eliminate the opportunity for "windfall" profits created by this shortage while at the same time making it possible for the public to participate from the beginning in revenues from shale oil production. By this is meant competitively established bonuses, rentals and royalties.

SHOULD LEASES BE COMPETITIVE OR NEGOTIATED

In our 1963 report to the State of Colorado, we expressed the following viewpoint on the method of awarding leases:

". . . There is ample precedent for competitive bidding, and it obviously yields a direct financial return to the government."

"Competitive bidding also has questionable effects, however. Will it insure earliest possible development of the resource? Will it exclude the smaller company? Would the money spent for leases be of greater benefit if used to develop the property?"

"There should be a serious effort to devise a satisfactory, non-competitive leasing procedure that places an obligation for early development on the lessee. Only in the event of failure to work out such a procedure should competitive bidding be considered."

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, we 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. While such a bonus arrangement should encourage development, it still would be prudent for the government, and not onerous to the lessee, to include strict development requirements in the lease. The lessee should be given maximum latitude in his development plan, consistent with good conservation practices, but due diligence should be required and the term should be extended only by production. If a lessee has not attained a commercial level of production in 10 years his lease should be subject to cancellation.

The position of the "independent" may still be of concern. Can he compete successfully for a lease? Does he have adequate technological qualifications? Is the ultimate cost within his financial capabilities?

Oil shale is not a game that everyone can play. The large capital requirements and the specialized technology will prevent all but financially-strong technologically-oriented companies from entering into the production phase of the business. Joint ventures to pool capital, share risks, and combine talents are essential and must be clearly provided for and encouraged. There are medium-sized companies that have the capabilities and, in our opinion, the desire to own oil shale leases and produce shale oil on a joint venture basis. The smaller company will probably defer entry into the shale industry until a technology is well established and the profitability of the business is better assured. With the limitation on acreage that can be leased there would be adequate land available for those choosing to wait.

In summary, we 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.

DEVELOPMENT OR RESEARCH—WHAT SHOULD BE EMPHASIZED

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? We suggest a better balance of the two phases.

First, some organizations are well advanced in their knowledge of techniques to mine and process oil shale, or have access to such knowledge through licensed processes. Should they not be given equal opportunity to lease public lands?

Second, we 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. The government need not and should not be a party to this decision.

Third, we suggest that the plan for research and its execution are too closely controlled. If the lessee is using his own funds they will be expended as productively as he knows how.

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. Be assured that no company will make the large investment for a commercial plant without adequate research.

COMPETITIVE OR GOVERNMENT CONTROLLED TECHNOLOGY

The proposed regulation, if it ever became effective would tend to vest control of oil shale technology in the Federal government. Is this intended? If so, we are unalterably opposed because we do not believe it to be in the public interest.

If the purpose of the clauses relating to disclosure and patents is to provide government with the knowledge to administer the Federal oil shale lands there are other better ways this can be accomplished. Holders of mineral leases routinely make confidential disclosures of information to the Geological Survey. If research results and other data obtained by the oil shale lessee should be required by the government a similar procedure should be followed.

If the objective of government control of the technology is to promote competition by providing everyone with the same processes on an equal basis, this logic is questionable and ignores other important factors in establishing competition. Perhaps the most significant is the competitive aspect of technology itself. Proprietary technology arising from independent research by competing organizations probably is the most powerful competitive force in our economy today. To eliminate or dull it, to remove the fear that a competitor may devise a "better mousetrap" makes for a complacent technology.

The coal and cement industries today and synthetic rubber under goverment ownership are classical examples of industries without strong proprietary research. The amazing improvement in the competitive position of synthetic rubber after the establishment of private ownership also is classic.

There is no fear in our minds that any one inventor or any one company will obtain a technological hammer-lock on the oil shale industry. The history of the petroleum industry has been one of successive invention and innovation. Seldom has one process or method been supreme for more than a few months or at most a few years. There is no reason to expect this pattern to change in the oil shale industry if competitive forces are allowed to act.

We have mentioned previously that financially strong technologically oriented companies will form the oil shale industry. There should be no concern that such organizations will need Federal assistance to acquire technology. And if an operator chooses not to develop his own technology he can buy it. Many research-minded companies derive significant income from licensing patents and know-how. In the case of oil shale the processes now being developed are available under license.

We hope those parts of the regulation dealing with disclosure and patents will be changed to promote a proprietary competitive technology. If changes are not made the regulation will not be effective for any purpose because it will not be used. We do not believe any company or group of companies will finance research under terms that require complete disclosure and the assignment of patents for use by competitors. As we interpret the regulation, the lessee could not even practice his own technology without authorization from the Secretary of the Interior.

Even if the research contemplated were financed by the government as has been proposed by Galbraith the technology so developed is likely to be mediocre and certainly less viable than that resulting from competition. And there is no cause for the government to spend tax money for such a purpose until and unless it is established that private funds are not available.

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 or 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 the 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.

Since the subject of royalties will no doubt be considered by the Public Land Review Commission, we suggest a more conventional approach to oil shale royalties until the Commission's findings can be invoked generally.

Aside from the question of whether or not a new concept of royalties should be used for oil shale, is the problem of the economic effect of the proposed royalty. The rate of return needed to attract capital for oil shale development is discussed below.

According to Fortune's survey of the 500 largest industrial corporation, the return on investment for all industry in 1966 was 12.7% after income taxes. This ranged from 10.4% for paper and wood products to 18.4% for pharmaceuticals. Mining, at 16.2%, was the second most profitable industry with petroleum at 12.3% just below the median. Statistics on before-tax income were not included in the reference but State and Federal income taxes can be expected to total about 50%, making before-tax income about twice the return after taxes.

The point of these figures is this. To compete successfully for capital funds oil shale must necessarily be as profitable as other industries. Being a new and more speculative business, and presumably an expanding one with a high proportion of profit being retained for expansion, oil shale will need a higher-than-average rate of return. A 30% before-tax profit would not be out of line.

With inter-fuel competition expected to keep prices near present levels, it will be difficult to achieve a 30% before-tax return without royalty. The proposed 50% royalty on income above the 20% level will make this impossible. The result will be no development on the public land.

The Governors of Colorado, Utah and Wyoming have cited other shortcomings of the progressive net profits royalty as applied to oil shale which we will not repeat. We concur with these and join in recommending that this royalty concept be removed from the regulation.

It is our belief that minimal royalties will be required at the present time to encourage development of the Federal lands. We 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 *in situ* 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 same manner. With experience, an appropriate royalty rate can be established which necessarily may be less than 12½%.

NEEDED—LESS RESTRICTION, MORE ENCOURAGEMENT

In our comments and recommendations we have taken the viewpoint that early development of oil shale is desirable and inclusion of the public lands in such development is in the public interest. Whereas the proposed regulation emphasizes research, we place our emphasis on development under a competitive system that will encourage the needed research.

We 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.

While not strictly a comment on the proposed leasing regulation, we believe it germain to point out that oil shale needs encouragement—not restriction. Even the richest of oil shales must be classified as a low-grade mineral. While the resource in Colorado, Utah and Wyoming has enormous potential its values cannot be realized without great effort by both government and industry to remove man-made obstacles and find acceptable solutions to technical and economic problems.

Senator Moss. Dr. Orlo Childs, president of the Colorado School of Mines, will be our next witness. Dr. Childs, we are very appreciative of your being with us and staying through these hearings and bringing to us the great fund of knowledge that you have, and that you bring also from the Colorado School of Mines.

Dr. Childs is a member of the Secretary's Oil Shale Advisory Board, and a former resident of my State, so I am delighted to have him here.

Senator ALLOTT. Mr. Chairman, may I add a word of welcome to that. All I can say is thank heavens that he and two others, one of whom is a resident of your State now, are members of the Board. Otherwise we might not have found any trace of sanity in the reports.

I want to compliment Dr. Childs on the very brilliant leadership he has provided to what I believe now is the sole surviving mining school in the United States, and we are proud that he is there, and very proud that the school is there. It is a great thing for our country. Am I wrong in that?

Dr. CHILDS. What?

Senator ALLOTT. Dr. Childs, that it is the only surviving mining school unincorporated within a larger university; is it not?

Dr. CHILDS. By the name of the School of Mines, it is the last remaining; that is correct.

Senator ALLOTT. That is what I thought.

Dr. CHILDS. The others are all either a part of a State university or they have enlarged the spectrum of their general range to the point of including all kinds of other things.

Senator ALLOTT. Yes.

STATEMENT OF ORLO E. CHILDS, PRESIDENT, COLORADO SCHOOL OF MINES

Dr. CHILDS. Mr. Chairman, I would like to make it rather clear that I am not here as a spokesman of my board of trustees. I am not here in any official capacity other than my own personal interest, my personal interest being primarily dictated by the fact that I head up a school whose principal objective is the training of engineers and scientists who will seek careers in mineral resource industries. Hence the help of mineral resources in the national economy is an extremely important aspect of our concern.

I might mention to you that a number of the items of my statement are identical with the statements that I made before the Hart committee recently, and I think Senator Hansen was in attendance at those meetings, so you must forgive me the repetition. I hope you will interpret it as emphasis.

Senator HANSEN. May I interrupt you, sir, to say that I was most impressed with your testimony at that time, and I am delighted to be exposed to it again. You had so much to say with so few words that I am certain I could hear it a number of times and not get all of the import of it.

Dr. CHILDS. Senator, I am afraid I am not going to read the whole statement. May I ask that the entire statement be placed in the record. In a way, this hearing reminds me somewhat of the oil shale problem. Gentlemen, we are running out of time.

Senator MOSS. Thank you. The statement will go in in full. We do not want you to limit yourself unduly, because we look forward to hearing from you. But to the extent that you are able to do so, we would appreciate a summary.

Dr. CHILDS. Well, I have tried to cut down my statement, and it has become so disjointed that I would like to make a few comments and then place the entire statement in the record. There are a few new things or new points of emphasis that I would like to bring up.

During the past 3 years much that has been said of our oil shale in special advisory group meetings and technical symposia and congressional committee rooms, and in considering the birth of the oil shale industry, the discussions usually involve one basic question: Will the land be made available for development by private enterprise or will this resource be developed by Government agencies?

May I submit to you gentlemen that if such a question had been posed a hundred years ago, and if the decision had been in favor of Government development, the growth of mineral resources in the national economy would have been quite different, and I believe, far below the level of economic growth which this Nation has experienced.

The debate of the private versus Government development has brought forth many warnings of dangers of giveaway, the danger of recurrence of Teapot Dome scandals, et cetera. Tea Pot Dome has been brought up here a number of times.

I would like to just state that in a letter from Byron Mock there was a very interesting statement made, and I will quote him:

> Tea Pot Dome was not a scandal so much because of the chosen instrument that was selected. It turned out to be an excellent business deal from the government's point of view. The scandal arose from the personal benefits sought and accepted by a government official behind closed doors. An open competitive system could prevent that. The inactivity of government since the 1920 Mineral Leasing Act may in itself be considered a scandal. The failure to secure rentals has deprived the government of large amounts of rental revenues. The failure to issue leases even in the period from 1920 to 1930 prevented the development of proper adversary proceedings to eliminate mining claims or perfect them under any of the methods available, including, as provided in the law, the substitution of a lease for an unpatented mining claim or claims. Today this substitution would be impossible.

Another point that I would like to draw from my statement is that much has been said about the magnitude of the oil reserve estimates attributed to the oil shale deposits of the West. Let me look for a moment with you at the magnitude of the investment involved when we look beyond the research at our best estimate of what it will cost to establish production.

To establish mines, retorting mills, and other facilities necessary to develop oil from oil shale ready for the refinery, we believe the cost would range near $125 million for production of 15,000 barrels per day. In the next 10 years our excess producing capacity of approximately 3 million barrels per day will be essentially depleted.

May I break in here for a moment to say I have been amazed at the comparability of the figures that have been used in this hearing. The president of Humboldt, the president of Union Oil, today Mr. Winger, Mr. Winston, all of us are practicaly using identical figures, and I was not aware of their figures. I think we have drawn them from primarily individual sources.

In the next 10 years, as indicated earlier in this treatise, and I spent some time developing this, our present excess capability, which is reserve because of the allowables, because of the states of maximum production, will go from approximately 3 million barrels a day down to less than a half million, 0.6 of a million barrels per day. Oil shale can best serve as a supplement rather than as a substitute and can take up this gap. However, at the rate of $125 million per each 50,000 barrels per day, that investment would be $6.5 billion.

Now, remembering also from what Mr. Winger said, and what I developed a little bit earlier in my presentation here, we are going to fall 4 million barrels behind daily requirements in the next 10 years, and therefore, you can see that this estimate is a minimum of that which would be required to hold us on an even keel.

Recently, in a hearing in New Orleans conducted by the Public Land Law Review Commission, it was estimated that total investment required for getting production from our Outer Continental Shelf was $6.5 billion, exactly the same amount.

At the hearing, none of the distinguished Members of Congress seemed inclined to believe that Congress would have been amenable to appropriating $6.5 billion for opening off-shore oil when exploration and production first began south of New Orleans.

Gentlemen, I think those people who championed the concept of Government production have failed to gather the point of the tremendous cost involved; and in the overloaded Government budgets of today, no room will be found for this kind of investment.

Excuse me, I feel so disjointed in this presentation that I am embarrassed. But I would like to dwell for a few moments on the particular items of the leasing regulations with which we have had a great deal of difficulty in the Colorado School of Mines Research Foundation in talking to potential clients about continuing the research at Anvil Points, which, as you know, has expended over $7 million in the last three years. So let me take them by number.

1. Should the adequacy of research performed be a Government judgment? If a given company is faced with the large investment involved in converting its operation from research to commercial production, is not the company itself in the best position to choose the step of major risk in allocating its money to commercial operation?

I believe they are.

2. If all information from research is to be made immediately available to the public, what possible advantage would accrue to the company investing in research? Why not sit back and let the others, and I suppose only Government would be the others, so interested do the preliminary work. Looking forward to a practice of open bidding for commercial acreage, would it not be better to release this information once commercial operations had begun so the company can enjoy some competitive advantage from its extensive research investment?

3. Should the disclosure of all oil reserves and the revelation of all background and new patents, be as restrictive as now seems to be required? The variable definitions of "reserves" as controlled by economics of production and by the differences in large and small company definitions might make such disclosures incomparable between companies.

I have been very interested, since coming to Washington, to learn of Battelle's approach to Union Oil to use their facilities. To my knowledge they did not approach us, because had they approached us there would have been, of necessity, because of our arrangements with the Government, the requirement for disclosure of any practice which they might achieve from their work. This is not attractive.

4. Can a further commitment be made regarding the size of a parcel of land that will be made available for commercial production? At present there is a great deal that must be taken on faith.

5. Can the sliding royalty scale be meaningfully laid out without a history on which to base this requirement? I think this whole area of royalty has been discussed beautifully in the hearings of this committee, and I cannot do anything further with it.

I would like to make this further statement. In our overprotectiveness we may now be setting up stringent regulations that will strangle an industry before it can evolve. Once the history of an oil shale industry has developed, a better basis for a pertinent regulation can emerge and will emerge. Regulations once set in print and established as precedent are difficult, nearly impossible, to change. Too much regulation and too much detail might well create an unworkable monster of control that could prove outmoded in its first year of operation. Let us not forget that economic incentive is a vital part of private initiative, and this aspect, too, must be protected in the contemplated development of an oil shale industry.

Mr. Chairman, I applaud the resolve of this committee in its desire to look deeply into the problems and the policy involving oil shale. In your wisdom you may find that the base of law on which administrative decisions must now be made is far too general. Such generalized authority may now be forcing our Secretary to follow an overly cautious route.

You, as the Congress, cannot dictate administrative practice except by review of existing law and the enactment of new legislative directions.

Those of us concerned about oil shale hope for the removal of the roadblocks that have kept this industry dormant for over 40 years, and we applaud the interest and the attention you are giving it. Thank you.

Senator Moss. Thank you very much, Dr. Childs, for your very fine statement. Your summary may have made it a little disjointed, but what you had to say was certainly very powerful and to the point, and we are glad to have your full statement for the record. Your background and experience and the position that you now occupy in the Colorado School of Mines, and your service on the Oil Shale Advisory Board, bid us to pay attention to your words, and we do. We are very happy to have your comments. Your closing words about the oil shale industry having been kept dormant for 40 years is certainly something that does concern this committee greatly, and we are anxious, if we can, to awaken "Sleeping Beauty" and get this industry on its feet and operating. Your advice and your comments are certainly appreciated. Thank you.

Senator Allott.

Senator ALLOTT. Well, I would like to comment on two or three things. First of all, the Colorado School of Mines Research Foundation, of course, is the entity with which the Department of the Interior contracted for the operation of the research at Anvil Points, and I think that should be mentioned.

Dr. CHILDS. I think I forgot to say, Senator Allott, that as president of the Colorado School of Mines, I am also president of the Research Foundation and hence, my deep interest in this problem.

Senator ALLOTT. Then I must say in talking with various people who have been involved in that research I have heard nothing but the

highest praise for the way the research foundation has handled its obligations there, and it would be remiss of me if I did not express that. I think we are also indebted to you or to the foundation for the small samples of oil shale which were before each member of the committee when we started these hearing yesterday.

Just as a personal aside, I can recall when I was a very young boy, and that is a little over 40 years ago, that oil shale was then a matter of common discussion. I can remember going out on the prairies west of Pueblo, Colo., and everybody was going to get rich from oil shale. We were picking up various samples of shale, particularly if they had a little dark streak in them, and applying matches to them to see if we could not find a deposit for ourselves then. So it has been a long time coming.

I think one of the most valuable things in your statement is your reference to the Battelle situation with Union Oil Co. To those who are fearful that everybody is going to get something for nothing in this thing, I think it is significant that in this instance a private company has contracted with a research institute, the Battelle Institute, on far more liberal terms, both as to royalties—there are no royalties—and as to patents than the Government is willing to contract by the proposed regulations with responsible members of industry.

And, secondly, I would like to ask you this question, and I ask it in the sense that I consider you an authority and an expert, and if I were qualifying you in court I would do more qualifying besides that, but do you really think, in view of the lack of ground rules that are laid in the regulations for any production leases, that a company which has already spent millions of dollars in research in this area can afford all of the indefiniteness of the future by proceeding with the so-called exploration leases now?

Dr. CHILDS. No, sir; I do not. I made quite a point of this in my appearance before the Hart committee. I am glad to put this, also, in the record here.

It is not feasible to think of research as only something that goes on antecedent to production. It is an ongoing process throughout the entire history of preliminary work and development, and if one were to take a small lease at a given point in the Piceance Basin and do research there on the process of extracting oil, having drilled wells there to determine the nature of the character of oil shale deposited there, and then be forced to go to another place 30 miles away or 20 miles away in the basin to acquire what he had learned in this new locale, he would have to virtually start all over again because the conditions to be found in one spot must not be anticipated to be exactly those conditions at another spot.

So if there is an assurance that a site can be chosen for preliminary exploratory research that very same site should be susceptible to enlargement into a commercial production so what has already been learned can be most effectively applied.

Senator ALLOTT. As I interpret the regulations there is no such assurance in the regulations.

Dr. CHILDS. And I think I mentioned that in my statement. I said that there was no such assurance that there would be commercial production at all. It is taking it purely on faith. I made a point of that in the discussion.

Senator ALLOTT. Well, thank you very much, Dr. Childs.

Dr. CHILDS. Before you leave that, may I just take a moment. I find that the involvement in oil shale is historical in the Colorado School of Mines. Back at the same time that you mentioned, about 1922, the then president of the Colorado School of Mines wrote a book on oil shale, and his preface statement was, "The development and the production of oil shale is just around the corner." It is not a corner, it is a 40-year curve.

Senator ALLOTT. That is very well put.

Senator Moss. Senator Hansen.

Senator HANSEN. Let me say again that we are most grateful to you for your appearance here and your contribution again today.

I would like to make note of the fact that Dr. Childs has an awfully big ax to grind. It is his responsibility to try to serve the public interest as well as he possibly can, and as I reflect upon the numbers of graduates of the Colorado School of Mines who have made significant contributions to Wyoming's economy, I am, perhaps, more grateful than some in my appreciation of what your great school down there has done.

But the point I want to make is this: We have heard from a great number of people who reflect, perhaps, every bit of the spectrum of public interest, and I think that we can attach special significance to your statement, to your approach, and to the points that you make because—and I repeat—the interest you are serving is the public interest. I think the observations that you make are particularly pertinent, and I just hope that every member of this committee and, indeed, every Member of the Congress will have occasion to read what you have said here, because it seems to me you have done an excellent job in pointing up what the possibilities are and what could result if we happened to be misguided and if we follow false prophets in seeking to protect the public interest and thereby denying recognition of the fact that the first and greatest public interest to be served is to make available a cheap source of energy.

It has been pointed out by previous witnesses here that competition has been the greatest drive to a low-cost product, a low-cost service in this country, and you stress that point here. I think you have made a great contribution, Dr. Childs. I appreciate your being here.

Dr. CHILDS. Thank you, Senator. Thank you very much.

Senator Moss. Thank you, Dr. Childs. We do appreciate your coming. Your prepared statement will be printed in full at this point.

(The statement referred to follows:)

STATEMENT OF ORLO E. CHILDS, PRESIDENT, COLORADO SCHOOL OF MINES

OIL SHALE—THE PROBLEMS OF BEGINNING

In 1966, the total demand for crude oil and gas liquids in the United States was 12.3 million barrels per day. Yet we produced only 80 percent of our needs from oil fields of the Nation; we imported the remaining 20 percent, 2.4 million barrels per day. During the next 10 years, the anticipated demand for crude oil and its products will increase at a rate of 2 to 3 percent per year. Thus, in 1977, we shall require a daily minimum of 15.8 million barrels of oil. Even the most optimistic expectations of new oil to be found over the next 10 years indicate an increase at only *half the rate of increase* in demand. This lag means that our domestic production of oil and gas liquids in 1977 will be 4.2 million barrels per day *short* of expected demand. Therefore, an important question during the next

10 years is whether we shall become a Nation more and more dependent upon imports to satisfy our daily requirements.

The recent events of the Arab-Israel conflict have brought to sharp focus the dangers to our national security, dangers that intensify as we drift more deeply into a national policy of ignoring the availability of important oil resources within our own country. Newspapers around the Nation have carried stories about Arabian oil boycotts and about the dislocation of available sources of foreign oil. One newspaper story from the Associated Press included the following statements: As Arab oil nations began to boycott the West, Egypt closed the Suez Canal, blocking a major supply route for the bulk of the Middle East oil output and thus sealing off the shipment of 9 million barrels of oil per day from the Middle East. Regardless of this action, the United States, with oil to spare, has no reason to fear that shortages of its own might develop: turning only a few valves could offset Arab imports of approximately 400,000 barrels per day. The United States could boost its products by 3 million barrels per day or more. However, this quantity would be far short of the Western European markets requiring 4 million barrels per day from the Middle East and nearly 2 million barrels a day from North Africa. Even with strong assists from Venezuela and Canada, the United States could not hope to export sufficient oil to cover European requirements

Even when such news writers feel they must mollify American readers by assuring that no shortage will occur, grave doubts seem to emerge about our ability to meet long-term European needs along with our own. We are told we can turn to our own excess-production capability and to the Caribbean or Venezuela to meet our own import needs. However, delays of a few months caused by major boycotts could cause supply problems that would soon reach major proportions, beyond those experienced during the Suez crisis of 1956. As you know, during the present unsettled European demand and supply problem. Europe's supplies, normally shipped by tanker through the Suez from the Middle East, are now taken by tanker around the Cape of Good Hope. A smaller amount of oil is still piped directly to Mediterranean ports. Major dislocations of supply of crude oil for the world market have profound affect upon our own national production. At the present time, output in some of our most important producing states is limited by daily allowables. Thus we have a current excess producing capability. At best we can only estimate what that capacity might be. If called upon, the increase would only be monetary and would almost immediately begin to decline. We could produce more oil tomorrow than we are producing today—perhaps 3 million barrels per day more than is now taken from our wells. However, without reacting to world dislocations, in the normal course of supplying America's increasing demand in the next 10 years, our anticipated excess producing capacity which is possibly 3 million barrels per day, will decrease to 0.6 million barrels per day as we face the expected increased demand of our own country.

We are not finding new reserves as rapidly as we are using the oil already found; moreover, domestic oil is becoming more difficult and more expensive to locate. Costs of exploration and production go higher each year as exploration must become more sophisticated and as drilling moves to deeper horizons on land and to deeper water offshore. Much of the current oil production in the United States is from fields discovered many years ago. Our oil companies have the advantage of producing oil that may have been found 20 years ago at low cost alongside oil found at the higher cost of present economics. The old oil is "dollar averaged" with new oil to provide the profits demanded by the stockholders, who select companies that show the best profits. Many of our oil companies have engaged in extensive foreign exploration and development of crude oil. In total company business, this oil also is "dollar averaged" with the higher cost domestic oil.

There is no shortage of world oil for world markets. Yet it is a sobering fact that great deposits of oil in the world have been found in countries where governmental restrictions and controls are quite variable because of the instability of the governments of those countries. Oil is definitely part of the economic power struggle in international politics.

A most important aspect that must be considered is that within the United States we have oil resources in oil shale that, if developed, can insulate our country from the vagaries of oil supply in world economic politics. If it is left undeveloped, there is no such insulation. Because oil shale stands on the horizon as

a needed supplement to the crude-oil resources of this country, it must somehow find its place in tomorrow's national economy. If an oil shale industry is allowed to start now, it can mature without wasteful subsidy. There is a lead time of 5 to 10 years necessary to bring this resource efficiently and economically into national use. Because a crash program would be ineffective and inefficient, we must have the foresight to start this process now rather than wait to see it be born out of economic or military chaos.

For the past three years, the Colorado School of Mines Research Foundation has acted as the lessor of the Anvil Points oil shale research facility near Rifle, Colorado. A thorough research program in the extraction of oil from oil shale has been going on there as an extension of the technology developed by the U.S. Bureau of Mines in earlier years. Six major oil companies—Mobil, Humble, Pan American, Phillips, Continental, and Sinclair—have participated in and provided the financial support of this research. To date there has been an expenditure of $7 million. The interest of these companies in advancing oil shale technology is real, and the research effort is a major one. I am sure that this effort was in good faith, looking forward to when land would be made available for commercial development of oil shale as an energy resource. This work is continuing toward that objective.

The Federal government owns approximately 72 percent of the total land layered with oil shale. The richest and thickest beds lie beneath these lands; thus, perhaps 85 percent of the total resource is government controlled. In the Piceance Basin of Colorado are many unpatented oil shale mining claims dating back before 1920. There are also patented claims around the periphery of the basin and some patented land along stream valleys within the basin. Additional mining claims since 1920 and leasing since 1930 of oil shale have been withheld by the Federal government.

During the past three years much has been said about oil shale in special advisory group meetings, in technical symposia, and in the committee rooms of Congress. In considering the birth of an oil shale industry, the discussions usually involve one basic question. Will the land be made available for development by private enterprise, or will this resource be developed by government agencies? May I submit to you that if such a question had been posed a hundred years ago, and if the decision had been in favor of government development, the growth of mineral resources in the national economicy would have been quite different, and, I believe, far below the level of economic growth this Nation has experienced. Ours has been a heritage of private capital; significantly, the emergence of mineral-resource wealth in this Nation has carried our people to the highest living standard in the history of mankind.

The debate of private versus governmental development has brought forth many warnings of "the danger of giveaways" and "the danger of the recurrence of Teapot Dome type scandals." These cries of doom, from those who believe that only government research and development can serve all the interest of all the people, have done much to slow the policy decisions needed so badly in recent years. At this critical time, it is inappropriate to fan the fires of emotion and fear and in so doing endanger the long-range values of resource development as a base to our national economy.

Enforced inactivity since 1920 is clearly a disservice to the Nation and in itself scandalous. Mr. Byron Mock, a fellow member of the Oil Shale Advisory Board, has pointed out to me that the "Teapot Dome was not a scandal so much because of the chosen instrument that was selected. It turned out to be an excellent business deal from the government's point of view. The scandal arose from the personal benefits sought and accepted by a government official behind closed doors. An open competitive system could prevent that . . . The inactivity of government since the 1920 Mineral Leasing Act may in itself be considered a scandal. The failure to secure rentals has deprived the government of large amounts of rental revenues. The failure to issue leases even in the period from 1920 to 1930 prevented the development of proper adversary proceedings to eliminate mining claims or perfect them under any of the methods available, including, as provided in the law, a substitution of a lease for an unpatented mining claim or claims. Today this substitution would be impossible."

For years the Secretary has heard the warning cry of pending scandal if any action were taken. He has been advised that there is no need for anything but continuing research. In January, 1967, the Secretary of Interior announced a five-point program of departmental action on oil shale matters. His resolve to

move forward toward a new, reasonable policy and the action already taken can only be considered as courageous progress in the face of much vocal opposition.

In early May of 1967, the Secretary released proposed regulations for leasing oil shale lands as an implementation of "Point 3" of his five-point program. The department is now receiving suggestions for possible changes in these regulations before they are formalized. From the beginning, it has been stated that some aspects of the regulations would be negotiable; however, there is still doubt as to what specific features will be held directly to the wording of the regulations.

The Department of Interior is aware of the interest of the Colorado School of Mines Research Foundation in a research lease once the regulations are firmed. The Foundation seeks to interest industry in the financial support of important research in developing the technology of extracting oil from oil shale. Financed by a consortium of companies, this is planned to be a major research effort with an anticipated budget of $5 million per year over a 5-year period. Economics incentives will be mandatory if this budget is to be realized from private capital. Our interest is primarily in the research effort antecedent to commercial development; it is anticipated that we would withdraw from the effort once commercial production begins. Only production-problem solutions would be referred to us as we visualize the on-going production effort. However, in our early planning, we have been reminded again that research does not terminate at the beginning of production. This is a continuing activity that begins with development of efficient skills, solution of basic problems of understanding, and carries into the daily problems, that emerge with commercial production.

Economic feasibility is of particular importance in attracting major financial support for the research effort. Participation in this research effort must provide attractive prospects for gaining vital knowledge about the entire technology of extracting oil from oil shale. If this program is to be truly attractive and meaningful in the inception of a new industry, there must be a government policy that will recognize and assure that the research performed will lead to an opportunity for commercial production with reasonable profit expectancy. Only then will the expenditure of approximately $125 million to set up commercial operation be a reasonable step for any company.

Much has been said about the magnitude of oil-reserve estimates attributed to the oil shale deposits of the west. Let us look at the magnitude of investment involved when we look beyond research at our best estimate of what it will cost to establish production. To establish mines, retorting mills, and other facilities necessary to develop oil from oil shale ready for the refinery, we believe the cost will range near $125 million for production of 50,000 barrels per day. In the next 10 years, as indicated earlier in this treatise, our excess producing capacity of approximately 3 million barrels per day will be essentially depleted. Oil shale can best serve as a supplement—rather than a substitute—for natural crude oil and if in the next 10 years oil from shale is to replace only our present excess capacity to produce, production investment of $6,500,000,000 will be needed. Remembering also that domestic supply will fall behind expected demand by 4 million barrels in the next 10 years, it is clear that this expenditure is a minimum estimate.

Recently, at a hearing in New Orleans conducted by the Public Land Law Review Commission, it was estimated that total investment required for getting production from our Outer Continental Shelf was $6.5 billion. At the hearing, none of the distinguished members of Congress seemed inclined to believe that Congress would have been amenable to appropriating $6.5 billion for opening offshore oil reserve when the exploration and production first began there.

Overloaded government budgets today will not find room for such investments in oil shale. This is a time for the full play of the research ingenuity of private enterprise; it is not a time for the restrictions of governmental straightjackets. The production skill of private industry will best serve the public interest by creating new resource wealth which povides the tax base for government. It does not seem reasonable to many of us that government should contemplate heavy expenditure of production investment, when the encouragement of private industry would shift the risk from government operation to the private sector and would further enrich the tax base.

In the light of the kind of research effort needed and of the scale of commercial investment to be faced, a number of facets of the proposed regulations for leasing raise serious questions that must be answered by either less stringent written regulations or a broader scope of negotiation on a case-by-case basis. Important problems and questions that now emerge in considering the proposed regulations are:

1. Should the adequacy of research performed be a government judgment? If a given company is faced with the large investment involved in converting its operation from research to commercial production, is not the company itself in the best position to choose the step of major risk in allocating its money to commercial operation? Remembering that production research will continue with daily operations and problems to be solved, can any governmental inspectors reach a meaningful judgment of adequacy of research accomplished? Conversely, could the judgment of adequacy be held up indefinitely and thus never allow production, thereby causing waste of research investment by the company that has made this investment in good faith?

2. If all information from research is to be made immediately available to the public, what advantage would accrue to the company investing in research? Why not sit back and let "others" (perhaps only the government would be interested) do the preliminary work? During a time of open bidding for commercial acreage, would it not be better to release this information once commercial operations had begun so the company can have some competitive advantage from its research investment?

3. Should the disclosure of all oil reserves and the revelation of all background and new patents be as restrictive as now seem to be required? The variable definitions of "reserves" as controlled by economics of production and by the differences in large and small company definitions might make such disclosures incomparable between companies. The public availability of all background patents, even if on a reasonable license fee, may serve to deter participation because of the loss of a company's competitive economic advantage.

4. Can a firmer commitment be made regarding the size of a parcel of land that will be made available for commercial production? At present there is a great deal that must be taken on faith: first, whether a commercial lease will be given at all; and second, the size of the plot to be made available and thus the scale the eventual operation can reach.

5. Can the sliding royalty scale be meaningfully laid out without a history on which to base this requirement? If periodic reviews of royalty are to be conducted, would not this procedure within the guidelines of experience gained from production protect the public interest?

In our over protectiveness, however, we may now be setting up stringent regulations that will strangle an industry before it can evolve. Once the history of an oil shale industry has developed, a better basis for pertinent regulations can emerge. Regulations once set in print and established as precedent are difficult to change. Too much regulation and too much detail might well create an unworkable monster of control that could prove outmoded in its first year of operation. Let us not forget that economic incentive is a vital part of private initiative, and this aspect, too, must be protected in the contemplated development of an oil shale industry.

There are those who believe in the simple generalization that all government action is in the public interest and that private industry serves only itself. We must not be beguiled by those who consider government infallible and that total administrative regulation of our energy resources is the best way to serve all our citizens. Let us not be charmed and overawed by those who insist that *their* economic decisions be the base for regulations that directly, or indirectly, control the operation of the market place. Let us remember that our country has grown strong under a system that encourages investment of private capital with the profit motive as the catalyst for personal endeavor.

Senator Moss. I have some statements that have been submitted. Dr. Spencer Smith, who was listed as a witness, was present and asked that his written statement be placed in the record, and that will be done at this point.

(The statement referred to follows:)

STATEMENT OF SPENCER M. SMITH, JR., SECRETARY OF THE CITIZENS COMMITTEE ON NATURAL RESOURCES

Mr Chairman and members of the committee, I am Dr. Spencer M. Smith, Jr., Secretary of the Citizens Committee on Natural Resources, a national conservation organization with offices in Washington, D.C.

The Citizens Committee on Natural Resources has been concerned primarily with the renewable resources and appropriate policies dealing with their management. Our interest in the past, relative to oil exploration and production, has been primarily with related resources.

We do not presume to be experts in all of the highly technical matters that the development of oil shale involves, nor do we presume to chart a specific and deliberate course for such development. We do feel, however, that any such course should be investigated fully in order that all parties involved find their interests protected, and that a careful consideration is given to the many other resources that may be affected. As a result of these considerations we are wary of the Federal Government proceeding forthwith in commercial leasing for shale oil lands. We do not see any crises in the oil industry regarding the supply now avaible that would be such as to mitigate against a most full and thorough-going analysis of the many problems that are involved.

Oil shale was made a leasable mineral by the Mineral Leasing Act of 1920. Prior to that time it was locatable under the general mining laws. On April 15, 1930, Executive Order No. 5327 withdrew designated lands containing deposits of oil and shale from mineral leasing and reserved these lands until an investigation and classification could be made. At the time of that order, however, a number of claims had been filed and, to the best of our knowledge, there were somewhere between 125,000 and 175,000 unpatented oil shale placer mining claims prior to the enactment of the Mineral Leasing Act of 1920.

The main concentration of oil shale is in the Green River Formation of Southwest Wyoming, Northeast Utah, and Northwest Colorado. The bulk of these lands that are most likely to be developed first are located in the Piceance Creek Basin of Garfield and Rio Blanco Counties in Colorado. Although the area ownership as estimated from one source to another varied slightly, according to the Bureau of Mines the ownership of the oil shale lands is as follows:

	Acres
Privately owned including mineral rights	380,000
Federal lands involving disputed mining claims	338,000
Federal domain	582,000

There is estimated to be about 100 billion barrels of oil in both the privately owned lands and the disputed claims lands leaving approximately 1.1 trillion barrels of oil in the public domain.

Our present use of oil is at the rate of 3½ million barrels a year or slightly over 4 billion barrels if the recovery and use of gas condensate material is included, though the latter does not place a drain on known inventory. It is estimated that we have approximately a 50-year supply of oil reserves exclusive of that deposited in oil shale.

The issue now is whether to withdraw the Executive Order of 1930. On May 12, 1965 in the published hearings of the Senate Committee on Interior and Insular Affairs, the following colloquy took place relative to the status of the Mineral Leasing Act:

Mr. CARVER. Of the Mineral Leasing Act. Section 241 relates just to oil shale, and this, however, of course at the moment he has no authority to lease because the lands which would be subject to lease are, by the Executive Order, withdrawn.

In other words, that withdrawal must be lifted before leasing can legally go forward.

Senator NELSON. So that the record may give some idea of the significance of this authority in the Secretary, I want to read one sentence here.

An area in the heart of the basin of about 350 square miles contains some 600 billion barrels of oil equivalent, and in parts of this area a single 5,120 acre plot, the size of the lease presently provided by the leasing laws, contains as much as 18 billion barrels, an amount equal to nearly 60 percent of the Nation's proved reserves of petroleum.

So under this leasing authority the Secretary in his discretion may lease to one lessee the equivalent of what would amount to 18 billion barrels of oil equivalent from the shale on a 5,120-acre plot?

Mr. CARVER. If the withdrawal order were to be lifted, and I think the Secretary has authority also to do that.

Senator JACKSON. Was this a Presidential or Secretarial order?

Mr. CARVER. It is a Presidential authority—it is a withdrawal order and authority to lift it has been delegated——

Senator JACKSON. By the President to the Secretary?

Mr. CARVER (continuing). To the Secretary of the Interior.

It is impossibe to place an accurate value on the amount of oil contained in the shale deposits. This would depend in part upon the projected state of the mineral, upon the total amount recoverable and upon the costs of recovery. As a result the stated values have ranged widely from $300 billion to $2.5 trillion. No estimate has suggested, however, that the value is not significant.

The technology is a matter of considerable concern to us. The two methods are mining and retorting and in place (in situ). The first of these involves mining, crushing and retorting. This procedure appears to us to create significant environmental problems. The removal of the overburden with the subsequent adverse effect upon water and air pollution, and specially upon fish and wildlife, is a significant social cost. The second method is the application of heat to the shale rock, which has the effect of fracturing the shale formation. As a result the shale is left in place and the hydrocarbon vapors are recovered at the surface. The emphasis at the present time appears to be on the in situ process, since the cost may be less and the revenue to the Government larger. Such a comparison has not been proven to a point certain, however, and considerable effort must be undertaken to ascertain the comparative costs and efficiencies.

The Bureau of Mines pilot effort appeared to have great promise between 1944 and 1956 and as a result of operating a mine and several processing plants they proved that shale oil production was technically feasible. In 1956 the program was abandoned and it has been only recently revived on a very small scale. Also, the Colony Development Company is constructing a demonstration shale oil plant in Colorado with the capacity of 1,000 tons of shale per day and if this operation proves successful a commercial plant producing 55,000 barrels of shale oil per day will be constructed at a cost of $100 million. The private lands are ideally suited to the only technically proven method which is mining, retorting and dispersing of spent shale because the shale lies just under the surface in most of the private holdings.

In 1965, Secretary Udall appointed an Oil Shale Advisory Board, which in their report to the Secretary did not agree upon the public policy governing oil shale development. In 1965 the Congress established the Public Land Law Review Commission to evaluate the laws and policies dealing with the public domain, including oil shale, and to submit reports of recommendations to the Congress and the President in 1968. Secretary Udall, on January 27, 1967, indicated a possible development program, which he further detailed on February 21 before the Senate Interior Committee.

To the best of our knowledge, the cost discussions are by nature estimates, and while economists feel that the returns to scale are reasonably predictable, this could vary significantly relative to the techniques employed.

There are so many questions, Mr. Chairman, that we are reluctant to burden the Committee with them in their entirety. We therefore suggest the following as not definitive to the problems involved, but rather representative of some of the major concerns with which we are faced.

Certainly, we feel that a full scale survey should be made, which would determine precisely the location and areas of oil shale, which would further indicate the quantity and approximate value. Such a survey should be able to determine other minerals, both as to location and quantity. Intermixture of other minerals has presented problems, as is evident by the claims filed under the 1872 Mining Act, which preceeded the 1920 Minerals Leasing Act. These titles should be cleared, and mining claims for sodium minerals in 1966 should also be cleared. It would be necessary, perhaps, to extend the Secretary's stop order on filing of sodium claims by closing the developed area until possible conflicts are either reconciled or priorities of use are determined.

We hope that the Government will retain and support an expanded pilot project, which could achieve the answers in terms of cost and efficiencies. It is difficult for us to understand how any kind of commercial leasing by the Government can protect properly this investment that primarily belongs to the public. If the Government maintains control of such a process the full evaluation of

the impact upon resources, and the total environment will be done. Also, it appears to us necessary that the Government maintain the title to patents in order that they can at a later date be opened for the use of any and all firms interested in the development of oil shale.

We are dealing with an enormously valuable resource, most of which is publicly owned. We feel we have some appreciation of the dimensions of the problem to see that all parties are fairly compensated for their efforts and property values. Ideally, everyone would like to hope that the policies that are eventually promulgated will provide for a favorable return to the investor, a proper return to the wage earner, an appropriate return to the private owner, and certainly an appropriate return to the consumer.

Whether a special fund is established for the Government to receive the royalties, or whether they should simply be allocated, having first been taken into the general account, is not a matter of principal concern to us. We do feel that the allocation of these royalties, since they represent the holdings of all of the people of the United States, should take cognizance of the most pressing and significant needs. Obviously, our concern is the needed reinvestment in our natural resources.

The difficulty that has been manifested in the last decade of expanding sufficiently needed and important functions of the public sector of the economy should be reevaluated in light of the potential revenue available in properly exploiting our oil shale reserves. A plea should certainly be entered in behalf of needed conservation measures. We have been too little and too late in affecting adequate and prudent natural resource policies. The critical issue of the moment, since the depression years, has seemed to sweep away effective proposals and recommendations for such policies. World War II obviously relegated natural resource matters to quick and hurried exploitation of needed goods and services and an evaluation of our resource base was postponed because of the postwar adjustments. The 1950's ushered in Korea and attendant problems thereto, hence another postponement.

It was not until the 1960's that a renewed effort was made to refurbish, restore and protect a significant part of our natural heritage. Even with the expansion of National Parks, public recreation, and the protection of soil, air and water, our efforts to date continue to lag. The establishment of the Land and Water Conservation Fund, which was a means to finance Federal acquisition of needed recreation lands and lend financial support to the States for development and acquisition of recreation areas, was a good beginning.

Though this was landmark legislation, it was recognized very early after its passage that it could not meet all the needs that became more and more evident. The value of projects in this area now authorized by the Congress but not yet funded approximates $500,000,000. If we are to approximate our stated goals and realized objectives then this fund must be increased significantly in the very near future, for the ability to acquire the necessary land will be possible only within a short time period. We feel that the postponement of needed Federal expenditures in the past can be rectified in great measure by an allocation from oil shale revenues.

The present distribution of revenues from the public lands are allocated as follows:

1. 52½% to the Federal Reclamation Fund
2. 37½% to the States involved for general education
3. 10% to the Federal Government

We feel this formula should be revised to reflect the National interests. We are not suggesting any precise formula at this time because of the hazard of ascertaining with any certainty the exact amount of revenues available. We are aware that the needs of education in urban areas, as well as many other segments of our society, should benefit from these revenues. We are asking here, however, that full consideration be given to the much postponed considerations of effective natural resource policies and which have been forgone for so long.

We do not oppose the proper development of oil shale. We feel the revenues will be helpful for all concerned. We reiterate, however, that this great potential also can bring destruction and adverse environmental consequences can diminish significantly any net gain that may be realized by society. We have sufficient time for developing prudent procedures in developing this resource and we will err badly and irrevocably if we act precipitously.

Senator Moss. Mr. Kenneth Pomeroy, the chief forester of the American Forestry Association, also requested that his statement be placed in the record.

(The statement referred to follows:)

STATEMENT OF KENNETH B. POMEROY, THE AMERICAN FORESTRY ASSOCIATION

Mr. Chairman and members of the committee, I am Kenneth B. Pomeroy, Chief Forester of The American Forestry Association.

The central objective of our Association throughout its 92-year history has been "Conservation Through Wise Use". This concept is being applied to forest and other surface resources with increasing benefits to the Nation. Oil shale, however, presents some new problems of unknown dimensions.

The most obvious need appears to be for thorough advance planning. In the present embryo stage of oil shale development it is important to provide for orderly progress so that subsequent sacrifice of other resources will not become necessary.

Therefore, the Directors of The American Forestry Association recommend:

1. Initiation of an orderly and balanced program of research and development by government and industry
2. Assurance that public owners of this vast resource will receive full value during its development
3. Protection of other natural resources so that they will not be wasted or destroyed in the mining of oil shale.

Our concern was expressed in an editorial in the March 1967 issue of American Forests Magazine. With your permission, we wish to submit the editorial for inclusion in the record of this hearing.

Senator Moss. I notice from reading this statement that it refers to an editorial asking that that also go in. I do not believe the editorial is attached, so we must wait until that comes in order to make his statement complete and meaningful.

(The editorial referred to follows:)

[From American Forests, March 1967]

NO MORE TEAPOT DOMES

This is a story about buried treasure—and *you* own it. Locked up in rich marl deposits along the Green River in Colorado, Wyoming and Utah is an organic substance called kerogen. From this substance shale oil can be derived. Not uniformly distributed, the richest beds are in the Piceance Basin of northwestern Colorado. While title to some claims is clouded, it is known that the general government owns 72 percent of the total oil shale acreage in a 16,000 square mile area, including the richest deposits.

Worth of this buried treasure represents a potential bonanza that makes Gold Rush days seem pale by comparison. Were the government to purchase every redwood in California for a national park the total cost would represent mere penny ante stuff compared to the riches under the ground along the Green. Competent geologists estimate that oil from these deposits will one day fuel the nation for at least a century and some say two. An estimated 2,000 billion barrels of oil are available here for the economy when they are needed.

Yes, there is a sheer excitement about such fabulous sources of untapped wealth. Since time immemorial mining has always been wrapped up in the American Dream. The sourdough with his mule of former days is one of America's most picturesque figures. While our modern-day sourdoughs are well aware of the bonanza along the Green, few conservationists and next to no Americans are yet aware of what they own out there and the need for the prudent development of this wealth without undue haste with emphasis on the most exacting research. Great and good things for the nation can come out of these deposits in years to come providing our Secretary of the Interior and future Secretaries, the present Congress and future Congresses, show caution and restraint. This we are convinced Secretary Udall is trying to do. But he is going to need the help of all of us.

These deposits represent the largest known concentration of hydrocarbons in the world, or 60 times the proven domestic crude oil reserves elsewhere. In view of the stakes, Secretary Udall two years ago named an interim committee to study the prospects headed by Dr. Joseph L. Fisher, President of Resources for the Future, and an AFA Board Member. The committee agreed this wealth must not be locked up and that the aim must be wise use conservation in the public interest.

Opinions differed, however, on the immediate scope of the development task, the urgency for development, and who should do it. Milo Perkins was a spokesman for one group that felt the government, aside from certain basic research and conservation features, should stay out of the applied research and development areas. H. Byron Mock proposed that areas of each lease be set at 5,120 acres (or whatever proves economically feasible), sliding scale royalties, and putting up the known deposits for competitive lease. Industry requires such assurances to plan, these members said. Inherent in this thinking is the point made by geologist William W. Porter II in an AMERICAN FORESTS series last year, that timidity does not develop mineral resources; that too much caution can find a government or an industry caught flat footed when an emergency arises.

Replied Prof. John Kenneth Galbraith, "we agree it is not sound policy to lock up important resources . . . alternative fuel supplies are, however, wholly sufficient to permit orderly and equitable development of shale oil resources. Extravagant windfall or unknown rewards need not be paid for hurried development . . . there is no showing of urgent economic or strategic need for oil from the shale in the present or near future."

Actually, oil firms owning 168,000 acres of oil shale lands have not shown any great alacrity to develop their holdings, Galbraith indicated. They are, of course, understandably concerned with protecting their future position. Galbraith said further he is opposed to "commercial size leases" at present because it would be "inconsistent with wise conservation practice." Specifically, cost of development is still unknown, cost of production is still unknown and the recoverable value of oil in the land offered for lease is imperfectly known. "Given these unknowns the government would be offering a subsidy of unknown value for a development of unknown cost promising a return of unknown amount," Prof. Galbraith said.

"There is a businesslike, certain and straight-forward course of action" Galbraith said. "It is for the Department of the Interior, under appropriate authorization, to enter into contracts with interested firms tested by competence, to develop methods of mining and processing or *in situ* recovery of oil shale." Dr. Fisher concurred in part with this. What both scholars seemed to be saying is "let's not get the development cart ahead of the research horse." This one might add, also applies to the conservation cart. Too precipitous development would not be likely to give ecological factors needed consideration. In short, what effect would these developments have on water? On soil? On wildlife? On forests? On natural beauty? So far, we do not even know what kind of a hole would be required to extract the oil.

In his news conference of January 27, Secretary Udall indicated he will follow a prudent course. The Department will consider applications "for provisional developmental leases" on a two-phase basis: 1) research and development on only small acreages; and (2) acreages large enough to assure a commercial operation, *only when the research and development work has proved successful.* Meanwhile, action to clear titles will be started involving withdrawal of oil shale land from other mineral entry, a "blocking up" program will be begun, the uses of atomic energy explored, and a full-fledged government research program launched.

One might wish the Secretary had more fully spelled out the conservation needs that will accompany this effort. They will be numerous. He did pledge to "protect the public interest fully" and this, historically and otherwise, is what conservation will mainly concern itself with. The aim should be: 1) Good conservation on the Green; and 2) No more Teapot Domes. Prudence and tested research will help meet both aims.

Senator Moss. Mr. Clarence Justheim has sent a copy of a memorandum and the reply, asking that they go on the record. So I will, without objection, submit them for the record.

(The documents referred to follow:)

Memo From the desk of Clarence I. Justheim.

Douglas Aircraft Laboratories say they can build under U.S. Patent 3237689 and Canadian Patent 764769 a hot hydrogen nuclear reactor to produce light oils and gasoline *in-situ* from oil shale. As we are not limited to the kind of Reactor we no doubt could build a hot hydrogen plutonium breeder. While the hot hydrogen reduces the impurities in the kerogen to produce light oils and gasoline very valuable plutonium is produced as a by-product.

CONTINENTAL OIL CO.,
New York, N.Y., September 6, 1967.

Mr. CLARENCE I. JUSTHEIM,
President, Justheim Petroleum Co.,
Salt Lake City, Utah

DEAR MR. JUSTHEIM: I have carefully reviewed the information and proposal in your letter of August 24, 1967, and have also gotten the views of our technical people. Although your idea is an ingenious one, it does not fit into our picture at the present time.

Thanking you for thinking of Continental Oil Company, I am,

Cordially yours,

HOWARD W. BLAUVELT.

Senator Moss. Now, there have been certain other statements received that may be submitted. The record is going to be kept open for 10 days for additional statements.

Other persons who are listed as witnesses either weren't able to remain for the full time or may wish to submit a statement or others may come in or there may be amplification of statements that have been made by witnesses here.

I think this will then complete our oral testimony.

I know that Byron Mock has been here through this whole hearing. I sent down and asked if he would not like to appear and say a word before we closed. He declined the invitation.

I will extend it again if he cares to make any remarks before this committee, because of his long involvement in the problem and his service to the Secretary's Oil Shale Advisory Board. Mr. Mock, would you care to say a word before we recess?

STATEMENT OF BYRON MOCK, ATTORNEY, SALT LAKE CITY, UTAH

Mr. MOCK. Senator Moss, I am Byron Mock, an attorney in Salt Lake City who had the privilege of serving on the Oil Shale Advisory Board with Dr. Childs and four others, where we filed six separate majority opinions, sometimes known as six dissents, to our report. I think that that has been made part of the record.

Senator Moss. That is true.

Mr. MOCK. Subsequently I had occasion upon the request of one of the law journals to make an anlysis of the issues that were developed there and that also, I understand, has been made a part of the record.

If I might make just two remarks as a lawyer, one, no lawyer who has ever delt with titles in the public land area has ever failed to run into the problem of unpatented mining claims as an impediment to development, either for oil and gas or for other activities. This has been a continuing problem that has been resolved time after time by the active work of those who held Federal leases granted to them without a warranty of title.

In this particular instance, I think we should point out two things.

One is that, in the discussion this morning about mining claim, it was said that it was impossible to resolve them except taking them one by one or by a group case, and that this created an interminable delay.

The inability of the various parties to go in and file mining claims over those that had been filed and to develop them for dawsonite, nacolite, or the other products that may have been locatable, if any, was stopped when the land was withdrawn from entry. Thereafter, the man who was being held up as trying to take undue advantage of the Government got a free ride, because any claims that had not been perfected at that time—it would have been subject to relocation by other diligent citizens who wished to develop a mining claim—was denied. They could not step in under this relocation approach.

The second point that I think should be in the record is that in 1955 the Congress, in its wisdom, saw fit to pass a law that segregated leaseable and locatable minerals on mining claims that were filed after that date. Therefore, if a Federal lease for oil shale were granted under the competitive system and the party had a time limit within which he had to develop that property or lose his lease, in other words, a lease would terminate under the normal provisions at the end of a fixed term or so long thereafter as production is obtained, that man would have no choice except to develop the lease in order to hold it, and in that case he would be under the burden of clearing his title as to any of those adverse claims.

This has been done so many times that it is a device that has been well used. It was omitted that a mining claim such as those that were being discussed does not carry with it any of the leasable minerals, even if patented, and on that basis I think that there was a slight misconception presented in the discussion of the legal aspects of it.

For that reason, I appreciate this opportunity to add that for the record. I think anything else that I might say at this time would be purely on the basis of any questions that the Senators may see fit to ask.

Senator Moss. Well, we appreciate your comments and especially this clarification of the legal situation.

I think the impression was left out of the coloquy this morning that the only salvation here was the final withdrawal of the area from any further filing of claims and, as I understand your point, that had it remained as it was before then, that then, if leases were granted, those people would have the burden of clearing up the unpatented mining claims that was placed on the same land; is that your point?

Mr. Mock. That is correct, sir; and if the mining claims for any purposes had been imperfect, they could have been eliminated by the active action in the courts.

Senator Moss. So the burden then would not have been on any public department, the Solicitor, or anybody else. The burden would have been on the person who was granted the lease by the Federal Government.

Mr. Mock. This burden has been assumed by private industry for many years.

The other aspect of it, I think, that focuses the entire discussion is that the whole argument was that we should not have any location rights under the mining laws. That seemed to me to be the thrust of both of the statements, both for and against, this morning. If that is

the question, it is one for consideration of the Congress. The laws do provide for those.

If the land had not been withdrawn, the alleged inadequate locations by failure to monument under Colorado law, which supplements the Federal statutes on mining, would have been corrected by other locators locating over those claims that were improperly located.

The whole thrust of the mining laws has been not to limit the number of claims that a person can locate, but the amount of acreage he can hold under any one claim and, thereafter, he must protect that claim by making a valid discovery, by doing his assessment work, and otherwise maintaining it in good standing, and anyone who locates 31 quarter sections under association claims is probably going to be faced with an impossible situation; first, to make his discovery on each of them; second, to maintain his assessment work; and also to maintain the proper location procedures. This has been a very basic and a very active successful system of eliminating the greedy and awarding the diligent.

Senator Moss. Thank you very much..

Senator Allott.

Senator ALLOTT. Mr. Mock, I have known you for a great number of years, and you have had, I do not know how much, but a very great wealth of experience as a lawyer.

Mr. MOCK. It is limited to experience.

Senator ALLOTT. And knowledge in this area. But if we were to assume a modification of the regulations in which we are trying to pinpoint the problem of letting companies who are genuinely interested in this know whether or not they could obtain production leases, as a lawyer would you see any particular difficulty in providing for such cases by the Secretary of Interior through a clause which would make the development of such leases a condition for the continued holding of those leases?

Mr. MOCK. I think that in fairness to both the landlord, whether it be the Government or a private owner, and to the developer, that any omission of such a requirement would be unfair. I think that the welfare of this Nation is based upon, among other things, the creation of new wealth which creates a new tax base, and those who will take an old and valuable asset, whether it be a private owner or a government, and prevent the development, are not serving the public interest. Therefore, I think there must be a requirement for proper use in the development of any lands that are granted by lease, and the suggestion that you make is one in which I certainly do concur.

Senator ALLOTT. Yes. Then I ask you, as a lawyer, do you see any particular difficulty in writing such a provision in such a lease?

Mr. MOCK. Senator Allott, there are numerous lawyers in the Department of Interior and numerous outside that inside of 1 week could draw an adequate lease to protect the interests of the United States and provide for development.

Senator ALLOTT. I thank you very much, because there seems to be on the part of some adverse persons almost a phobia that this is going to end up in a speculative situation, which I am sure no member of this committee nor anybody, for that matter, who has testified here

would be willing to accept. With your remarks about lawyers in the Department of Interior and others being able to draft provisions in a lease which would inhibit, in fact stop, any procurement of leases for merely speculative purposes, I really feel we have no concern here, because I am sure the committee is at least of one mind in this respect, as most other people are, none of us wants to see this resource given away for speculation, but it need not be, and I am sure you agree with that.

Mr. MOCK. Sir, the responsible industry of this country, and I have had the pleasure of talking not only with Government officials but also with responsible industry in this country, feel that there should be strict penalties on anyone who takes and holds one of these leases without development. The incentives to develop should be accompanied by some penalties for failure to develop them, and they are willing to assume that.

The one thing they do ask for is some certainty that if they go forward with diligence that they will have some opportunity to recoup their investments.

Senator ALLOTT. And that cannot be done under the proposed regulations because of the failure to pin down the actual production leases.

Mr. MOCK. The uncertainty that exists in the present regulations would leave such a state of confusion that the financing of it by banks and others who might be asked to loan money would be literally impossible.

Senator ALLOTT. Well, thank you very much. I am happy that you appeared here.

Senator Moss. Senator Hansen.

Senator HANSEN. First, let me ask you, Mr. Mock, did you happen to file any comments in response to the publications of the proposed regulations by the Secretary?

Mr. MOCK. Senator Hansen, I have not personally sent any comments. I think that my position was stated rather fully, although because of the urgency of the final reports it was not stated as fully as I would have liked, in the report to the Secretary on the Interim Oil Shale Advisory Board.

I have, however, enlarged my comments by identifying the issues in a publication which I was requested to make and which is a part of the record, which appeared both in the Denver Law Review and was subsequently reprinted in the Rocky Mountain Mineral Law Institute publication.

Senator HANSEN. I would like to commend you for that very excellent article. I am certain that everyone who would be privileged to read it cannot help but be impressed with the quality of the contribution that you make.

May I express, too, my appreciation, Mr. Chairman, for the great assistance that our witness rendered the Governors of the States of Colorado, Wyoming, and Utah recently, and in an advisory capacity.

I take note also of the fact that he is making a very fine contribution to the Public Land Law Review Commission, and to those of us in the West concerned with the problems of the West. A lack of understanding and appreciation is all too often exhibited by people in other parts of the country, and I think that Mr. Mock has rendered yoeman service

in seeing that a greater number of Americans can understand some of the intricate and complicated problems that come into the area of administration of our public land laws.

I would like also to say that he is a very distinguished and interested citizen in the West, and for that we are again grateful.

Thank you very much, Mr. Mock.

Mr. MOCK. Thank you, Senator.

Senator MOSS. Thank you, Senator Hansen.

I echo the sentiments of my colleagues on this committee. Mr. Mock certainly is one of the best informed in this field of law pertaining to our resources in the West. His public service, when he has been called upon to serve on the Land Law Review Commission and the Oil Shale Advisory Board and other assignments, have all been discharged with great distinction. We appreciate your coming, and I ask your pardon for asking you impromptu to come up and testify. But I knew that you could add to our record a great deal with your comment, which you have done.

I am very pleased that you would do this for us. Thank you very much.

Mr. MOCK. Thank you very much, Senator.

Senator MOSS. That completes our witnesses. Is there anybody that we did overlook inadvertently or otherwise? These are all I have on the list.

As I indicated before, the record will remain open for 10 days, so if there is other information that should go into this record it will be submitted to this committee, and we will place it in the record following my remarks if it is on the subject and deals with the general problem we have, whether it is pro or con or any other point of view.

We are anxious to have before us all the information that we can gather so that the committee may address itself to this problem of the regulations that have been proposed by the Secretary.

(The data referred to follows:)

STATEMENT OF MR. J. R. FREEMAN, EDITOR, THE FARMER AND MINER NEWSPAPER, FREDERICK, COLO.

(*Committee note*: Mr. J. R. Freeman, Editor of the Farmer and Miner Newspaper, Frederick, Colorado was scheduled to testify before the Committee on Friday, September 15, 1967. Due to previous engagements, Mr. Freeman was not available to testify in person and his testimony was submitted for the hearing record. As a consequence, no opportunity was afforded to the members of the Committee to question Mr. Freeman or to seek documentation of allegations contained in his statement. The Committee invites Mr. Freeman to appear before the Committee at a mutually convenient time to elaborate upon his statement and to offer any additional testimony he may have on the development of oil shale.)

I. INTRODUCTION

Chairman Jackson and Honorable members of this very important Senate Committee: My name is J. R. Freeman. I am the editor and co-publisher of the Farmer and Miner Newspaper of Frederick, Colorado, located in the Congressional District in which the Colorado oil shale lands are situated. The Farmer and Miner is about the smallest weekly newspaper in this country, but its voice on oil shale has been heard in many parts of the nation.

I wish to thank Chairman Jackson for affording me, as editor of the Farmer and Miner, the opportunity to appear and testify on oil shale matters. I am delighted to appear before the Senate Interior and Insular Affairs Committee to present information on oil shale and on the proposed oil shale leasing and ex-

change regulations issued by the Department of the Interior as published in the May 10, 1967 Federal Register.

The Senate Interior and Insular Affairs Committee must be aware of the fact that I have written and published in the Farmer and Miner 38 articles in an oil shale series in excess of 100,000 words, entitled "The Multi-Billion Dollar Grab of Oil Shale Lands." Although I had written about oil shale in 1965, my series on oil shale began on June 9, 1966. The 38th article in my series was published on August 31, 1967. And the series will continue for some time into the future. Anyone who may be interested will find the complete series available through Mrs. Rice, Room 115–H, Legislative Reference Service, Library of Congress.

The Senate Interior and Insular Affairs Committee was provided a statement by me dated February 19, 1967, pertaining to oil shale in the hopes that the statement would be incorporated into the hearing record in the oil shale hearings held by this Committee at that time. Those of you who may be interested in additional facts and details about me may wish to refer to that statement which this Committee may find in my 23rd article of the series on oil shale, published March 2, 1967.

I believe it is appropriate for me to inform the Senate Interior and Insular Affairs Committee of the facts that the Farmer and Miner was awarded the 1967 National Herrick Editorial Award from the National Newspaper Association, for having tackled the timely subject matter of oil shale as was then evident from the fact that I had written and published 27 articles in my oil shale series at that time.

II. PROPOSED LEASING REGULATIONS ARE PREMATURE

The "swap" or exchange and leasing regulations proposed by Secretary Udall would give away too much too soon to the many people or entities who will be able to take advantage of the regulations if they are adopted as Federal Government policy. I will explain why in this statement.

III. OIL SHALE VALUES

(*A*) *Ownership per person*

Every American, according to former Senator Paul Douglas owns today in the vast public domain oil shale reserve in Colorado, Utah, and Wyoming at least 8,500 to 10,000 barrels of recoverable oil. See 33rd article in my oil shale series published July 6, 1967. Each American thus owns oil shale worth approximately $25,000 if it could be extracted.

(*B*) *Aggregate public ownership*

There are in total in the oil shale lands of Colorado, Utah, and Wyoming 2.6 trillion barrels of potentially recoverable shale oil. See 27th article in my oil shale series published April 27, 1967.

Roughly 2 trillion barrels of potentially recoverable shale oil reserves are contained in 4 million acres of the richer oil shale lands.

However the real rich oil shale lands are situated in roughly 200 square miles of land in Colorado, and a single 5,120 acre shale lease could embrace all the oil shale lands having a thickness of 1900 feet averaging 25-gallon-per-ton shale.

Roughly 50 trillion barrels of shale oil reserves are contained in 7 million acres of the poorer shale lands. The present value of the oil shale deposits and their associated mineral values is in the neighborhood of $5 trillion to $6 trillion. But it is forseeable that 8 to 10 years from now when oil shale development on a large scale is expected to occur, the oil shale lands in Colorado, Utah and Wyoming will be worth $8 trillion to $10 trillion if not more.

At present 70 percent of oil shale land in Colorado, Utah, and Wyoming is publicly owned as public domain, but 80 percent of the shale oil in such land is publicly owned.

However the American people will not own this public resource for long if past and present policies are allowed to continue.

IV. BONA FIDE DEVELOPMENT OF OIL SHALE ADVOCATED

Let me make one point crystal clear, I am for development of the West's oil shale resources. I want progress, but I want real honest-to-goodness development of the public lands for the public benefit. I do not want: (1) Enrichment of speculators who use phony oil shale mining claims filed 47 years ago to buy public land containing 3,000,000 barrels of shale oil per acre for $2.50 and then sell them to the oil companies for $2,000 an acre. (2) Transfer of the public

domain to the control of a few oil monopolists who lock up the oil shale so it won't compete with their Arabian and Texas oil. (3) Disposal of the public oil shale lands or leasing of large blocks of oil shale lands before the recovery processes are developed and the real values are made known to the public. (4) Robbery of the public through fraudulent, conniving, collusive or self-serving actions by public officials who are in cahoots with speculators and oil companies. Indeed, Gentlemen of the Senate, present department policies are leading directly to these undesirable and deplorable consequences.

If private enterprisers who scream for development are in earnest let them develop the 200 billion barrels of shale oil contained in the 380,000 acres already divested from the public domain in Colorado, Utah and Wyoming partly by hook or crook. The oil companies already own 216,065 acres of this total, or more in Colorado alone.

V. PRINCIPAL FINDINGS

My first principal finding in 2 years of extensive research is that the Department of Interior, and indeed the Executive Branch, taken as a whole, is not adequately protecting the public interest in the vast oil shale wealth in Colorado, Utah, and Wyoming.

(A) *No planning—No policy*

The crucial problem with the proposed "swap" and leasing regulations is that they are not based on any sound long-range plan for oil shale development.

The Department of Interior has developed no overall plan for oil shale development. It has no policy to protect the public interest. It has not considered the alternatives to piecemeal leases to the oil companies and other entities.

The Department of Interior's whole position represents just a short range response to pressures from special interests—the speculators and the oil companies—and the Congressmen who press their viewpoint on the Executive Departments. The absence of a positive, well-planned policy to protect the public interest leads willy-nilly to a give away policy, because Government is responding to private requests for give aways rather than projecting positive programs. One oil company asked to lease a 50,000 acre block of oil shale lands. The Department of Interior suggests blocks of 5,120 acres which is still ridiculously a large amount for a research and development program.

The deficiencies in the Department's planning have been evident by the following:

Approval of give aways under the invalid and often null and void pre-1920 mining claims and its failure to recover erroneous disposals based on invalid or fraudulent claims.

Failure to withdraw the oil shale lands in 1965 and 1966 until 4 million acres of oil shale lands containing 2 trillion barrels of shale reserves had been covered by dawsonite and other alleged mining claims for metals.

Offering of this swap and leasing proposal which would enable the oil monopolists to get control of the very richest oil shale the public domain contains.

(B) *Abuses in public service*

My second major finding is that the climate in public service is exceedingly hostile to the protection of the rights of the American people in their public domain holdings of oil shale.

Our Government can be no better than the public servants who are employed by the Executive and Legislative Branches to serve the interest of all the American people.

Unfortunately the public service, especially the very high officialdom, handling oil shale in many key spots is absolutely inadequate.

The highest standards of integrity and absolute honesty are essential in our officials when billions or trillions of dollars of public wealth can be disposed by the Secretary of Interior or some subordinate official by the stroke of a pen (or simply by the failure to use that pen). Public business of this magnitude must be conducted in a goldfish bowl so that the people and the press can know exactly what is being done. But this has not been the case in the past and it is certainly not the case today.

1. Self-serving officials

(a) I must report to this distinguished body that I have found key officials and employees involved in handling oil shale in the Executive Branch, especially in the Departments of Interior and Justice, and in the Legislative Branch, sadly lacking in honesty, and openness.

Let me be more specific, and let me say, that if you are dubious, I will open my files to the FBI and document these findings. My condition for this, however, is that the FBI report be provided to me in advance for review and also that it be made public, and if the facts warrant, the report be presented to Federal Grand Juries.

A number of former officials and employees of the Department of Interior with inside knowledge of oil shale matters have gone to work for law firms, private companies and consulting firms seeking to obtain oil shale rights from the Department or have on their own been trying to obtain patents on questionable oil shale mining claims.

One former employee is going to great lengths to patent pre-1920 claims on which he stands to make $50 million or more, and from which he has already derived large sums.

Various employees and officials have left the Interior Department in recent years to enter private positions where their inside knowledge is probably their key asset. This may perhaps be within the letter of the law, but it surely violates the spirit of public service.

Who is to protect the public interest against this sort of flagrant abuse?

(b) Officials in the Interior Department, some at the political level, have been evasive, refused to provide factual information, and have not been candid to me in some instances in their efforts to cover up their maladministration and their efforts to give away the oil shale resource.

(c) Justice Department officials have not been candid and indeed have tried to provide misleading answers to my inquiries.

(d) The Secretary of Interior, the Attorney General, and certain White House officials have not been courteous enough to respond to my inquiries. If and when their subordinates did respond, they did so with great delay and more often than not with great evasiveness and even with outright inaccurate if not **fraudulent replies.**

(e) Certain key members of the Congress including some who had accepted oil interest contributions and some who had been involved in pushing the Department of Interior to approve patents have refused to provide honest answers to direct inquiries by me. Others have introduced flagrant give away bills which would strip the public of billions if not trillions of dollars of oil shale wealth. See the 10th and 13th articles in my series published August 25 and September 29, 1966 respectively.

(f) An assistant to former Under Secretary John Carver who drafted the original give away bill on February 27, 1962 to validate even the worse tenuous pre-1920 oil shale claims and turn them over to the claimants at $2.50 an acre, has denied to me that he did so. I regard this as an outright lie. This draft was the prototype for similar bills actually introduced by two Colorado Senators. And these bills have never been repudiated by the Secretary of Interior or by the Department.

2. Destruction of those who try to protect the public

A second basic requirement for faithful and effective public service is that civil servants and officials who stand up for the public interest be secure against hostile or punitive attacks on their persons or on their character. If honest public employees are not protected against vicious attacks by a claimant, a Congressman who represents the claimant, or by their bosses or even their department heads if they courageously oppose illegal give aways or unsound public policies our entire governmental structure will rot and the public welfare will suffer.

I have found that the oil shale give away issue has produced one of the most horrible instances of attacks and mistreatment of incorruptible civil servants imaginable. The Dreyfus and the Billy Mitchell cases could not have been worse.

Gentlemen of the Senate, make no mistake on this, for I have the solid documented facts. Four employees who uncovered the mineral resource give aways and put the Interior Department in the position of having to stop the give aways of land worth $2,000 an acre for $2.50 an acre on the basis of flimsy pre-1920 claims have had their careers and reputations destroyed by vicious means. See an article entitled "Teapot Dome, 1967?" by Adam Hochschild, published in the May 1967 issue of Ramparts Magazine. Also see the 21st article in my series published January 26, 1967.

The four employees were hounded, interrogated, threatened, denied promotions, had their work demeaned and reversed regardless of the merits; were

subjected to kangaroo proceedings in which form affidavits and perjured testimony were used against them. In the end, when nothing else would work, charges of mental illness or other character defects were made or threatened against all of them, at one time or another. Documents were stolen from them and even their lives were threatened.

Nothing casts the smell of scandal over oil shale more widely or strongly than the use of vicious tactics to destroy honest public servants.

An FBI investigation will show that a Congressman initiated this vendetta. The employees were driven out. Since then give aways have been resumed and the work they did is being undone by a give-away minded staff in the Department of Interior.

These people were good honest employees. At least two of them have had "excellent" performance records.

In my 24 months of research I have found that they were utterly right, for the Department for years had been patenting invalid pre-1920 oil shale mining claims, more than 100 of which the Department had itself previously declared null and void.

High officials disregarded written reports that this maladministration and these abuses were occurring and have refused to even investigate the situation. Gentlemen, I must ask why?

(C) Special interests control the big daily press

My third finding is that the "grip" of the special interests over the public communications and opinion-forming media is so strong that they can and do suppress dissemination of information about the oil shale land grab by use of their already overwhelming economic and political power. To cite some examples:

1. A big money mogul with interest in the Oil Shale Corporation who is publicized in the Nations leading newspapers and magazines as a philanthropist has intervened to attempt to stop republication of my oil shale series in an Eastern newspaper.

2. Various political figures who normally take a public interest position have wrung their hands in concern but have shied away from full disclosure of the facts on this trillion dollar scandal because it would have political implications presumably harmful to their party. Little do they realize that the give-away policy is bipartisan . . . that the oil interests and speculators have dominated the Department of Interior under Republican and Democratic administrations alike. As an illustration, patenting of worthless pre 1920 claims was apparently started under the Truman-Oscar-Chapman regime. It hit a peak under Eisenhower-McKay-Seaton period. It was stopped in 1960 because a few Interior employees sacrificed their chances for promotions and for jobs. The Department has lost the "trillion dollar" court case in Denver to Tell Ertl and the Oil Shale Corporation and their battery of lawyers because it drove out its most knowledgeable and motivated lawyers and put on a half-hearted defense. Secretary Udall's confidential assistant is moving over to a law firm tied into the Oil Shale Corporation which has a major interest in approval of pre-1920 claims. The Department is also making only a nominal effort in the present contests by not using some of the principal challenges or charges it could raise against the validity of the 47 year old claims.

The Department has made only one little effort to recover illegally patented lands. There is nothing worse than a sham effort by the Department, because the public defenses are then legally foreclosed. Yet when the "trillion dollar" case opened in Denver a year ago last July, I saw 27 lawyers, mostly private, and no newspaper coverage except by a reporter who favors the private interests and by this editor who tried to inform the people truthfully. Why doesn't the big daily press tell the public about these matters?

3. Only two or three big daily newspapers and only one national magazine have shown the initiative and courage to publicize the "Trillion Dollar" oil shale scandal.

While overt fraud has not turned up yet, as in the Teapot Dome Scandal, the political and economic implications are much larger in the oil shale scandal. And I can tell you that a full investigation will reveal that laws have been broken and the public interest has been gouged in an unparalleled fashion. High officials who parade as conservationists have sold the public interest for a few paltry campaign contributions. Congressmen have breached the bounds of propriety in pushing the designs of selfish claimants on the public domain. High

officials have blackmailed employees in the Interior Department who uncovered and sought to stop the scandal and they continue to blackmail and muzzle them. Despite my position, I must ask the question, why doesn't the national press dig into this scandal which is 100 times bigger than the Teapot Dome affair?

(*D*) *Attempts to mislead the press*

A high Interior official recently attempted to cover up the oil shale scandal by writing a letter to *Editor and Publisher* Magazine in New York for the purpose of endeavoring to overcome the general thrust of an article published in the magazine on July 1, 1967 about this editor and oil shale, authored by Associate Editor, Rick Friedman. It is enough for me to say here that the official has failed in his objective to cover-up the multi-billion dollar oil shale scandal in view of factual information in the rebuttal which I published in my 37th article of the oil shale series, on August 24, 1967, and a condensed version of which was published in the September 2 issue of the magazine.

VI. FOUR MAIN THREATS TO PUBLIC'S OIL SHALE RICHES

Gentlemen of the United States Senate, with present trends, the public will not retain ownership or control of the vast oil shale riches for long. Public rights to these inconceivably large riches are threatened or are being plundered by—

(1) pending disposals for $2.50 an acre of lands now selling for $2,000 an acre on the basis of pre-1920 mining claims covering as much as 4 million acres of oil shale lands;

(2) 25,000 new mining claims for dawsonite or sodium or possible metalliferous minerals which the Department of Interior permitted to be filed in 1965 and 1966 on 4 million acres of the richest oil shale lands containing some 2 trillion barrels of potentially recoverable shale oil. In this same area prospecting permits have been issued covering 20,000 acres of the best oil shale lands, for sodium. These prospecting permit applications should have been rejected by the Secretary;

(3) proposed "R & D" leasing programs which could turn control over to more than 100 billion barrels of oil in 30,000 acres to as few as 6 oil companies. This would be enough for 30 years U.S. consumption of petroleum at current rates; and

(4) proposed "swaps" of Federal lands for private lands without sufficient safeguards.

VII. PRE-1920 OIL SHALE CLAIMS THREATEN PUBLIC OWNERSHIP

(*A*) *Number of claims and acres covered*

Briefly the Department of Interior has estimated that 30,000 to 60,000 oil shale mining claims were located prior to the enactment of the Mineral Leasing Act, which precluded further locations for that mineral. These old claims possibly cover 4 million acres of the oil shale lands in Colorado, Utah and Wyoming.

(*B*) *Why claims are invalid*

With benefit of hindsight it is clear that all of the unpatented pre-1920 oil shale mining claims are phony. See the 2nd article in my oil shale series, published June 16, 1966. They are no good because the claims have not been used for oil shale mining purposes as contemplated by the United States Mining laws under which the claims were filed. For one thing, discoveries of valuable oil shale deposits could not have been made on each and every mining claim as required by law. Required discoveries could not be made as most of the oil shale lands are covered with hundreds of feet of worthless overburden. In some cases the overburden (soil) is at least 400 to 1000 feet thick above the oil shale deposits. Thus pre-1920 mining claimants could not have perfected valid discoveries on each and every claim, the kind of discoveries which would have justified the reasonable prudent man of the mining law to expend his time and effort with reasonable expectation of success to work each and every claim with the view of making a profit. If discoveries of valuable oil shale had been made when claims were located, the discoveries were lost during the past 47 years.

Most of the oil shale claims were located as association placers by groups of eight individuals—in many cases some of the locators named in location certifi-

cates were dummies in that they had no interest whatsoever in the claim or claims.

In most cases after the East Texas oil fields were discovered in 1920, oil shale claimants abandoned their claims and failed to take any steps to produce oil from the thousands of oil shale placer mining claims.

In the early 1930's the United States through the General Land Office investigated and contested thousands of pre-1920 mining claims—perhaps covering in excess of 2 million acres. Claims were declared null and void for failure to do assessment work. And in some cases the claims were declared null and void on other charges such as abandonment, fraud in the location, non-mineral in character, and that the claims were not valid and subsisting on the date of the enactment of the Mineral Leasing Act of February 25, 1920.

As part of the contest proceedings the claims were actually physically taken by agents of the Interior Department for uses and purposes of the United States. Notices of such takings were posted on thousands of pre-1920 mining claims and where it was possible the GLO agents served the mining claimants personally or by registered mail. Thereafter the United States through the Interior Department administered the lands under various public land laws. There is adequate evidence in the West that pre-1920 claimants lost their claims, if for no other reason, by adverse possession on the part of the United States for a period in excess of 30 years.

(C) Total acreage patented under oil shale mining claims

Regardless of the obvious invalidity of pre-1920 claims, 380,000 acres of oil shale lands in Colorado, Utah, and Wyoming have been processed to patent from 1920 to July 1960 under procedures which cannot stand scrutiny. Even claims which had been declared null and void years ago were passed to patent at $2.50 per acre.

In one known instance a half-interest in unpatented mining claims sold for as much as $1,000 per acre as far back as 1957 and within several months the patent on such claims were secured from the United States for $2.50 per acre.

(D) Departments fail to seek recovery

Yet for reasons not publicly developed the Departments of Justice and Interior have taken no constructive action to clean up the scandal involving past illegal disposals of oil shale lands under guise of pre-1920 mining claims. Secretary Udall and his chief subordinates have refused to press the Justice Department to initiate suits to effect recoveries for past illegal disposals of oil shale lands. Only in one case was there any effort made to secure recovery for the wrongful disposal of oil shale lands. That case was instituted in 1957 and settled in 1960 with a windfall of some $300,000 or more to the patentee and his successors, and Standard Oil of California got to keep the land. The case involved a patent issued in 1951 on claims which had been declared null and void because of fraud in the location as far back as the early 1930's.

(E) Legislative bills and other efforts to validate claims

The magnitude of the oil shale scandal has become somewhat publicly known as the result of efforts made to validate pre-1920 oil shale mining claims. It is no secret that Senate Bill 2809 (88th Congress) and Senate Bill 1009 (89th Congress) were introduced to validate pre-1920 mining claims. These bills were designed to eliminate any basis upon which pre-1920 oil shale mining claims could be contested or patent applications be rejected on the basis that such claims had been declared null and void on charges such as abandonment, lack of discovery, and failure to do assessment work. The bills endeavored to waive the discovery requirement of the mining law in-so-far as failure to comply with that requirement could be used to declare pre-1920 mining claims null and void. The scandal is heightened by the fact that the draft bill, similar to the above massive give-away bills, was actually drafted in the Interior Department on February 27, 1962.

The pre-1920 oil shale mining claims are a real threat to the continued public ownership because the Departments of Justice and Interior have failed to prepare adequately the defenses for the Government in the "Trillion Dollar" suits tried in July 1966 in the Federal District Court in Denver, involving the judicial review of a decision rendered on April 17, 1964 by the Department of Interior which upheld the rejection of patent applications on claims which had been declared null and void in the 1930's for failure to do annual assessment work. See the 1st, 17th, 19th, and 34th articles in my oil shale series, published

on June 9, Nov. 17, Dec. 1, 1966, and July 27, 1967 respectively. If the decision of December 21, 1966 rendered by Federal District Judge William Doyle is upheld in the higher courts, it is clear that thousands of pre-1920 oil shale mining claims will be revived, which cover some 2 million plus acres of oil shale land . . . claims which had been declared null and void in the 1930's for failure to do assessment work.

(F) Inadequate charges in oil shale contests

If the decisions which declared claims null and void for failure to do assessment work are knocked out, it becomes clear that the present oil shale contests being heard in Denver take on a more giveaway role because the Interior Department is not using all the principal charges upon which to contest pre-1920 mining claims which had not been declared null and void heretofore. Thus the contests which are regarded as precedent-making in the Department are not what they are supposed to be, as in essence the Government is waiving several principal charges which could be invoked upon which to declare the pre-1920 mining claims null and void but which charges the Department failed to state in the contest proceedings. Charges which are not being used are: Abandonment, fraud in the location, adverse possession, non-mineral in character, claims not valid and subsisting at the date of the enactment of the Mineral Leasing Act of February 25, 1920 and possibly other principal charges. Thus the present oil shale mining contests being heard in Denver by a Bureau of Land Management Hearing Examiner on the discover issue may open the door to wholesale disposals of oil shale lands under pre-1920 oil shale mining claims should the discovery issue be found in favor of the claimants by the Department or should the Federal courts knock out any decision rendered by the Department in the precedent-making contests which might declare the claims null and void for lack of valid discoveries.

VIII. DANGER OF GIVE-AWAYS ON RECENT MINING CLAIMS

(A) Secretary failed to issue timely withdrawal

Secretary Udall failed to act to withdraw the public oil shale lands from location of mining claims for metalliferous minerals. His failure to act to issue the withdrawal of oil shale lands from metalliferous mining locations permitted some 4 million acres of oil shale lands to be covered by new mining claims in 1965 and 1966.

Secretary Udall failed to issue a timely withdrawal order despite the fact that Dr. John Kenneth Galbraith, former Director of the Bureau of Land Management, Charles Stoddard, and perhaps others, requested Secretary Udall as far back as mid 1966 to issue the withdrawal order to prevent the further location of mining claims used to tie up the oil shale lands under guise of metalliferous mineral filings.

(B) Calculated delay by Executive Branch

There is a likelihood that the necessary withdrawal order was not issued timely because those in the Executive Branch favoring disposals of oil shale lands to private interests figured that the new mining claims were a possible way with which to let powerful private interests pre-empt the oil shale lands. Although the new mining claimants are not entitled to oil shale deposits in the land covered by the new claims there is presently a great danger that Congress might be prevailed upon to give the new claimants a preference right to oil shale leases when and if oil shale leases are issued.

(C) Possible inside collaboration

The most questionable thing about the new claims, aside of maladministration and non-feasance to act to issue a timely withdrawal, is the fact that there is a likelihood that new claims may have been filed on the basis of inside information from the Department itself. According to an article in the Oil Shale and Offshore published August, 1967 someone in Rock Spring, Wyoming informed Mr. Merle Zweifel, who apparently located for himself and others most of the new mining claims. It is significant to note that the article mentioned the fact that a Mr. Anderson called Mr. Zweifel from Washington, D.C.

It would seem that this distinguished Committee would want to ascertain identity of the person who purportedly tipped Mr. Zweifel to the fact that oil shale lands were available for location for metalliferous minerals contained

in the oil shale lands and whether the person was and is a Department of Interior employee or an official. It would behoove this Committee to determine whether any high officials in the Department of Interior collaborated with anyone to keep the oil shale lands available for location of mining claims until the best oil shale lands were tied up with new claims.

(*D*) *Withdrawal application helps claimants*

It seems strange that the application for the withdrawal order was filed by the Department on or about January 27, 1967 after all the best oil shale lands were tied up. Since some 2 trillion barrels of shale oil reserves were clouded by the new claims, what was there left to protect?

The application for the withdrawal order now actually operates to the benefit of the new claimants because claimants will not have to perform $100 worth of annual assessment work per claim, which would amount to a total of around $2.5 million per year, to keep the claims from being relocated by other persons. See article 38 in my oil shale series, published August 31, 1967. One should be entitled to wonder—was the application for withdrawal order filed to protect the interests of the American people in the oil shale lands or was the application for the withdrawal order filed to protect the interests of the new claimants?

(*E*) *Elimination of claims costly*

Gentlemen of the U.S. Senate, I wonder whether anyone in the Interior Department and in the Executive Branch or in Congress has considered what it will cost the United States to determine the validity of all the 25,000 new mining claims—claims which could have been prevented from being filed only if the Department had had the "strength" or courage to act as a responsible public trustee.

IX. PROPOSED OIL SHALE EXCHANGE AND LEASING REGULATIONS

Gentlemen of the Senate I now address my testimony to the proposed oil shale "swap" or exchange and leasing regulations published in the Federal Register on May 10, 1967.

(*A*) *Swaps or exchange regulations*

The proposed regulations for the exchange of "private" oil shale lands for Federal oil shale lands should not be adopted until it is determined by the Attorney General and the President that the United States does not have any remedies available to recover the lands or their values on all previously wrongful disposed oil shale lands in Colorado, Utah and Wyoming.

Gentlemen of the Senate, you must know that thousands of acres of oil shale lands were given away by irresponsible administrators in the Interior Department who did not bother to properly examine pre-1920 mining claims upon which applications were processed to patent. Many of these claims had been declared null and void. Many were phony in all respects. Many were never valid for any purpose. Thus disposals under guise of pre-1920 mining claims were and are void—if only the Interior and Justice Department officials would have the courage to initiate suits to remove the cloud on the Government's titles which have resulted from patents issued in violation of law.

Failure on the part of the Executive Branch officials to pursue to secure the elimination of clouds on title on oil shale lands disposed under guise of pre-1920 mining claims constitutes fraud in the high levels of our Government.

Why don't the exchange regulations contain standards to guide the action of administrators? How are the disputes over shale values in the lands to be resolved? What standards are there in the regulations to guard against strengthening monopoly positions by way of exchanges of lands? If regulations for swaps are to be adopted, why not require the Secretary to set up a board of economists who are not oil company related, to advise on improving these regulations and later to screen any applications.

(*B*) *Leasing regulations*

The oil shale leasing regulations are designed to continue the transfer of the vast public domain oil shale reserves into the hands of the giant oil companies and other powerful private interests which are and have been robbing the public for many years. And it must be quite obvious that these proposed regulations are a follow-through to the Rifle Oil Shale Plant giveaway to the major oil companies.

The proposed oil shale leasing regulations are designed to foster and to sneak a fraud over on the public even though the public is given an opportunity to submit comments to the Interior Department before regulations are adopted.

This fraud could be pulled off because the public is not aware of what it owns. Certainly the Interior Department, including the entire Executive Branch, has not tried to educate the public as to the complete oil shale facts and issues because the Department and Executive Branch officials, present as well as former, have been involved in a major national scandal which dwarfs the Teapot Dome Affair.

The proposed regulations are designed to permit oil companies and other entities to get the richest oil shale lands for nominal rentals and royalties. The proposed sliding scale of royalties is a sham and a device to permit oil companies and other entities to get the loot and to make sure that the people will only share nominally from oil shale development and production from leased tracts. Any shale oil operation can be set up so as not to yield any net taxable income. Thus it is forseeable that the Government under proposed leasing regulations would only get nominal royalties.

Leasing regulations, if they are to be adopted, should be revised to define that royalty is free and clear of all costs of production. This is the meaning of royalty. Royalty as defined in the proposed regulations would only mislead the uninformed public into thinking that the Government would receive substantial royalties—up to 50 percent of the oil produced from the oil shale leases. Deceit should be eliminated from the proposed regulations.

Department spokesmen admitted in the Senate Oil Shale Hearing held before this Committee on May 12, 1965 (pages 33–35), that some public lands in Colorado had shale 1,900 feet thick and that a 5,120 acre block would probably contain approximately 18 billion barrels of recoverable shale oil—equal to nearly 60 percent of all proven petroleum reserves in the United States. This is a staggering amount of oil to turn over to one company under an untried and unknown R & D lease.

The 30,000 acres proposed for lease could include more than 106 billion barrels of oil—more than three times all proven petroleum reserves in the United States. At current consumption rates our country would take 30 years to consume that much oil. Yet only six companies or entities could secure control of this staggering amount of oil under the Secretary's proposed policies. The concentration of such wealth in the hands of so few would be unparalleled in our Nation's history.

One aspect of the proposed oil shale leasing scandal becomes quite clear when one considers the fact that Secretary Udall has represented to the public in his letter to Editor and Publisher Magazine, July 21, 1967, that his proposed oil shale leasing regulation would be applicable to a very small area of the oil shale lands owned by the Government. But Mr. Udall failed to disclose that the total barrels of recoverable shale oil reserves that may be contained in the 30,000 acres which he proposes to lease, may exceed 106 billions of barrels. See 37th article in my oil shale series, published August 24, 1967. This kind of "slanted" representation on the part of the Secretary to the public borders on deception, if not out right fraud.

1. Questions cast doubts on leasing proposal

This all brings up some big questions:

Why lease such big blocks?

Why not limit this R & D phase to 1 billion barrels which is still a lot?

Why not limit any lease so that no private group or corporate body can get more oil shale under its control than 1 percent of the proven oil reserves in the U.S.?

Why not limit R & D leases by barrels rather than by the phony measure of acres?

Why not confine the leaseable reserves to say 5% of all proven petroleum reserves?

Why not make the consortiums reveal all the shale oil and other oil reserves they, their subsidiaries and their parent companies own, control, or lease so that steps can be taken to prevent issuance of leases to those entities whose monopoly positions would be strengthened by oil shale leases if issued?

Why not have an impartial public advisory board of economists review and issue public findings on proposed leases and swaps before the Interior Department acts?

Why lease now? Why the hurry to lease large blocks of public land or to "trade" it? If there is need for research to develop technology, why don't the companies do their research on private land? Why doesn't the Government contract for research and make the patents on processes developed freely available

to all. And if leases are issued, why shouldn't the patents developed in connection with R & D leases be made public rights as a condition?

Doesn't the "net" approach for computing royalty open up the Government to cost-plus type manipulations and abuses?

Since the discovery is assured already, why should the public take less than 1/8th or 12½ percent of the gross as is traditional in the petroleum industry as a minimum in most states—say after the first 1 billion barrels of cumulative shale oil production in the Nation?

Why lease at all?

Why doesn't the companies use the 380,000 acres that are already divested from Federal ownership in Colorado, Utah, and Wyoming, that contain an estimated 200 billion barrels of shale oil reserve?

Why issue leases before the results of the nuclear in-place retorting tests are run?

Why lease any lands before the Belser in-place retorting process is proven or disproven?

2. Sound plan for development needed

Gentlemen of the Senate, the leasing regulations should not be adopted because the officials in the Executive branch should first consider and recommend to Congress a plan for the development of the vast public domain reserves under a corporation chartered by the Government. Obviously the Secretary, in proposing the leasing regulations, has shut his eyes to the rational development of the oil shale reserves and related land and water resources by ways and alternatives other than by way of leasing to oil companies and individuals and other entities. Leases if issued will only lead at most to piecemeal type monopolistic development by major oil companies or by giant consortiums of big money.

Before any leasing of any type is adopted, it is necessary that the Department officials reveal to the public just how they are controlled by the powerful forces of the private interests who dictate and manipulate the policies of Federal Government.

3. Scandal necessitates investigation before leasing

Gentlemen of the Senate, the oil shale scandal is so big that no leasing regulations should be adopted until appropriate Senate Committee investigations are held to expose the oil shale scandal nationally. The public is entitled to know what our Federal officials have been doing for some 30 years. Have these officials been bought and paid for all these years? Who placed them into positions of power? To whom were they beholden? To whom are they now beholden? Why were the oil and gas lease frauds upon the Government put to sleep by high Interior and Justice officials? Who might have been paid off with cash, if not by political positions of power?

4. Leasing Act provisions outdated

Gentlemen of the Senate, no oil shale leasing proposals should be adopted as national policy because it is time to update the Mineral Leasing Act of February 25, 1920 particularly insofar as that act contains any authority for leasing of oil shale lands. At the time the Act was passed Congress and the Executive Branch did not possess all the facts available presently on the oil shale resource. Even now the Department of Interior does not have a complete inventory of the land, water and mineral resources in the area of the oil shale deposits in Colorado, Utah, and Wyoming. Before any sensible evaluation and plan can be made for the future development of the oil shale resource it is necessary that Congress require the Secretary of Interior and the entire Executive Branch to make complete inventory of the resources in the area of oil shale deposits. Otherwise, Congress and the Executive Branch will never be able to adopt a wise and national policy for the development of the oil shale and related resources.

X. RECOMMENDATIONS TO CONGRESS

Congress should—

(1) scale down the leasing proposal to a true R & D scale—not over 1.5 billion barrels of shale oil reserves in the aggregate;

(2) gear up Interior staffs and resources to support effectively the preparation of mining contests on all available charges involving pre-1920 oil shale mining claims;

(3) require Interior and Justice Department officials and employees to represent the United States effectively in the "Trillion Dollar" court case which has been appealed to the Circuit Court of Appeals in Denver;

(4) require the Secretary of Interior to contest all outstanding mining claims covering oil shale land, whether the claims be new or old;

(5) require the Secretary of Interior to recover the value of illegal past disposals;

(6) investigate the abuses of Interior Employees by Secretary Udall and his officials and provide for proper restitution for these employees as well as require the Secretary to award recognition for their exceptional meritorious service;

(7) create a new multi-purpose regional oil shale of planning and development corporation on the model of the TVA;

(8) conduct a detailed investigation of the oil shale scandal on the model of the Teapot Dome investigation, to determine what individuals, officials, and companies were responsible for the maladministration in the Department of Interior and elsewhere in the Executive Branch and how this can be stopped without delay;

(9) create a congressional watchdog committee on oil shale staffed by outstanding economists and by competent investigators from the General Accounting Office and the Federal Bureau of Investigation;

(10 block the exchange and leasing regulations proposed by Secretary Udall so as to avert the biggest giveaway ever proposed in the history of America as would occur if the proposed oil shale regulations are adopted; and

(11) expose nationally the facts which prompted former Senator Paul Douglas to recently state that "this (oil shale resource) is the most important submerged issue in American domestic politics involving the greatest scandal thus far in the history of our republic." See 37th article in my oil shale series, published August 24, 1967.

Gentlemen of the Senate, I thank you for permitting me to appear before you to express by views on the greatest untapped treasure in the United States. My hope and my reason for being here is to see that this oil shale treasure will be used for the benefit of all Americans and if necessary for the benefit of all mankind.

STATEMENT OF SINCLAIR OIL & GAS CO.

Mr. Chairman and members of the committee, your committee has contributed significant clarification to oil shale issues through its past hearings. We feel that this hearing may well be the most important yet. We believe that there will be real need for a viable oil shale industry in the next decade to meet our domestic needs, to provide for national emergency, and to prevent overdependence on foreign supplies of raw hydrocarbon materials.

Sinclair is extremely pleased that the Department of the Interior has taken the stand of encouraging development of federal oil shale lands by private free enterprise. Our company welcomes the competition Interior hopes to foster. We feel that the public interest can be served best by the free enterprise approach and that revenues can be generated for the state and federal governments that can be used for public benefit. However, we do not believe that the federal oil shale lands can possibly generate for public funds the tremendous amounts some speakers have envisioned. In fact, we believe that the regulations as proposed would penalize projects on government land so much that development of federal lands and resulting public funds may be precluded. Our purpose today is to point out the aspects of the proposed regulations that would seem the most destructive of attainment of the stated objectives of the Department and that would do the most to keep private industry from moving ahead on development of government oil shale reserves.

Recovery of the hydrocarbon and mineral values from oil shale and conversion of them to forms that can be used are difficult tasks. Sinclair has spent millions of dollars and hundreds of man-years of effort on these problems in the last 15 years. The indicated rate of return on invested capital is still such that companies with massive privately owned oil shale reserves and with oil shale zones as rich as those of federal oil shale lands have preferred to invest their money elsewhere. Under the proposed regulations, any chance of windfall profit rests with the land speculator who would risk only small amounts of money and make no contribution to the development of a shale oil industry. Therefore: 1) if the government will not give the investor who leases government land an opportunity

to recover his research costs by owning and licensing his investions; 2) if it will not assure him enough reserves to recover his plant investment and make a decent profit if his research and development are successful; and 3) if it will not keep leasing costs (including royalty charges) at a reasonable level, the government cannot expect responsible investors to spend the vast amounts of money necessary to develop federally held reserves.

Another general observation is that the language of the proposed regulations is vague in many places. In our comments we will state what the regulations could mean and then discuss their impact.

Finally, all concerned with oil shale should remember that raw shale oil as produced from oil shale is not a useable commodity. It requires treatment to make it thin enough to be moved through pipelines, and treatment with hydrogen before it can be used in a refinery. The cost of this treatment will be about a dollar per barrel, and it should be considered in any economic estimates.

NEED FOR RESERVES

One stated purpose of the Department of Interior in Section 3170.0–1 is to "encourage participation by companies not favorably situated with respect to access to reserves of the minerals present in oil shale." This seems indicative of a policy of the Department to favor the less forward looking companies which have not previously obtained oil shale reserves. If it is intended to provide reserves for the "have not" companies to the exclusion or detriment of those companies which previously obtained reserves on privately owned land, it will very unfairly penalize the companies having a present investment in oil shale reserves. Reserves owned by the Government are richer in oil content and thicker than those currently owned by private companies near the south end of the Piceance Basin and in other states. This could result in somewhat lower cost production of oil from the government-owned properties. If the companies not now holding shale reserves are given preference in leasing government lands, those companies that have spent large amounts of money on oil shale and in fostering its development to the present stage will be severely penalized. This would discriminate against those with initiative, imagination and willingness to take risks. We hope Congress will not permit this discrimination.

An implication of this discrimination is repealed in Section 3171.2(c)(11) which requires a "description of the reserves the applicant then owns or controls of oil and other minerals believed to be present in the lands applied for." This is subject to the interpretation that an applicant must supply detailed reserve information, perhaps property by property, on all such minerals held by the company wherever they exist throughout the world. It is exceedingly expensive for an oil or gas producer to compile reserve data on large numbers of properties, some of which it may not operate. Furthermore, the extent of reserves is a substantial factor in competitive positions among oil companies, so producers are understandably reluctant to make official statements concerning their oil and gas reserves. Historically such information has very appropriately been considered to be a confidential part of the company's business. Sinclair believes that it is not necessary for the Department of the Interior to require the furnishing of reserve information of the scope and nature proposed in this regulation.

Interior would require a showing of need, 3171.3(d), for leased lands to conduct research and development, and for commercial operation. One wonders whether the requirement as to need for lands for research and development is separate or different from the need for commercial development lands. If so, could this result in an applicant being granted a research lease and later being denied extension to permit commercial operation for the reason of inadequate need as determined by the "then" Secretary of Interior? This provision again implies that an applicant will be unfavorably considered if he owns fee shale land.

Section 3171.3(f) would require a showing of need for reserves of the minerals to be produced. An oil company can readily show a need for oil if it has more refining capacity than production, but even a company with a balanced refining-production position needs future reserves to maintain its position. What about a small independent producer who wants to join a consortium and double his production? In view of the intimate association of oil and aluminum in the shale, what about an aluminum company that wants to broaden its interest and get into the oil business or an oil company that decides to produce aluminum also? What is the nature and extent of the need required to be established? We doubt that anyone could administer these sections without discrimination.

We wish to make it clear that Sinclair has need for federally held oil shale reserves. To meet refinery needs, Sinclair is a large purchaser of domestic crude oil. This situation prevails despite the expenditure of nearly one-half billion dollars in the last five years on exploration, drilling, and acquisition to obtain new reserves in the United States. Despite these expenditures our new domestic reserves have not been discovered in quantity equal to our domestic consumption. Consequently, it is obvious that new sources of supply must be developed to meet Sinclair's marketing requirements and protect the investment of Sinclair's stockholders.

Sinclair's present oil shale holdings represent a sizeable potential when compared to its present crude oil reserves, but they are not large enough to provide for significant improvement in our raw material position when planning for future increased population and for national security. Therefore, we are vitally interested in acquiring additional oil shale reserves in the Piceance Basin in Colorado. Development of these reserves by private industry is necessary to maintain healthy competition among oil companies. Assurances by Congress that these reserves can be developed privately and without discrimination will be more to encourage large-scale investment and process development than would any system of government-sponsored monopoly.

Large surface acreage will be needed for water storage, plant, and waste disposal. Leasing regulations should take into account that these needs may be greater than the surface of the reserves needed for commercial operation. Much of this surface may have to be used from the beginning of development work.

LEASES

The granting of leases is the major purpose of the proposed regulations, but the basis for granting contain a number of statements and approaches which Sinclair strongly believes are unfair and would discourage development and competition.

One important section, 3172.3(b), 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." Another, 3172.3(c), states in part, "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."

In order to encourage the very large-scale research expenditures needed to develop commercial production techniques, companies will need assurance that if they do spend large amounts of money on research they can obtain sufficient commercial reserves to make adequate profit on the overall expenditure. This assurance is not provided by the two-step award procedure implied by the Secretary's announcement. We recommend that, upon acceptance of research plans, each lessee be granted the right to use a development tract for research, and at the same time receive an option on a specified commercial tract of its selection. The option should be exercisable by the commencement of operations on the commercial project, with diligent pursuit of those operations being a condition for retention of the lease. The decision to go commercial should rest with the organization which has spent the money on research and development work! When the research and development have proceeded to the point that commercial profitability is indicated and the company is willing to risk the further tremendous investment needed to put up a commercial plant, the development phase is completed. There is no assurance that the development program will succeed; the company should not be exposed to the additional hazard that Interior will later apply some criterion of success different from industry in general and the needs of the lessee in particular, and cause loss of the expenditures for development by denying adequate reserves for commercialization. A company needing the oil for its refineries might consider the development successful if it indicated that a project would yield an estimated return somewhat lower than that which would be required by another company which simply wanted to diversify and produce oil.

Under proposed Section 3172.2, extension of the term of leases to permit commercial production would depend on the judgment of the Secretary on such matters as whether methods are commercially feasible, whether methods provide for optimum recovery, etc. All such matters are for the most part judgeable only on a highly subjective basis, susceptible to diverse opinions among even

the best qualified and most conscientious experts. Under the circumstances, judgment is amendable to political and other pressures. The primary decision to extend the lease and start the commercial production term should be left where it always has been in free enterprise—with the company willing to take the risk. It might be better to require that before the Secretary could prevent a lease maturing to the commercial production phase, he would need to make a determination, based on substantial evidence, that the method is not feasible, would not result in optimum recovery, etc.

Section 3172.2(b) provides for extension of the term of the 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." This does not with certainty leave a reasonable period for completion of design of facilities for commercial production nor for construction of such facilities. The commercial term of the lease should allow for some period, in the nature of a primary term, for such completion of design, construction, and start-up of commercial facilities.

Section 3172.3(c) provides that *at the time the lease is extended* to commercial term, the Secretary will determine the quantity of mineral deposits needed for commercial production, allowing reasonable reserves. The term would be extended only with respect to the area which contains the quantity of mineral deposits so determined. To permit effective economic analysis and planning, a lease owner must know before he makes the huge expenditures necessary for research and development, the extent of the reserves he can obtain for commercial production. He must know the length of the life of the project, which depends on the extent of reserves he receives, before he can determine the economic feasibility of commercial production. As it now is, government representatives will in effect determine the commercial life or the size of the plant by determining the size of deposit leased for commercial operation. This would not seem to foster either competition or support free enterprise.

Section 3172.2(b)(2) requires that in order to extend a lease to commercial production, a research lease must *during the course of the research term* develop both a mining *and* processing method which is commercial. If he developed a commercial mining method but not a commercial processing method could he obtain extension to commercial production and use the commercial processing technique of others who have made it available by license if this combination is profitable? Will he be denied a commercial lease unless he has literally developed both mining and processing methods which are commercial? What if some or all of one or both of his methods were developed on private land before the research term of his lease? What if a company applies for an extension to commercial production on the basis of an entire processing method that would be licensed from or developed by others?

Another section, 3172.6, provides for automatic termination at the end of the research term unless the Secretary has previously authorized commencement of the commercial production term. As this provision now reads, a research lessee could lose his lease and all his expenditures thereon if the Secretary did not think the lessee was entitled to an extension into a production term. The result could be the same if the Secretary simply made a mistake or inadvertently, or for other reason not the fault of the lessee, failed to extend before expiration of the research term. The word "unless" is a word of special limitation and could result in automatic termination if given the usual construction. No procedure is set up for action by the lessee to file and process an application for extension. There is no provision for extension when a lessee, prior to expiration of the research term, submits proof necessary to obtain extension to the commercial phase, but the Secretary does not act on that proof until after expiration of the research term. The Secretary could, merely by failure to act, cause termination of the lease.

There are no provisions regarding a lessee's right to remove his plant and facilities upon termination of the lease. Without such provisions the conventional laws of real property might require all facilities attached to the realty to remain with the realty. This would be particularly unfair if the lease expired at the end of the research term and after construction of the research plant, water facilities and other units which would be useful in a commercial operation.

Section 3172.2(b) provides for extension of commercial production "* * * so long as mineral products are produced from oil shale in paying quantities * * *" Do these words constitute words of special limitation which would result in automatic termination if the lessee ceases production temporarily or if production ceased to be in paying quantities? Section 3172.9(c) merely requires due diligence in pursuing each phase.

Proposed Section 3172.2(b) also states that the Secretary will extend the term of the lease to permit commercial production if certain requirements are met. Tests for meeting these requirements with respect to "optimum recovery of minerals" and air and water pollution are not spelled out. We recommend that these provisions be made somewhat more specific before any leases are granted. Otherwise, non-uniform application of limits, variations of limits, or designation of new criteria after the development phase is completed could cause complete loss of expenditures for development. We will discuss pollution specifically later in this presentation.

Another requirement by Section 3172.2(b) is that a lease is extended for production only if the Secretary determines that the research activities of the lessee were substantially in accordance with the research plan submitted or a modification approved by the Secretary. Part of such plan must be based on estimates. This presents the question of whether the required estimates submitted in good faith, can result in failure to obtain a commercial lease if the estimates were materially different from the final facts. What if the research disclosed a better avenue of development that was not in the plan? Would pursuit of this avenue to a profitable process prevent extension to a commercial production term?

Finally, all of the discussion of leasing in the proposed regulations is based on the assumption that commercial operations must be preceded by research and development. There should be some provision for straight commercial leasing without a research term. As we recommend in discussion of royalties, selection of these lessees should be by competitive bidding.

LEASE LIMITS

Section 3172.3(a) of the proposed regulations places limitation on the acreage of any lease (5120 acres). There are indications that lease grants will be considerably smaller in extent. Then Section 3172.3(d) becomes critical. It provides that no one "may take, hold, own or control an interest in more than the total maximum acreage of land included in any lease hereunder, * * *" This section might be construed as meaning that if a company owns 1% or any small undivided interest in a shale lease from the government, it is disqualified from owning other leases or interests in other leases. This provision does not specifically relate these ownership limits to federally leased land or even to oil shale lands. This might be construed as meaning that fee ownership of shale land could disqualify applicants for federal shale land. The provision should be clarified and state that a "net" interest of more than 5,120 acres in federal oil shale leases will not be allowed, or that a "net" interest of more than a specified number of barrels of reserves in federally owned oil shale of specified minimum richness will not be allowed. We recommend that only zones thicker than 25 feet and averaging more than 30 gallons per ton be counted as reserves but that there be some weighing factors to allow for greater thickness of less rich material.

The statute (30 U.S.C.A. sec. 241) says that not more than one lease will be granted to any one person, association or corporation. Thus, if a company took a research lease which was later reduced in the discretion of the Secretary to a small number of acres for the commercial term, such company might thereafter forever be precluded from obtaining another lease. Even if the Department of Interior changes the proposed regulations to clarify its intent, this does not necessarily mean the judiciary will construe the statute in accordance with the intent and understanding of the Department of Interior.

We believe that the acreage or reserves limitation should be placed on a state by state basis. This would push development of processes for less rich reserves and foster competition in states other than Colorado. Further, depleted acreage or reserves should be removed from the chargeable acreage or reserves status. This change would, of course, require changes in existing legislation. A statute based more along the lines of 43CFR 3120.1–2, concerning oil and gas leases would seem preferable. However, we do not feel that revision of present regulations should be delayed pending new legislation.

POLLUTION AND CONSERVATION

The oil industry is conscious of the need to minimize pollution of air and water to keep our land clean and livable. Our company is making extensive efforts to improve control of pollution in every operation and will apply the same effort in planning shale oil projects. We feel, however, that neither

Interior nor Congress should require of a developing industry adherence to standards more rigorous than existing operations.

The proposed regulations require compliance with pollution requirements which are not themselves specified or otherwise described. We believe that the same requirements should be applied to all mining and industry in the area and that requirements should be delineated as completely as possible before leasing starts. It may be necessary for the state legislatures or Congress to take part in developing these pollution and surface damage control regulations so they are the same for all industry.

ROYALTY

Sinclair feels that the royalty provisions of the proposed regulations act uniformly against the interest of the public and private investor who might provide the money to support the development of this resource. One section, 31725(b), states that the royalty shall be "3 percent on the gross value, at the point of shipment to market, of the mineral products from the oil shale, * * * " This might be construed as applying to raw shale oil sold at the plant gate in Western Colorado, or to gasoline produced at the Colorado plant and shipped to market, or to gasoline produced at a midwest refinery from shale oil. We recommend clarification because this regulation could promote inefficiency by inducing intermediate sales and precluding integrated plant complexes. If this royalty component is retained, it should be specified as applying to fair market value of the raw shale oil at the outlet of the retort and the fair market value of any unrefined metallic salt isolated and sold or further refined elsewhere. In the calculation of royalty on any basis, reasonable allowance should be made for transportation and processing.

The most important section regarding royalty is 3172.5(d). The royalty rate is to be a percentage of "net income" from the production of mineral products from oil shale. The "net income" is to be computed without allowance for royalty or depletion. The royalty is to apply to that portion of the net income which exceeds certain percentages of original cost of the capital assets, used in production and processing, less depreciation. The investment should include direct costs of development and construction and, if the government takes title to data and patents, all research expenditures. All royalty should be waived during the developmental term.

The most serious aspect of the proposed approach is its confiscatory nature, during the latter part of a commercial projects life. During this period, eighty to ninety percent of the net income could be taken by federal income tax and royalty for projects showing only modest rates of return before royalty.

Royalty tends to result in wastage of the resource by forcing early cutoff of production; it adds to operating costs and results in earlier reaching of the breakeven point. We recommend another means for deriving public revenues. The holding of leases for speculation should be discouraged by requiring the expenditure of substantial funds on research and development for each year of the development lease or for a substantial reserve rental to apply from the beginning of the lease. This would encourage the lessee to undertake construction and production at the earliest possible date. We also suggest low fixed royalty, such as 5% on the gross value of the first products recovered from retorting or spent shale leaching. Such a reasonable figure is recommended to keep from leaving too much of the reserve in the ground.

Competition should also be fostered in the acquisition of developmental-commercial leases. This should be in the form of open bidding on the amount of bonus or price to be paid for the lease, in addition to the fixed royalty and committed development program or rental.

Section 3172.4(e) of the proposed regulations provides for readjustment of base royalties at 20-year periods. This provision is consistent with the statute, but the advisability of any such readjustment is presumably with the unilateral discretion of the then Secretary of the Interior. Without additional criteria and guidelines, this could result in a great deal of uncertainty as to the stability of a very large investment. To relieve this uncertainty, some reasonable and more definitive ground rules should be established. Also the first 20-year period would start with the issuance of the research term of the lease. Due to research and start-up time, this could well result in royalty rates being certain for a period of much less than 20 years.

PATENTS, DATA AND DESIGN

Among features of the proposed regulations which most greatly disturb Sinclair are the provisions concerning dissemination and use of all the data and information from work during the research and development term of the lease. Section 3172.9(d)(3) provides that the lessee must not make available to others besides representatives of the Secretary of the Interior, the results of the research work under the lease or any information concerning the same without prior written approval. It is not clear to the reader just how a lessee could comply with this section. It is likely that numerous agents and individual contractors, as well as employees, will be aware of at least certain aspects of the research and at least some related information. Policing this requirement would be very difficult. This section indicates that no research personnel could publish technical papers on their work without the approval of the Secretary. We feel that the lessee should own the data and thereby be able to release reports and publications based on his work as he wishes and that the Department of Interior should receive reports sufficient to show due diligence in prosecuting the research and that these should be held in confidence for at least five years.

Section 3172.9(d)(1)4 requires a lessee to allow to all persons designated by the Secretary access to the leased premises and all other facilities in which any part of the research is conducted. This requirement would appear to extend to allowing any "designated" competitors access, even into our research laboratories if any part of the work is conducted in them.

Section 3172.9(d)(1)2 of the proposed regulations requires reporting with "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 * * *" The effect of this is that if the lessee should spend millions to develop a process and detailed design, he must give it to the government and hence to his competitors for them to practice without charge. This certainly will not foster either research or competition; it amounts to confiscation and will discourage expenditures of large amounts for research and development.

Section 3172.9(e) states that the public will acquire title to all patents and inventions made in the course of the lease, except where proper showing of exceptional circumstances is made. This is one of the most critical points for private companies and investors. The effect would be that the lessee may make development expenditures of many millions, and then must give all the results away. The lessee would have no chance to recoup through licensing the moneys risked on research, as has been the heart of the free enterprise patent system. It would seem to place a premium on waiting and letting others do the early development. Let someone else develop the process and then apply for commercial leases to utilize the results without risk or prior investment. The "proper showing of exceptional circumstances" appears to be a formidable obstacle; some in the proposed Bronco project consortium feel this point may keep the project from ever going forward.

We strongly recommend that the free enterprise patent policy be sustained. The developer should own his inventions and not be restricted in efforts to recover his expenditures in them. The developer should own the data and be permitted to utilize them as he wishes. We would not object to a requirement of licensing at reasonable royalty rates after some waiting period.

In summary, our past research on underground retorting of oil shale and our current participation in the Anvil Points cooperative research project lead us to believe that shale oil production will become attractive 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 agreement 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 smaller royalty rates than are used in conventional oil and gas leases and much smaller than in the proposed regulations. Investment should be encouraged by the government through investment tax credits and depletion allowance on raw shale oil.

Sinclair appreciates the need to protect the public interest in developing federally held oil shale reserves. We are extremely pleased that the Department of the Interior proposes to take the route of putting the development in the hands of private industry and fostering competition. On the other hand, we believe this should be done without discrimination against companies which have shown sufficient prudence to invest in reserves and hold them privately. We believe that Congress should act, if necessary, to prevent loss of patents, data and other products of the work. Maximum progress will be made toward development of this new source of energy if private industry is rewarded rather than penalized for spending large sums of money in research and development. The fruits of this research should not be freely disseminated to a lessee's competitors, thereby eliminating rather than fostering competition. We believe that the present royalty rates are confiscatory. We believe that the Secretary is not the proper source for first judgment as to whether research and development have been successful; the decision should be left with the company taking the risk as it always has been in free enterprise.

STATEMENT OF L. DAN JONES, GENERAL COUNSEL, INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA

Mr. Chairman, my name is L. Dan Jones. I am General Counsel of the Independent Petroleum Association of America (IPAA), a national Association representing independent oil and gas producers and land and royalty owners with membership in ever oil producing area in the United States.

The matter of proper development of the oil shale underlying the public domain has been of real concern to IPAA for many years. Several years ago, IPAA established an oil shale committee, now the Synthetic Fuels Committee, which has given extensive consideration to the problems involved in the development of oil shale.

This Committee made the following recommendations which have been adopted by our membership.

1. 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.

2. 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.

3. 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.

In our opinion, the regulations as presently suggested by the Department of the Interior would not provide an economic climate which would be conducive to the development of an oil shale industry.

The long history of the petroleum industry very persuasively demonstrates that independent producers, by providing a broad-based multiplicity of effort, have made a substantial contribution to making the domestic petroleum industry the leader and envy of the world. The Federal Government, both the Executive Branch and the Congress, has recognized the vital role of the independent and encouraged his participation in petroleum resource development, as for example, through the non-competitive leasing of the public lands. We feel it is important, therefore, that similar policies be established so as to enable and encourage maximum participation of independents in the oil shale development program.

The potential mineral energy resources contained within the oil shales are so vast and of such importance to the Nation that prior to their development Congress should review and give full consideration to all aspects of this important matter. The great impact that an oil shale industry will have on the economy of the Rocky Mountain area, and the effects that such an industry would have on the over-all economy of our Nation, make it imperative that Congress establish policy guidelines and standards that will insure the proper development of this important resource.

THE IZAAK WALTON LEAGUE OF AMERICA, INC.,
Glenview, Ill., September 13, 1967.

Hon. HENRY M. JACKSON,
Chairman, Committee on Interior and Insular Affairs,
U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: The Izaak Walton League of America appreciates the opportunity to comment on Federal oil shale policy. We respectfully request that this letter be included in the hearing record.

Enclosed is a resolution adopted by the League in 1965, stating our belief that development of oil shale resources should proceed under terms of the Mineral Leasing Act rather than the mining laws.

This is the League's basic policy on oil shale. Our membership approved it for a number of reasons. Heading the list is the fact that the "oil shale country" possesses many non-mineral resource values which are critical to its people and, indeed, the entire nation. It is, for example, quite clear that oil shale development must be most carefully planned to prevent adverse impact on the water resources situation in the Colorado Basin. Similarly, this vast region contains enormous wildlife and public use values and potentials. Because the region is so large, because of the public resource values it possesses, and because of resource interrelationships, we believe the public must control oil shale development.

In connection with this, the League recognized the immense dollar values of the oil shale and other mineral resources occurring therewith. To dispose of them under the mining laws would surely yield minimum fiscal returns to the Federal government.

Though we have no firm policy in this area other than the enclosed resolution on revenues to the Land and Water Conservation Fund, the League questions whether 52½% of revenue from oil shale leases ought to go into the Reclamation Fund—and whether the 37½% available to the States ought to be used solely for roads and schools. A public resource of this magnitude, it seems to us, ought to be available to meet a variety of needs.

The League is aware that the Land and Water Conservation Fund should be more adequately funded. We know that the Bureau of Land Management, which administers the oil shale lands, has a scant operational budget. We are unable to advise the Committee precisely how oil shale revenues might be divided—but we do ask whether they could not serve a number of valid resource purposes.

Thank you for considering our views.

Respectfully,

J. W. PENFOLD,
Conservation Director.

RESOLUTION NO. 9 OF THE IZAAK WALTON LEAGUE OF AMERICA, 45TH ANNUAL CONVENTION, JULY 12–15, 1967, MILWAUKEE, WIS.

To Improve the Land and Water Conservation Fund Act by Providing Additional Financing and Adding the Bureau of Land Management as an Eligible Participant

Whereas, the receipts available to the Land and Water Conservation Fund have been proven inadequate to meet even the highest priority needs; and,

Whereas, escalating land values and many newly authorized Federal, State, and local park, recreation and wildlife areas have made funding even more critical, with no respite in sight; and,

Whereas, the problem of obtaining access for the public to the Federal Lands for recreational purposes is rapidly becoming more acute due to prohibitions, restrictions and fees imposed by adjacent or intermingled private landowners; and,

Whereas, the Land and Water Conservation Fund Act requires that fees be collected for the use of recreation facilities administered by the Bureau of Land Management and deposited into the Fund, but fails to provide for reallocations from the Fund to permit the purchase of lands and easements needed by the Bureau of Land Management for very important public recreation, public access and fish and wildlife programs;

Now therefore be it resolved, by the Izaak Walton League of America in convention assembled this 14th day of July, 1967 at Milwaukee, Wisconsin, that it urges the Land and Water Conservation Fund Act be amended to (1) authorize the deposit into the fund of all continental shelf mineral receipts and all un-

earmarked mineral receipts from Federal lands, and (2) add the public lands administered by the Bureau of Land Management and classified for retention in Federal ownership to the purposes for which monies from the Fund may be allocated under Section 6 of the Act.

RESOLUTION NO. 4 OF THE IZAAK WALTON LEAGUE OF AMERICA, 43D ANNUAL CONVENTION, JUNE 16–19, 1965, CODY, WYO.

Oil Shale Development

Whereas, the Green River formation oil shales of the Colorado Plateau potentially constitute the world's greatest oil field; and,

Whereas, the 5 million to 10 million acres of land underlain by such oil shale are largely in Federal ownership, and contain surface resources of great public value; and,

Whereas, there is before the United States Congress a proposal to validate oil shale claims filed decades ago on perhaps 2 million acres of the Federal lands involved; and,

Whereas, these outstanding claims are apparently null and void under existing law;

Now therefore be it resolved, by, The Izaak Walton League of America in convention assembled this 19th day of June, 1965, at Cody, Wyoming, that recovery of Federally-owned shale oil should proceed under terms of the Mineral Leasing Act, with due consideration and protection of surface resource values; and,

Be it further resolved, that the League opposes legislation which would arbitrarily validate otherwise invalid oil shale claims, and thereby transfer both subsurface and surface public resources to private ownership.

NATIONAL WILDLIFE FEDERATION,
Washington, D.C., September 14, 1967.

Senator HENRY M. JACKSON,
Chairman, Senate Committee on Interior and Insular Affairs,
Washington, D.C.

DEAR MR. CHAIRMAN: Thank you for the invitation to comment upon oil shale regulations proposed by the Department of the Interior.

When the proposed regulations were first announced, the Federation's Executive Director, Thomas L. Kimball, wrote the Director of the Bureau of Land Management to say: "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 and will adequately protect the surface of the land after extraction has been completed."

Mr. Kimball, however, posed two essential questions which he said should be resolved prior to a determination that the oil shale lands should be offered for leasing. These questions are:

"1. Since such a tremendous public wealth is involved, upwards of $300,000,000,000, why does not the Government conduct the necessary research and development for the competitive economic extraction of oil from the shale? This would permit the Government to develop the process and give all companies, large and small, the opportunity to compete for the leases. It would appear that the public at large would benefit from such a procedure.

"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."

Mr. Kimball, earlier in the year, had appeared before another Senate Committee to comment upon oil shale lands and a copy of his statement is attached. We would be pleased if it, and this letter, can be included in the record of the current hearings.

Thank you for the opportunity of making these comments.

Sincerely,

LOUIS S. CLAPPER,
Chief, Division of Conservation Education.

STATEMENT OF THOMAS L. KIMBALL ON BEHALF OF THE NATIONAL WILDLIFE FEDERATION

I am Thomas L. Kimball, Executive Director of the National Wildlife Federation, which has its national headquarters at 1412 16th Street, N.W., here in Washington, D.C.

The National Wildlife Federation is a private tax-exempt organization which seeks to attain conservation goals through educational means. The Federation has Affiliates in 49 States. These Affiliates, in turn, are made up of local groups and individuals who, when combined with associate members and other supporters of the National Wildlife Federation, number an estimated 2,000,000 persons.

Mr. Chairman, I come today to tell you that the National Wildlife Federation has a deep and abiding conviction that the tremendously valuable oil shale lands must remain in Federal ownership. They must be administered to protect the great public values. Our organization took this position in a resolution adopted during the annual convention in 1966, a part of which reads:

"A national policy on oil shale should direct that the Federal Government continue in oil shale technology and research, with all exploitation of minerals located on public lands being accomplished under leasing arrangements, allowing control of the surface resources to remain with the Federal Government."

At the outset, believing it relevant, I should also point out that I have had more than a passing familiarity with these lands. It was my personal privilege and pleasure to serve as administrator of the Colorado State wildlife agency for nearly a decade, and know firsthand all too well many of the properties—and problems—involved in this complex situation.

The unfortunate history of the magnificent redwood groves in California comes to mind when the oil shale assets are discussed.

A history of the redwoods reads like a first-class frontier adventure novel, or a Hitchcock-style movie, with the good guys battling the bad guys. When California and the Oregon Territory became parts of the United States, all of the giant redwoods grew on Federal land. The young, new, and vigorous nation was rich in natural resources and there were men who stood ready to exploit them. Some far-looking conservation leaders endeavored to protect these national assets, but the Homestead and Timber and Stone Acts did not allow a person or company to acquire forested land of sufficient amount and size to make commercial logging economically feasible. As a consequence, the era of the great land frauds came into being. So-called "timber barons" manipulated, circumvented, and contravened the law until the land pattern within the incomparable redwoods had changed completely—from Federal ownership to near-complete private ownership. Now, the Federal Government is placed in the paradoxical position of attempting to buy back enough of the redwoods to create a national park worthy of the name—and at a price exceedingly dear.

The same cannot—or should not—happen with oil shale lands. Yet, all of the same ingredients are there.

Unless one has lived and worked in the oil shale country it is difficult to appreciate the air of get-rich-quick connivance, of heady profiteering. Lawyers deal in what was once determined by the courts to be invalid mining claims for high stakes. Speculation drives paper "values" and "profits" up to unbelievable heights. All of this is built on outdated and outmoded mining laws governing mineral assets owned by all of the people of the United States.

At least part of the uncertainty surrounding the oil shale lands has its genesis in an unfortunate situation. The management of the public domain lands, in the past, has not been of the type to install confidence in the Federal Government. Most laws under which public domain lands are administered were enacted at a time in our nation's history when our resources needed exploiting and incentives had to be given in order to colonize our great land. That era has passed. We need to repeal these outmoded statutes and enact a new body of law designed to protect the public interest while developing what remains of our resource wealth. To make a difficult task almost impossible the professional management staff of the Bureau of Land Management long was held at ridiculously low numbers. Each employee had far too much land to supervise for him to do an efficient job. I might interject the observation here that the BLM still is woefully understaffed, with respect to assignments and in comparison to other Fed-

eral land management agencies. In short, the task of keeping up with all of the claims on oil shale lands was beyond reason, especially when there was no requirement that the Federal Government even be notified and in the light of conflicting and outmoded laws and court interpretations. Claims are superimposed upon others. Some few people each located more than 50 claims!

Mr. Chairman, it is our opinion that the time has come for the Congress to bring order into this confused and contradictory situation. Now that research appears to be on the threshold of important breakthroughs in the processing of oil shale, it is even more urgent that basic decisions be made.

The National Wildlife Federation believes the Congress soon must take these highly significant steps:

1. Recognize by a suitable policy statement that the oil shale lands are public assets which will remain in public ownership and management. This declaration will discourage private speculation.

2. Declare invalid—or null and void—all old claims on lands on which the required assessment work has not been done. The original claimants have long since passed on from this frail existence. Attorneys out for a fast buck and some oil companies apparently are now showing an almost exclusive interest in reviving the validity of what was once determined by the Interior Department and the Courts to be an invalid mining claim. Otherwise, the entire oil shale program seems destined to settle into a morass of inactivity necessitated by the resolution of claims and counter-claims—a process which could take decades.

3. Adopt laws which require utilization of the oil shale resources in the manner best designed to protect the surface. The oil shale country is the wintering grounds for the largest migrating deer herd in North America and these assets also must be safeguarded. Protection of the land surface is one reason we hope the in situ retorting method proves the most successful. Opening these lands to one gigantic strip-mining, or open pit mining, operation would be tragic.

Without casting aspersions at any agency, or individual, or administration, we think these basic policies and regulations governing the development of such a vast and valuable public resource should be set out by law. In this manner, any temptation for another "Teapot Dome" scandal will be lessened. Sen. Douglas might not even need a "Watchdog Committee" although we are inclined to agree with him on its desirability.

4. Set out a revised distribution formula for royalties. We agree that the States involved should benefit from this public resource, but believe there is no justification whatever for diverting 52½ per cent to the Reclamation Fund. The Reclamation Fund is designed principally to help finance the irrigation and reclamation of agricultural lands in the western states. There is no solid rationale whatever for giving these special interests such a windfall.

In our opinion, the Federal Government must retain a much greater portion of the royalties. Surely the people of the U.S. who own this land are entitled to at least a ⅛ royalty—the same amount usually provided private landowners on any oil development lease. Under no circumstances should a low-fixed fee for lease holders be developed. All lease monies, except that paid to state and local governments, should be set aside for broad public benefits such as the Land and Water Conservation Fund, education, health, and other projects the Congress would approve.

5. Remove the depletion allowance on Federally leased land. If the land remains in Federal ownership, as we believe it should there is no reason for the oil companies which utilize the resources to get this generous tax consideration. In this manner, the Treasury of the United States and the proper financing of badly needed social programs should benefit in still another way.

6. Care should be taken that this vast amount of public wealth be developed competitively with the small oil companies entitled to share in the leasing and extraction of this valuable mineral resource.

In conclusion, Mr. Chairman, we should make the observation that this matter is of extremely high importance and significance. In fact, we doubt that the Congress has a more important single principle to consider, from a financial point-of-view, than this policy relating to oil shale. From the long-range point-of-view, this certainly is one of the most important decisions ever to be made in the resources field. Therefore, we urge that this august body not procrastinate until the decisions are made.

Thank you for the opportunity of making these observations.

AMERICAN FEDERATION OF LABOR AND
CONGRESS OF INDUSTRIAL ORGANIZATIONS,
Washington, D.C., September 28, 1967.

Hon. HENRY M. JACKSON,
Chairman, Committee on Interior and Insular Affairs,
U.S. Senate,
Washington, D.C.

DEAR MR. CHAIRMAN: In connection with your recent hearings on the oil shale development program set forth by the Secretary of the Interior in the Bureau of Land Management regulations dated May 7, 1967, (43 CFR 3170—Oil Shale) and (43 CFR Subpart 224—Exchanges), I wish to present the views of the AFL–CIO.

As you know, the AFL–CIO has strongly opposed proposals by the Secretary of the Interior which would lead to commercial leasing of shale oil lands before major problems of public interest protection, monopoly prevention, conservation and technology are solved. Our position was set forth by the most recent AFL–CIO Convention in 1965 as follows:

"We urge full protection of the enormous stake that all Americans hold in the shale oil 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 protections against private monopoly and speculation."

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 immediate major responsibility for shale oil development is turned over to private industry.

In a statement on September 14, 1967, the Secretary of the Interior told the Senate Interior Committee that he has "in process the further intensive study of oil shale policy which is so necessary in arriving at the decisions on a proper program. Our target for completion of this study is mid-January 1968."

We welcome this clear indication by the Secretary that more information and more study are needed to make intelligent, sound, pro-public-interest decisions on oil shale policy. Policy decisions based on inadequate information are likely to be wrong decisions.

We also commend the Secretary for his statement that his department's oil shale policy will "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 position is in line with our most recent AFL–CIO convention resolution on federal research and development programs.

However, we are still seriously concerned about the proposed regulations of the Secretary of the Interior for a number of additional reasons:

1. The extent and the value of oil shale resources are not yet known with sufficient accuracy for the making of sound public policy.

2. Some 1.5 million acres, about 30% of the total area of the Green River Formation, are now held under cloudy, uncertain titles.

3. Feasible alternatives for oil shale mining, processing and retorting technologies have not yet been developed. The conventional retorting techniques can be made competitive with the costs of producing well oil, but raise many environmental problems. On-the-spot retorting which would avoid most environmental problems is still undeveloped.

4. Water supply and quality, land use and conservation problems have not yet been adequately studied.

5. There is no existing oil supply shortage for the nation, either from domestic or foreign sources.

6. The problem of multi-mineral development (oil shale, sodium and other intermixed and intermingled minerals) has not been assessed or solved.

7. Sixteen companies, most major oil producers, own more than 200,000 acres of oil shale lands held in patented claims in the Piceance Basin in Colorado. There are additional patented private holdings, according to the Department of Interior, which aggregate another 300,000 privately held acres in Colorado, Utah and Wyoming of which more than two-thirds are owned by the oil companies.

All these points raise questions which must be answered. We hope the report due in January 1968 will clarify these problems.

The May 7, 1967 proposed regulations to govern oil shale research and development leasing under the Mineral Leasing Act were devised, the Secretary told your Committee on September 14, "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."

These are commendable goals for research and development leasing, but we cannot ignore the Secretary's indication that commercial production will probably result from a research-and-development lease. It is clear that an R and D contract lease will open the door for possible monopolistic commercial production by the oil industry giants which can afford a 10-year R and D program.

Therefore, we again urge your Committee to insist on the program outlined in our AFL–CIO resolution, as quoted in the third paragraph of this letter.

Mr. Chairman, I respectfully request that this letter be included in the record of the recent hearings on the Secretary's proposed regulations on oil shale policy. When the shale oil question comes before your committee again we would like a further opportunity to make our views known.

Sincerely,

ANDREW J. BIEMILLER,
Director, Department of Legislation.

Senator Moss. We stand adjourned.

(Whereupon, at 4:20 p.m. the committee adjourned.)

APPENDIX A

(The comments submitted by Senator Hansen are as follows:)

GREEN RIVER, WYO., *June 22, 1967.*

HON. CLIFFORD P. HANSEN,
U.S. Senator, Washington, D.C.

DEAR CLIFF: I recently received a letter from Russ Beamer of the Wyoming Mining Association requesting that some of us from the Green River area review the recent Department of Interior's proposed regulations dealing with oil shale as they appeared in the Federal Register, Volume 32, No. 90, May 10, 1967.

I cannot speak for my company on this situation, but I do have some personal comments that I would like to pass along to you.

To me, the proposed rules are so completely opposite to all free enterprise, capitalistic theories that I find it difficult to imagine people in our government proposing such rules and regulations, particularly when they claim that these rules and regulations are to encourage competition in development and use of the oil shale. It is even more discouraging when you see this type of thing and see where one of the government secretaries arbitrarily issued an order against all reasonable and sensible data placed before him. Even so, I will pass on these few comments which may be of assistance to you in evaluating the subject.

Section 3170.0–5.—The use of the word "substantial" in reference to amounts of oil or gaseous products and the use of the word "significant" in relation to damage to oil shale beds used in this section leaves the whole definition wide open. I think that anybody will agree that these two words have multiple meanings. How is one to know if their proposed leases will yield substantial oil or gaseous products until they have done the research work? If the rock must yield oil or gaseous products by destructive distillation, the methods of obtaining oil and gas are set and quantities may be defined. Damage can be set also by simple definition.

Section 3171–1.—It is not my interpretation of a free enterprise system that allows a municipality to compete with its own citizens in leasing mineral deposits.

Section 3171.2.—Under No. 10, if the applicant knew all these things, particularly the mining and processing techniques to be studied, then it is not research, because you already know what you are going to do. A research program starts out with a study of the known methods, but then branches off into the areas of unknown, untested, untried methods, processes, etc.

In the same section under No. 12, again, if all of these items could be answered on application, there wouldn't be much use to conduct the research.

Section 3171.3.—It says that the State, Federal and local agencies are the monitors of your research program. I do not believe that these people know enough about such things to properly evaluate them. It is also very interesting under this section to see that the Secretary lists the limiting of potential hazards to environment above importance of limiting potential hazards to human safety. Then again, further down in that section, I don't see how the State, Federal, and local agents are in a position to evaluate the effects of competition of the projected research and so forth until after it has been completed.

Section 3172.2.—This discusses such things as commercial feasibility, optimum recovery, which cannot be decided upon until after the research work is done. Commercial feasibility is something that changes from day to day, therefore, it should not be a condition for a long-term research lease. Here again in this section, they put human safety after minimizing polution, scenic and aesthetic damage, damage to fish and wild life, etc.

Section 3172.3.—This gives the Secretary the right to tell you where you are going to do your work. I don't see how he can possibly assume to be so knowledgable. Later in this section, they discuss fairly reasonable reserves. The word "reasonable" is very, very loose.

Section 3172.9.—The first part of this again puts human safety after everything else. Later in this section it discusses disclosure of all work which means that you spend millions on research and then give it to the Federal Government. This is absolutely ridiculous. Also, in the section further down, it discusses the patent rights belonging to the Federal government. Here again, I don't think there are many companies that would spend this kind of money to turn over their results to their competitors.

All in all, this set of regulations is just about ridiculous as the Federal Government can get, and it would be my hope that the powers-to-be would do something about this deplorable situation.

I don't think that Wyoming has ever been as green and beautiful as it is now, so if you have an opportunity to return in the near future it would certainly be worthwhile.

I am sorry that I have not written you sooner and congratulated you on your record to date in the Senate. Please do not hesitate to notify me if you feel there is any thing I can do to be of assistance.

Very truly yours,

JAMES H. OGG.

PAN AMERICAN PETROLEUM CORP.,
Tulsa, Okla., August 14, 1967.

Hon. CLIFFORD P. HANSEN,
U.S. Senate, Washington, D.C.

DEAR SENATOR HANSEN: This will supplement Mr. Yost's letter to you of June 21, regarding Pan American Petroleum Corporation's statements and recommendations concerning proposed amendment of the regulations covering the leasing of oil shale lands and exchanges under the Taylor Grazing Act.

I am very sorry that we have been so delayed in compiling these comments; however, we have just today mailed Mr. Rasmussen the enclosed letter even though it shows a date of August 4.

We trust that these comments will be of assistance to you in your appraisal of the proposed regulations and we wish to again point out that in our opinion the entirely wrong approach has been taken by the Department to this subject which we think is based on the general misconception concerning the nature of oil shale operations and the net value of the products to be derived therefrom.

If we can be of any further assistance to you in this matter, please advise us.

Yours very truly,

J. W. HAMILTON,
Chief Landman.

PAN AMERICAN PETROLEUM CORP.,
Tulsa, Okla., August 4, 1967.

Re amendment of regulations governing the leasing of oil shale lands (43 CFR, Part 3170) and exchanges under the Taylor Grazing Act (43 CFR, Subpart 2244).

Mr. BOYD L. RASMUSSEN,
Director, Bureau of Land Management,
Department of the Interior, Washington, D.C.

DEAR MR. RASMUSSEN: Comments have been solicited by the government concerning the proposal by the Department of the Interior to amend the regulations regarding the leasing of oil shale lands (43 CFR, Part 3170) and regarding exchanges of privately owned lands for public lands to facilitate oil shale development (43 CFR, Subpart 2244). This letter sets out Pan American Petroleum Corporation's comments concerning both proposals.

Pan American has long been actively interested in oil shale beginning in 1949 when it participated in the National Petroleum Council's original economic feasibility studies and continuing today through participation in the industry's cooperative project at Rifle, Colorado, and through preliminary refinery research. Consequently, we believe that the establishment of a policy relating to these

matters is laudable and long overdue. In our view, however, 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 proposed regulations will not result in the attainment of the Department of Interior's stated objective of developing "* * * oil shale to the point where it can begin to make a contribution to meeting U.S. energy needs."

The general approach discerned in the proposed regulations is, we believe, 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 information, 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). Various individual provisions are discussed in detail in Appendix I attached hereto. All in all, there appears to be a greater concern in the propsed regulations to counter any charge of "give-away" than there is to promulgate regulations which will attain the basic objective, a viable shale oil industry.

We are convinced that the proposed regulations, if finally enacted, would not promote "improved technology for the mining and recovery of shale oil" but rather would delay the arrival of an oil shale industry for many years. We believe it would be most desirable if the Department would critically examine the misconception concerning the mythical oil shale "bonanza". Once the true nature of oil shale operations is recognized, revision of the proposed leasing regulations can be effected on a basis which will accomplish Interior's stated objectives. We have set out below 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.* While it is perhaps not an exact analogy, there are trillions of dollars worth of gold in sea water, but no method has yet been devised to extract the gold from sea water on an *economic* basis. Thus, large reserves do not automatically translate to large profits, or necessarily to any profit at all.

2. *The large reserve estimates relative to Federal oil shale lands are by no means a measure of the "economically recoverable" oil present.* We estimate that more than 80% of the oil in Federal oil shale deposits is present in grades not sufficiently concentrated to make currently visualized operations profitable. Of the remaining 20% or less, fully one-half may well be in deposits which are too deep or too thin beds to be worth recovering.

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.* The gross income from each ton of rock that is mined and retorted will, on the basis of present technology, be substantially lower than the yield from any other mining and processing operation taking place in the United States today. The synthetic crude oil is expected to be worth about $2.00 per ton of rock mined; however, deducting the cost of the coking hydrogeneration process to upgrade raw retort oil to marketable synthetic crude will reduce this to roughly $1.50. Fundamentally then, oil shale compares unfavorably even with low grade iron and copper ores in the gross income per ton realized ($3.00 and $5.00 per ton respectively), and it should be obvious that oil shale operations will not yield a high profit margin, even if technology improves markedly in the future.

4. *Oil shale operations represent a high-risk investment industry.* There is admittedly little exploration risk involved in locating suitable oil shale deposits. The same type of geologic survey and core drilling program used to establish sufficient coal reserve to open a mine would be followed. Here, the similarity ends, for coal reserves thus established could be mined and sold at the mine mouth for perhaps $3.50 a per ton while oil shale, when mined and before retorting, is worth probably only about $0.60 per ton. Moreover, the marketability of coal is already established. An industrial market for mined shale must await full scale technological development, with attendant high financial risk. The estimated construction costs and operation expenses of commercial plants are based on untried, theoretical scale-ups of research operations, which probably understate

costs because of the inability to foresee all eventualities. In any case, there is no known way to start a shale oil industry with a small investment. To effect the requisite economies of scale, it is necessary to start with a plant producing at least 50,000 barrels of synthetic crude per day, requiring a minimum investment in the neighborhood of $150,000,000, assuming that existing pipelines to existing refineries may be used. The financial exposure is extremely high with substantial risk of failure to compete economically.

In response to the invitation of Secretary Udall, my letter of January 27, 1964, provided the Director of the Bureau of Land Management with Pan American's specific recommendations concerning revision of the shale oil regulations. We believe the comments set out in that letter provide a sound basis upon which realistic regulations can be promulgated. For purposes of convenient reference, a copy of that letter is attached as Appendix II.

Very truly yours,

F. R. YOST, *President.*

APPENDIX I

ANALYSIS

A. Proposed Oil Shales Regulations (43 CFR, Part 3170)

Section 3170.1. *Designation of Available Lands.* The first sentence indicates that "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." The foregoing sentence 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.

The second sentence broadly refers to selecting areas with a view to encouraging research with a variety of processes, also taking into account the principles of conservation. 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; this sequence is the historical pattern followed in the case of other minerals. By way of illustration, there would be no point whatever, in our opinion, in trying to encourage research, now, on very low grade oil shale deposits—the means should first be found to exploit the "flush" or rich deposits of shale, after which, degree by degree, technology would probably improve to permit the industry to extract crude from progressively poorer deposits.

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, considering Federal ownership of over 500,000 acres of shale land in the Piceance Creek Basin in Colorado, alone. In any case, it is suggested that this "built-in" restriction be removed and that the course of research and development, together with the interest of private industry, indicate to the Secretary whether, in his discretion, more or less acreage should be offered for lease.

Section 3171.2. *Form and Contents of Applications.* 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. It is suggested that no useful purpose is served in stating in detail such items as "the goals of the research plan; the nature, location and cost of plants and equipment to be utilized," etc. [see 3171.2 (10)].

Additionally, 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 [see 3171.2 (7) and (11)].

Section 3172.2. *Term of Lease.* If the district research and commercial production terms for oil shale leases are adhered to, as contemplated by these proposed regulations, it seems reasonable that the research term should be for a flat ten year term in all cases, or, at least, for a term which is *not less than* ten years.

Section 3172.3. *Acreage Designations and Limitations.*

(a) (d) As suggested by Pan American's letter of January 27, 1964, to the Director of the Bureau of Land Management, 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. It is submitted that the broadening of limitations to the extent herein proposed would not tend to create monopoly or to hinder competition.

(b) This portion of Section 3172.3 states that "[u]pon 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.

If the lessee desires, he should even be allowed to change the location of his research operations to some other site on the leased premises without getting advance approval of the Secretary.

(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—there is ample analogy for this treatment in the instance of Federal oil and gas leases.

Section 3172.4. *Rentals,* Pan American suggested in its letter of January 27, 1964, to the Director of the Bureau of Land Management that the annual lease rental should be established at $2.00 an acre. Such rental, in place of the 50 cent per acre rental set out in this proposed regulation, would tend to eliminate or to reduce speculation in oil shale leases.

Section 3172.5. *Royalties.*

(b) 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. In this regard, it should at all times be borne in mind that even the best deposits of oil shale represent a low grade mineral resource which cannot be burdened with high royalties, if research, development and production are to come to full fruition.

(c) (d) If the basic royalty referred to in (b), above, provides a smaller annual payment than a payment computed under (d), then subparagraph (c) of the proposed regulation indicates that an additional payment computed under (d) will be made. Subparagraph (d) provides for a sliding-scale royalty computed on the "net income" of the lessee from the production of mineral products from oil shale. Up to 50% of net income which exceeds 20% of lessee's investment will be the basis for computing the additional payment.

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. The sliding-scale provision would discourage the growth of an oil shale industry and its should, therefore, be eliminated.

(e) This subparagraph provides in part that "[l]ease royalties shall be subject to readjustment at 20-year periods succeeding the issuance of the lease." Again, this provision tends to retard the growth of the industry by injecting the

possibility of an increase in royalties. By analogy with the current Federal Oil and Gas Lease (Form 3120–3, September 1966), a fixed royalty should be specified, with, however, the right in the Secretary to waive or reduce royalties for valid hardship or conservation reasons.

Section 3172.9. *Other Provisions.*

(d) This portion of the section relates to disclosure of information developed during the research term of an oil shale lease. Under (d), the terms will provide, essentially, that the lessee shall keep the Secretary fully informed in detail of all research work and progress; that the Secretary shall have access to all facilities and books and records; and that the Secretary shall have exclusive rights to publish research information developed by the lessee.

(e) Under this portion of the section, the oil shale lease must provide that the United States will acquire title to all inventions made during the research term of the lease. Moreover, the lessee must issue licenses, at reasonable royalty rates, with respect to such patents as he may own, unless the lease otherwise provides.

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, and, for only after that happened, to begin operations in earnest.

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.

B. Proposed Exchange Regulations (43 CFR, Subpart 2244).

Section 2244.1–7(c)(3). This portion of the regulations requires an applicant desiring to exchange his privately-owned shale lands for government shale lands must enter into an agreement specifying a time schedule, rate of investment, and a plan of operation for recovery of shale oil and other minerals from the selected tract and neighboring oil shale lands. 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.

APPENDIX II JANUARY 27, 1964.

Re revocation of regulations in 43 CFR Part 197—Oil shale leases.

MR. KARL LANDSTROM,
Director, Bureau of Land Management,
Washington, D.C.

MY DEAR MR. LANDSTROM: This is in reply to Secretary Udall's invitation of October 24, 1963, for comments and suggestions relating to the leasing of Federal lands for oil shale development. Pan American Petroleum Corporation's analysis of crude oil production from oil shale indicates it is a distinctly different business from the production of conventional crude oil. The capital and operating costs are high and although the risks may be lower, the profitability is accordingly lower. As a result, the leasing and royalty arrangements for the conventional petroleum industry are not directly applicable to oil shale properties. In the recommendations which follow, departures from conventional petroleum industry practice are intended to encourage development of the oil shale industry.

Pan American Petroleum Corporation recommends revocation of Executive Order 5327 and the regulations in Part 197, as well as rejection of all pending oil shale lease applications.

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% anually 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.

Very truly yours,

F. R. YOST, *President.*

TUCSON, ARIZ., *July 26, 1967.*

Senator CLIFFORD P. HANSEN,
Senate Office Building,
Washington, D.C.

DEAR SENATOR HANSEN: I have a copy of a letter sent you by Heinrichs Geoexploration Company and criticism of the proposed rules and regulations sent out by the Honorable Secretary, Stewart Udall.

The regulations, in my opinion, are bordering on the ridiculous, and I don't know of any person in my financial bracket who would spend any money under this type of a bureaucratic setup.

The real danger to Wyoming, Colorado and Utah is their definition of "oil shale." In Wyoming today you have quite an industry developed to mining sodium from the oil shale strata. This in turn is processed and sold as soda ash and other commercial sodium compounds. Should you allow them to adopt this definition of oil shale, this would probably allow them to refuse any future sodium leases in your state, as this definition includes all the minerals within the oil shale stratas as oil shale.

The way this is drawn I am afraid will be overlooked, and they will have some plausible excuse for this definition, but the thinking behind this is that they have a clause in their sodium regulations which says "chiefly valuable" and this clause will enable them to say that the oil shale stratas are "chiefly valuable" for oil, and in that manner will refuse to issue leases under sodium, potash, and other types of salt minerals, of which there are a great number. Some we do not know their chief value today. One we will point out is dawsonite. This is our main source of aluminum for future use in this country.

The truth of the matter is that the shale beds in your state and Colorado and Utah are "chiefly valuable" for these types of minerals and oil shale will just be a by-product of the salt minerals industry. The only chance to get the oil shale moving so we get the oil out as a by-product is in the salt minerals mining operations which are developing very rapidly.

Today our air pollution problem is becoming more serious. It has been pointed out by research that one of the main things to control air pollution will be large amounts of cheap soda ash which is one of the main products of the salt mining operation.

In your state you have the jump on everybody else, as you have a number of sodium mines in operation. Should you allow them to get away with this definition, it means that they will put their arms around all the oil shale and all the minerals which are inter-bedded with the shale, and under these regula-

tions, if they are adopted, it would be impossible for you to develop more sodium mines.

There have been a number of criticisms sent in by the major oil companies regarding the regulations as set down, such as having to make a full disclosure of research and patents, etc., etc., which they shouldn't have the power to do, as I don't think the federal courts today themselves have that power. I don't believe that Congress intended to give the Department of the Interior that power when it created the Bureau.

I'm in favor of states being able to put on sufficient taxes to help run their state on any profitable industry in the state, so that by taxaion if Mr. Udall and his boys are disurbed by "wind-fall profits" the states can take the wind out of it very easily and not let the industry fall on its face.

I could, of course, write pages about this oil shale and how the Department has deliberately thrown every road-block it could in the way of an oil shale industry, and these regulations are another road block to show they are not intending to promote an oil shale industry. The Department boys want the government in the shale business with the taxpayers money.

The Tennessee Valley Authority they point to with great pride, but under cold-blooded accounting procedures, as against private industry, I don't believe it will shape up. However, it has done a great deal for the adjacent states, as it furnishes cheap power to get industries located, so maybe over all it has done some good for a few states, but all the rest of the states have had to help pay for it and will continue to do so.

Mr. Heinrichs, who wrote you, delivered a paper at the Oil Shale Symposium in Denver, Colorado. If you don't have this available, I am sure he will be glad to send you a copy. This goes to show that the oil shale should be mined by open-cut mining, and that the original investment would be considerable. However, it would enable you to mine shale in such a manner that you would take out these other minerals, shale oil being a byproduct and it could be offered to the industry for refining purposes at a price that would still allow the American public to have gasoline much cheaper than any other nation in the world over a long period of years.

Now, I don't know whether this rambling has helped you any, but old men are inclined to ramble a little bit, particularly when their favorite Tiger is the Department of the Interior. I have been fighting these fellows for 50 years, and I don't believe that I would enjoy life unless I continued the battle.

Kindest personal regards.

Sincerely,

JOE T. JUHAN.

FMC CORP.,
INORGANIC CHEMICALS DIVISION,
Green River, Wyo., June 23, 1967.

Senator CLIFFORD P. HANSEN,
Senate Office Building,
Washington, D.C.

DEAR SENATOR HANSEN: I apologize for my apparent procrastination in answering several of your recent letters to me. I have been attempting to secure some of the answers to your questions.

First, may I point out that Mr. R. L. Wahl of C F & I Corporation, Sunrise, Wyoming is now President of the Wyoming Mining Association and consequently I have passed your letters on to him. As you know, I am leaving the State in July.

Your letter of June 13 regarding the proposed oil shale leasing regulations has been discussed with the other trona producers in this area. Our principal concern with the oil shale regulations center on the withdrawal of oil shale lands from sodium leasing and I realize that these particular regulations on which you ask my opinion are not concerned with this phase. However, I mention this problem because I do not feel it has been resolved. The Department of the Interior continues to insist that this withdrawal will not affect the trona operations, but they admit that any new lease application or lease transfer must be reviewed in light of the oil shale withdrawal regulations.

As to the oil shale leasing regulations, the mining operators of this State do not seem to have any immediate interest in this proposal. I'm sure that if they did, they would share the oil producers' concern for the extremely stringent regulations which provide very little incentive for proceeding with any sort of development.

Your letter of June 16 regarding Willard Wirtz' Radiation Standards for Uranium Mining has been passed on to the Uranium Committee of the Wyoming Mining Association. This committee is deeply concerned with arbitrary ruling of Mr. Wirtz and I am sure will be expressing their joint opinion to you in the near future.

Thank you for your continuing interest in the opinion of the Wyoming Mining Association on matters concerning mineral extraction.

Best regards.

Yours truly,

R. F. LOVE, *Resident Manager.*

CONTINENTAL OIL CO.,
Washington, D.C., June 15, 1967.

Hon. CLIFFORD P. HANSEN,
U.S. Senate, Washington, D.C.

DEAR SENATOR HANSEN: I am enclosing a copy of Continental Oil Company's response to the proposed Interior Department oil shale research and development regulations, as requested in your June 13 letter.

I have also sent a copy of your letter to the Conoco officials who prepared the enclosed letter so they will be aware of your request in the event they have any further views to express on the proposed regulations.

We certainly appreciate the leadership you have provided in prodding the Department of Interior to expedite its programs for the development of our oil shale resources. Your daily attendance at the recent Senate Judiciary Subcommittee hearings on the antitrust aspects of oil shale development was also most helpful.

If I can be of any further assistance to you or Dave Dominick, please let me hear from you. Meanwhile, I would appreciate it very much if you would have Dave let me know when the Senate Interior Committee reschedules its hearing on the proposed regulations.

Sincerely yours,

TERRY RICE, *Manager.*

CONTINENTAL OIL CO.,
New York, N.Y., June 7, 1967.

Hon. BOYD L. RASMUSSEN,
Director, Bureau of Land Management, Department of the Interior, Washington, D.C.

DEAR SIR: As a company with great interest in shale oil as a potential source of energy, Continental applauds the efforts of Interior to stimulate shale oil research and development. We have examined the proposed regulations with considerable care.

Our reaction is not a favorable one. Overall it is our view that the rights to be granted are circumscribed with restrictions and conditions to such an extent that sufficient economic incentive will be lacking. It is our view that private industry will not be warranted in making the necessary capital, organizational and technological commitments which will be required.

The improved technology sought by Interior, and so obviously in the long term public interest, is incidental to what will be essentially a manufacturing operation. We see a future shale oil industry as one with large capital requirements, limited return on investment, and modest profit potential.

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.

Conoco will continue to pursue its interests in shale oil research. We expect to be a participant if the development of shale oil lands becomes a viable business. We hope this rather frank expression of our views is useful in connection with the decisions which must be made concerning this important subject.

Yours respectfully,

WAYNE E. GLENN,
Executive Vice President.

Hon. CLIFFORD P. HANSEN,
New Senate Office Building,
Washington, D.C.

DEAR CLIFF: This is in answer to your letter of June 13 with respect to the Department of Interior proposed oil-shale leasing regulations. I have read them over. There are many objectionable features in detail which you will doubtless hear about, particularly from RMOGA.

Inasmuch as I personally do not have any economic oil-shale interests, I have not made a study in depth of the situation. However, I can comment from a general point of view. I do this from a background of having talked to a number of major energy companies who are interested in the coal business. As you know, coal and oil shale are in a competitive position in the national synthetic-fuel picture.

I had a visit last week with the Cleveland Cliffs Iron people and the Sohio people who have been principal financial backers of much of the oil-shale effort in Colorado. I have also talked with the management level of Sun Oil Company in Philadelphia.

I can report that invariably these people feel that the Department of Interior proposals are completely unpalatable and will inhibit the development of oil shale.

From the point of view of one who is interested in the competitive position of coal, this is to our advantage. From the point of view of the national energy position, it is unfortunate.

Some of the technical people with whom I visited in Washington feel that these regulations are mostly politics.

The principal objection, of course, is the net-profits proposal for royalty and the very limited amount of land holdings permitted to a major financial investor.

The Galbraith-Douglas talk of a windfall in oil shale is, as you have pointed out, ludicrous. In many respects extraction of oil from shale is comparable to extraction of most minerals from oceans. There are tremendous quantities of each but, under today's technology, is uneconomic. This is a time for encouragement of research, within a responsible regulation framework, rather than the hamstringing of research by socialistic regulations based on politics.

For the fossil-fuels people in competition with oil shale, these proposed regulations are the "windfall." For the national interest, however, one can only hope that the Department will come up with some new regulations based on sound economic and technological considerations.

With kindest regards,

JOHN S. WOLD.

SUN OIL COMPANY,
TREASURY DEPARTMENT,
Philadelphia, Pa., June 20, 1967.

Hon. CLIFFORD P. HANSEN,
U.S. Senate,
Washington, D.C.

MY DEAR SENATOR HANSEN: In response to your request of June 13 there is herewith a reproduction of submittal to Director of the Bureau of Land Management by Mr. Kingsley V. Schroeder, our Vice President for Production, with regard to the oil shale matter.

We trust this statement of Sun position is the information you seek.

Very truly yours,

JOHN H. MCWILLIAMS,
Manager, Land Department.

KINGSLEY V. SCHROEDER, VICE PRESIDENT OF PRODUCTION, STATEMENT ON THE PROPOSED FEDERAL REGULATIONS FOR LEASING OIL SHALE LANDS ON THE PUBLIC DOMAIN, U.S. DEPARTMENT OF THE INTERIOR, JUNE 5, 1967

Sun Oil Company is pleased that the United States Department of the Interior has provided this opportunity for comment on the proposed Federal Regulations for Leasing Oil Shale Lands on the Public Domain.

Sun does not own or have any leases on domestic shale oil lands but we wish to comment on the proposed regulations since the recovery of oil from such privately-held or government-owned deposits in the future is a subject of vital concern to our national security.

It is recognized that the publication of the proposed regulations in the *Federal Register* was accomplished to provide the Department of the Interior with information which would help formulate the orderly development of a national resource in the best interest of the people of the United States.

Comments on Sun's position are listed separately on the following pages by major sections of the proposed regulations.

Subpart 3170—Oil Shale: General

Sun Oil Company concurs with some of the stated purposes of the proposed regulations regarding the leasing of oil shale lands under Title 43 of the Code of Federal Regulations which would foster improved technology for the mining and recovery of shale oil. The regulations are pursuant to the Mineral Leasing Act of February 25, 1920 (41 Stat. 445), as amended, (30 U.S.C. 181–287).

The potential value of shale oil is great—but it can have value only after methods to produce it have been developed at great cost. The dollars realized should not be considered a "bonanza" gathered from the public realm. Any producer of this resource will need to know that his investment will be sound and sufficiently stable or he will choose to make his investment in some other venture.

We are particularly pleased to see that one of the objectives shall be to "encourage competition in development and use of oil shale and related mineral resources and to develop a basis for subsequent competitive leasing of Federal oil shale lands".

It is our opinion that the best utilization of the potential oil resources can be effectuated by adhering to this purpose as the central theme for all of the regulations. Each applicant for leases and subsequent development and commercial production should be considered on its own merits. Each applicant should be permitted to operate with a minimum of external control and to benefit financially in recognition of the risks taken.

Development of oil shale lands is vital to our national security and should be coordinated in a consistant manner with the existing Mandatory Oil Import Control Program established by Presidential Proclamation 3279, as amended.

Sun has made projections for U.S. petroleum demand for the next 15 years based on demand increasing at a rate averaging 3 per cent per year. On this basis, U.S. oil demand by 1980 will total almost 18 million barrels a day, compared with the 11.5 million barrels used daily in 1965. This represents a demand gain of more than 50 per cent, or 6.5 million barrels daily, over the next 15 years. An increase of this magnitude suggests not only that we face a tremendous oil-finding job in the future, but also that by 1980 we may be required to supplement domestic sources of oil supply with increased imports and/or with oil from shales and tar sands.

Sun believes that the Nation cannot rely for the balance of this material to come from imports alone. Recent world events have shown that oil from abroad may not necessarily always be available on a scale sufficient to meet our needs. To prevent any critical shortages, the U.S. must encourage greater domestic production by allowing industry to continue to operate with a minimum of controls and a maximum of incentives.

Any oil shale policy should be formulated with conventional crude oil production practices in mind. Leases for oil, gas and other minerals exploration for years have been obtained from private, state or federal owners with no requirements made that the producer give the owner any information on new production techniques employed or developed. This also was true with offshore production acreage when leases first became available around 1950.

Subpart 3171—Applications for Leases

We are 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. This type of disclosure of a company's other business interests is not normally made. 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. This, in our opinion, is in conflict with a free competitive enterprise system which would allow all individuals an equal opportunity to seek leases.

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. We believe in this principle even though Sun Oil Company does not now have leases in oil shale lands.

Also, we are uncertain of the requirements which would have the applicant describe the reserves owned or controlled (3171.2 (c) (11)). If this section means the applicant must describe the total of oil reserves owned or controlled "of the kind believed to be present on the lands applied for" on a worldwide basis, Sun feels that such information is not only not germane to the issuance of a research shale lease but is impossible to determine with any degree of reasonable accuracy. This section should be redrafted to exclude such data.

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. Only a few companies who have already carried out extensive research on privately held oil shale acreage and pilot plant projects could possibly be in a position to answer these questions.

Subpart 3172—Miscellaneous Provisions

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. It is our belief that a standard lease form is desirable, at this time, in order that any lessee can be informed as to the specific requirements and terms of the leases under which he must operate.

The proposed regulations (3172.2 (b)) now specify an extension of the term of the research lease to permit commercial production if the Secretary determines that certain requirements under the research lease were met. 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 * * *."

Also, 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. In view of the magnitude of expenditures likely to be made during the research term, it would be better to have an objective test used to determine substantial compliance with the research program.

It is difficult to predict the profit potential under the proposed regulations since broad discretionary powers are reserved for the Secretary. One consequence of this is that an unreasonable risk would be attached to any financial commitment.

Specifically, the Secretary can determine (3172.2 (b) (2)) whether a proposed commercial process is economic and can reject an application for commercial production on this basis after an expensive research program has been successfully completed. A company's willingness to commit the investment necessary for commercial production should be the basis for determining the economic feasibility.

Also, 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 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.

Under the section dealing with royalty rates (3172.5 (d)) provision is made for graduated annual income royalty rates up to 50% of the net income which is more than 20% of the investment. This seems to be unreasonably high and may well discourage investment in and consequently development of the oil shales. 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. Sun carries a nationwide bond of $100,000 in connection with its operations under the Mineral Leasing Act. It is our opinion that any increase in the amount of the bond for oil shale research should be tied strictly to the lessee's

commitments in the research lease and not adjusted upward later. The ability for the Secretary to increase the required performance bond, along with the indefinite nature of the performance requirements, would provide a means for the Secretary to halt operations at any stage in the research.

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 and is in direct conflict with the free enterprise system. Whatever competitive advantages there are in any newly developed techniques should acrue solely to the benefit of the company developing them.

It also would handicap the research work itself if a company wishes to make use of equipment or research supplied by outside contractors. It is quite likely that such a contractor would have his own proprietary position which he would not want to compromise under the proposed regulations.

Since all inventions made in the course of or under the research terms of the lease become the property of the United States (3172.9 (e)), no company doing research work can expect to recover part of its cost of the research through the sales of licenses to others. This also detracts from the incentive to do research work and, in our opinion, is an unreasonable requirement and should be withdrawn.

Finally, 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.

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 per lease there will be presumably only six successful applicants. (Any lease assignment of less than 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.

SHELL OIL CO.,
Denver, Colo., June 30, 1967.

Hon. CLIFFORD P. HANSEN,
U.S. Senate, Washington, D.C.

DEAR SENATOR HANSEN: Pursuant to your letter of June 13, 1967, addressed to our New York office and a similar letter addressed to our Mr. Black, we are enclosing a copy of Shell's comments on the Department of Interior's proposed oil shale regulations. These comments have been sent to the Department.

We appreciate your request and hope that our comments will be of assistance in your deliberation of the matter.

Yours very truly,

J. F. BOOKOUT,
Vice President, Denver Area.

SHELL OIL CO.,
Denver, Colo., June 8, 1967.

Mr. BOYD L. RASMUSSEN,
Bureau of Land Management,
Department of the Interior, Washington, D.C.

DEAR MR. RASMUSSEN: This letter is written in response to the Secretary of the Interior's request for comments on the proposed Rules and Regulations for the leasing and exchange of Federally owned oil shale land, which were published in the Federal Register on May 10, 1967.

We believe that the proposed regulations represent a positive step toward the development of this nation's oil shale resources; however, we are concerned over the following points 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 regulations leave uncertain 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.

We believe that the matters enumerated above are so basic as to require modification of the regulations and presume that comments and suggestions from others will result in further changes. We would appreciate the opportunity to review and comment upon subsequent revisions before the proposed regulations are finally adopted.

The proposed amendment to the regulations under the Taylor Grazing Act to allow for exchange of privately owned oil shale land is a most worthwhile revision of the regulations and we support this proposal.

We appreciate the opportunity to offer these suggestions for your consideration.

Yours very truly,

J. F. BOOKOUT,
Vice President, Denver Area.

ALLIED CHEMICAL CORP.,
New York, N. Y., July 7, 1967.

Senator CLIFFORD P. HANSEN,
U.S. Senate, Washington, D.C.

DEAR SENATOR HANSEN: Since we know how concerned you are with respect to the recent proposal for the withdrawal of oil shale lands and the proposed regulations regarding the leasing of oil shale lands, enclosed herewith are copies of two letters which we have recently sent to the Bureau of Land Management. Please note that we have not commented on the merits of our problems involved in the proposed oil shale withdrawal generally, but, rather have restricted our comments to the manner in which any adverse effect on the Wyoming soda ash industry might be avoided.

Please feel free to call upon us if we can be of any further assistance to you in this matter.

Copies of our letters to the Bureau of Land Management are also being sent to Senator McGee, Governor Hathaway and Congressman Harrison.

With all best wishes, I am,

Sincerely yours,

VICTOR FUTTER,
Assistant Director, Legal Department.

ALLIED CHEMICAL CORP.,
New York, N.Y., June 28, 1967.

Re: Proposed Withdrawal and Reservation of Lands F.R. Doc. 67–1118, filed January 27, 1967; as amended, F.R. Doc. 62–2855, Filed March 13, 1967.

BUREAU OF LAND MANAGEMENT,
Washington, D.C.

GENTLEMEN: This letter is written in response to your request for comments on the Bureau of Land Management's application for withdrawal of oil shale deposits and lands containing said deposits from mineral leasing. Without commenting on the merits or problems involved in the proposed withdrawal generally, we submit that it is essential to the continued economic well being and development of Wyoming that no proposal be considered without incorporation of the modifications discussed herein.

PROPOSED MODIFICATIONS OF WITHDRAWAL POLICY

For the reasons set forth below, we respectfully request two modifications in the proposed withdrawals:

(1) It be made explicit that the renewal of present or future sodium leases is not subject to the withdrawal or the policies stated therein; and

(2) So far as Sweetwater County, Wyoming is concerned, the leasing of sodium (trona) lands be continued, and such mineral deposits in Wyoming be excluded from the withdrawal and the policies stated therein.

BACKGROUND

This Company is currently developing trona reserves contained in sodium lands located in Sweetwater County, Wyoming, pursuant to leases from the federal government. These lands are embraced within the area covered by the proposed withdrawal. We have presently invested in excess of five million dollars in shaft construction and in preliminary mining operations on these lands, and the immediate projected capital outlay for facilities necessary to mine and process sodium is anticipated to be over twenty million dollars. Furthermore, proposed plans for the near future include increasing the capacity of the proposed processing facility and mining operation with the result that the Company's capital investment would be increased to approximately forty million dollars. To understand the substantiality of the trona industry in Wyoming, these capital investments, representing the commitments and plans of only one of several companies that are currently developing or have announced plans to develop lands held under federal sodium leases, must be multiplied several fold.[1]

I. Renewal of Existing Federal Leases

Contemplated financial investments of the magnitude stated above obviously cannot be made if any uncertainty is created about the renewal of sodium leases which, in our case, have only 10 to 14 years to run.[2] These leases grant the "preferential right in the lessee to renew the same for successive periods of 10 years under such reasonable terms and conditions as may be prescribed by the Secretary of the Interior, unless otherwise provided by law at the expiration of any such period". Unless specific exception is made in the proposed oil shale withdrawal, it would seem possible to contend that existing leases should not be renewed because the oil shale withdrawal creates a situation where "it is otherwise provided by law". It is hardly fair to expect anyone to make a substantial investment in the face of any such uncertainty. We recognize, of course, that the proposed withdrawal does not apply to sodium leasing "where the Secretary finds that development of the sodium deposits would not adversely affect in any significant way the oil shale values of the lands". This, however, presents a difficult burden of proof, because in Wyoming sodium and oil shale desposits are often adjacent and the mining of sodium would necessarily affect the oil shale values. In addition, while we do not believe the oil shale in Wyoming adjacent to the trona is of commercial significance, a map published by the Department of the Interior (Geological Survey Circular 523 *Organic Rich Shale of the United States and World Land Areas* by Duncan and Swanson (1965), p. 12), attached hereto as Exhibit A, does show some high content oil shale lands to be in the same general area as the Wyoming trona lands. On the foregoing basis, it is urged that the renewal of any sodium leases now existing or hereafter issued be excepted from the proposed oil shale withdrawal and the policies stated therein.

II. Insofar as Wyoming is concerned, the proposed withdrawal should not apply to the leasing of sodium (trona) lands

The proposed withdrawal should not apply to all oil shale lands in Wyoming because it would interfere with the leasing of sodium lands. The leasing of Wyoming sodium lands should not be interfered with because:

A. The Wyoming sodium lands have demonstrated commercial value whereas the commercial value of most—if not all—of the oil shale lands in Wyoming is extremely speculative;

B. The purpose of the withdrawal could be effected by merely withdrawing the oil shale lands in states other than Wyoming, since it is admitted that the extremely rich deposits are in the Piceance Creek basin in Colorado and the

[1] FMC and Stauffer are both currently expanding existing operations. Texas Gulf has announced plans to initiate shaft construction, and others have expressed interest in developing their reserves.

[2] In informal discussions with the Department of Interior we have sought to have these leases extended to 20 years from when our plant commences commercial operations and have been advised that the existing leases could not be so extended.

Uinta basis in Utah[3] except to the extent that it would interfere with the mining of trona, the purpose of the withdrawal would certainly be effected.

C. If the Wyoming sodium lands are not included in the withdrawal, the feasibility of future oil shale development in Wyoming would not be materially impaired.

A. *The development of the commercially value sodium deposits should not be jeopardized for the benefit of the oil shale deposits in Wyoming most of which are not now commercially practical to develop.*—It is submitted that the proposed withdrawal of trona (sodium) lands with their proved values because of their possible oil shale value is not justifiable on the basis of any evidence that the value of such oil shale exceeds the value of the trona deposits. Whereas the development of Wyoming's sodium (trona) lands and the production of soda ash therefrom is a thriving industrial reality, the purpose and thrust of the proposed withdrawal is based on the mere possibility that commercially feasible methods of extraction of the oil values will be developed.

Speaking before the Subcommittee on Antitrust and Monopoly Legislation of the Senate Committee on the Judiciary on April 26, 1967, Secretary of the Interior Udall made clear the highly speculative nature of the proposed oil shale development. In commenting upon the fact that in the 47 years since the passage of the Mineral Leasing Act, there has been no commercial development of oil shale he stated:

"There are a number of reasons to explain this fact, but the principal or dominant one has been the absence of a *technology* that would make shale oil *competitive with conventional petroleum.*

* * * * * * *

". . . if we were actually on the threshold of *commercially feasible production,* there would be little need for the program that I have proposed." [Italic added.]

The Congressional Quarterly Fact Sheet for June 2, 1967 refers (p. 940) to "the *prospect* of an economical method of extracting oil from the oil shale approaches reality." Some sources (see *Denver Post* editorial of April 23, 1967, 113 Cong. Rec. S.6561) predict that the cost of extraction will be exceedingly high on the basis of current research, all of which seems to cloud the future competitive marketability of oil shale when extracted.

Contrasting these speculative values against the demonstrated value of sodium deposits in the area of Sweetwater County, Wyoming, the withdrawal seems unwarranted and would deny both the nation and the State of Wyoming the economic benefits of the highly competitive and growing natural soda ash industry. This could seriously hamper the spreading economic development in this area of Wyoming with the consequence that new jobs needed to spur growth and maintain economic health would not be created and substantial capital outlays now planned would be substantially curtailed. Why, one might ask, should a commercial reality be hampered for the sake of an admittedly speculative development, particularly when, as will be shown in the next point, the least important part of that development is in Wyoming?

B. *The purpose of the oil shale withdrawal could be effected even if the Wyoming trona were not withdrawn.*—Leaving aside the issue of the specula-

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[3] *The Congressional Quarterly Fact Sheet* for June 2, 1967 states (p. 941):

"A USGS spokesman April 18 told the Senate Judiciary Antitrust and Monopoly Subcommittee that the Piceance Creek Basin alone contained total mineral resources 'that tax the imagination'."

Geological Survey Circular 523, *supra,* states at p. 10:

"Shale units that yield a few gallons to about 65 gallons of oil per ton are distributed throughout much of the Green River Formation, which ranges in thickness from a few hundred feet to about 7,000 feet. In general the central parts of the Piceance Basin and the Uinta Basin contain thick rich oil-shale sequences that grade to thinner and leaner oil shale at the basin margins. Somewhat thinner and generally lower grade oil shale in the Green River basin and Washakie Basin, Wyoming, also show decrease in grade toward the basin margins."

Russell I. Cameron, a consulting engineer, has stated (113 Cong. Rec. A3017, see extension of remarks of Mr. Aspinall):

"Our major oil shale reserves are in Colorado, Utah and Wyoming. The areas are well defined and we are confident that the largest reserve is in Colorado's Piceance Creek Basin. Utah has some areas that may be developed at reasonabl cost my open-pit mining but much of its oil shale is deeply-buried and cannot be economically produced with technology now available.

"*Wyoming has only marginal oil shale prospects despite a large area of Green River formation,* but additional exploration is needed especially with regard to associated minerals. I will have more to say on these other minerals later." [Italic added.]

tive and uncertain values of oil shale as compared with the known values of trona deposits in Wyoming, it is submitted that the purpose of the withdrawal would be met if the withdrawal were to apply solely to the known oil shale lands in Colorado (the Piceance Creek basin) and Utah (the Uinta basin) and the oil shale area in Wyoming other than the Sweetwater County trona lands. The map attached hereto as Exhibit A shows the respective oil shale areas in the three states. The Department of the Interior News Release dated May 7, 1967 states (page 2) that the richest oil shales are believed to be those in the Piceance Creek basin where there are some 770,000 acres containing 25 gallon-per-ton shale in thicknesses of 15 feet or more. According to the Department of the Interior's Memorandum dated January 26, 1967 to the Land Office Managers of Cheyenne, Denver and Salt Lake, the oil shale in the center of the Piceance basin has a thickness of up to 2,000 feet.

The contrast is even more marked if one examines the data published in an article entitled "Shale Oil—the Problems and the Prospects" (*The Oil and Gas Journal*, March 9, 1964, p. 65) from which the following table can be compiled:

	Oil shale area (square miles)	Number of barrels (billion)
Colorado	1,500	1,000
Utah	5,400	430
Wyoming	9,600	43

Thus, in an area 6.4 times as large in square miles, Wyoming is expected to produce less than 1/23 of the total number of barrels as Colorado. This suggests the comparison (as a matter of illustration rather than scientific accuracy) that the oil shale seams in Wyoming may be 1/150 of the magnitude of those in Colorado. The comparative figures for Utah are also striking. Wyoming's area is almost twice as big, yet it produces only 1/10 the number of barrels, suggesting as a comparison (on the same basis as above) that the seams in Wyoming are only 1/20 the size of those in Utah. Furthermore, Mr. Edward Weinberg, Deputy Solocitor of the Department of the Interior, in his statement before the Senate Subcommittee on Antitrust and Monopoly of the Committee of the Judiciary on April 20, 1967 sets forth statistics showing that less than 1.5% of the total number of oil shale claims for which patents were issued in Wyoming, Utah and Colorado covered lands in Wyoming. Finally, Geological Survey Circular 523, *supra*, states (p. 13) that Wyoming contains only some 30 billion barrels out of a total of some 600 billion barrels (or 5%) of the deposits in the three state area yielding 25–65 gallons of oil per ton.

The Wyoming trona area is depicted on the map attached hereto as Exhibit B, the source of which is Geological Survey Professional Paper 496–A by W. H. Bradley at page A–3. The prime trona area, however, is in Sweetwater County and it is proposed that just this portion of the trona area be excluded from the proposed oil shale withdrawal. Excluding such a limited area from the proposed oil shale withdrawal would hardly interfere with the purpose of the oil shale withdrawal, particularly when the quantity and nature of the Wyoming oil shale reserves are compared with those in the other two states.

C. *The non-withdrawal of the Sweetwater County, Wyoming trona lands will not materially impair the oil shale development.*—Aside from the feasibility or practicality of oil shale development in Wyoming, it appears unnecessary to cause the Sweetwater County, Wyoming trona lands to be withdrawn inasmuch as the oil shale seams immediately adjacent to the trona seams are of minor significance when contrasted with the seams in high grade oil shale areas (e.g. the 2,000 foot thick seams in Colorado). In our trona operations in Sweetwater County we have not encountered any commercially exploitable oil shale. Our experience is supported by the view of J. Cordell Moore, Assistant Secretary of the Department of the Interior, who, in a letter dated March 22, 1967, to Representative William H. Harrison of Wyoming, a copy of which is attached as Exhibit C, notes that Dr. William T. Pecora, Director of the United States Geological Survey, has explained that "trona operations in Wyoming under previously issued sodium leases are conducted in relatively clean trona beds" whereas in Colorado in the Piceance Creek basin the sodium minerals "are in-

timately mixed with oil shale." While the trona beds are relatively clean there do appear, however, to be oil shale seams immediately adjacent to trona seams. Even if these are of poor quality and not commercially significant, it cannot be said that trona mining "would not adversely affect in any signifiant way the oil shale values of the lands".

It may be suggested that the quoted language should not be as narrowly construed as we have suggested; that it really is intended to safeguard the Wyoming trona development; that it places the matter in the hands of and at the discretion of the Department of the Interior; and that we should be satisfied to rely thereon.

The answer to this is several fold:

(1) While we might have the assurances of this administration of the Department of Interior, subsequent administrations might take a different view;

(2) Prudent management dictates that multi-million dollar investments should not be made in the face of known legal uncertainties, particularly when, as here, those uncertainties could be eliminated now;

(3) The present state of technical knowledge covering oil shale is too uncertain to sustain the burden of proof, imposed by the proposed withdrawal, that trona mining "would not adversely affect in any significant way the oil shale values of the lands".

(4) The United States Supreme Court has warned: " 'Men must turn square corners when they deal with the Government'." (*Federal Crop Ins. Corp* v. *Merrill*, 332 U.S. 380 at 385 (1947), per Mr. Justice Frankfurter quoting from an earlier decision by Justice Holmes.) If the farmer who was advised by a government agency that his crop was insured couldn't win the sympathy of our highest court when his crop was destroyed and he sought to collect on his insurance because the particular type of insurance violated a Department of Agriculture regulation, then we doubt whether a major corporation—in some-what analogous circumstances—could do so.

It is suggested, therefore, that sodium leasing in the limited Sweetwater County, Wyoming trona area should not be affected in any way by the proposed oil shale withdrawal but should be explicitly excluded therefrom. In that small area the development of the oil shale should only be permitted if it "would not adversely affect in any significant way the sodium (trona) values of the lands." This would put the relative values in proper order and would not put the development of an existing and commercially significant industry at the mercy of a speculative future industry. If oil shale development is performed in the Wyoming trona area even in oil shale beds at levels not immediately adjacent to the trona beds, retorting and blasting in connection therewith might seriously adversely affect the development of the trona resources. Conversely, the conventional mining methods used to recover trona would not seriously interfere with future oil shale recovery of deposits at levels not immediately adjacent to trona beds.

The effect of our suggestion would be to permit the continuation of the burgeoning natural soda ash industry in Wyoming without penalty to the oil shale development. Experimentation could be carried on in Colorado, Utah and even in Wyoming, and at the same time the oil shales in the limited Wyoming trona area to the extent not permitted to be exploited because it might interfere with the trona development would be reserved to the federal government and preserved except to the minor extent that trona mining would interfere with the probably non-commercially significant oil shales immediately adjacent to the commercially operable trona beds.

Finally, it should be noted that the proposed exclusion: (1) only concerns trona and not the other sodium minerals such as dawsonite; (2) is limited to the narrow area of Sweetwater County, Wyoming and does not include Colorado or Utah; and (3) embraces only the prime trona area in Wyoming, not the entire trona area.

Such an exclusion would thus not interfere, for example, with the Piceance Creek basin in Colorado where dawsonite is intimately mixed with oil shale.

CONCLUSION

We trust that this letter demonstrates that with only slight modifications the proposed oil shale withdrawal program can be fully achieved without interfering with the commercially successful production of natural soda ash in Wyoming.

Accordingly, we respectfully request that:

1. Explicit provision be made that the renewal of existing or future trona leases will not be affected by the proposed withdrawal; and

2. The prime Wyoming trona lands located in Sweetwater County, Wyoming be excluded from the proposed withdrawal since the proposed oil shale development would in no way be seriously prejudiced by such exclusion.

The effect of these two minor changes would be to assure the continuing contribution of the natural soda ash industry to Wyoming's economic development.

Please feel free to call upon us if you have any questions with respect to our suggestions or desire any additional information. We shall be happy to meet with you to discuss this matter further at your convenience. We would, of course, appreciate notice of any hearings you may hold with respect to this matter.

Sincerely,

VICTOR FUTTER,
Assistant Director, Legal Department.

Enclosures.

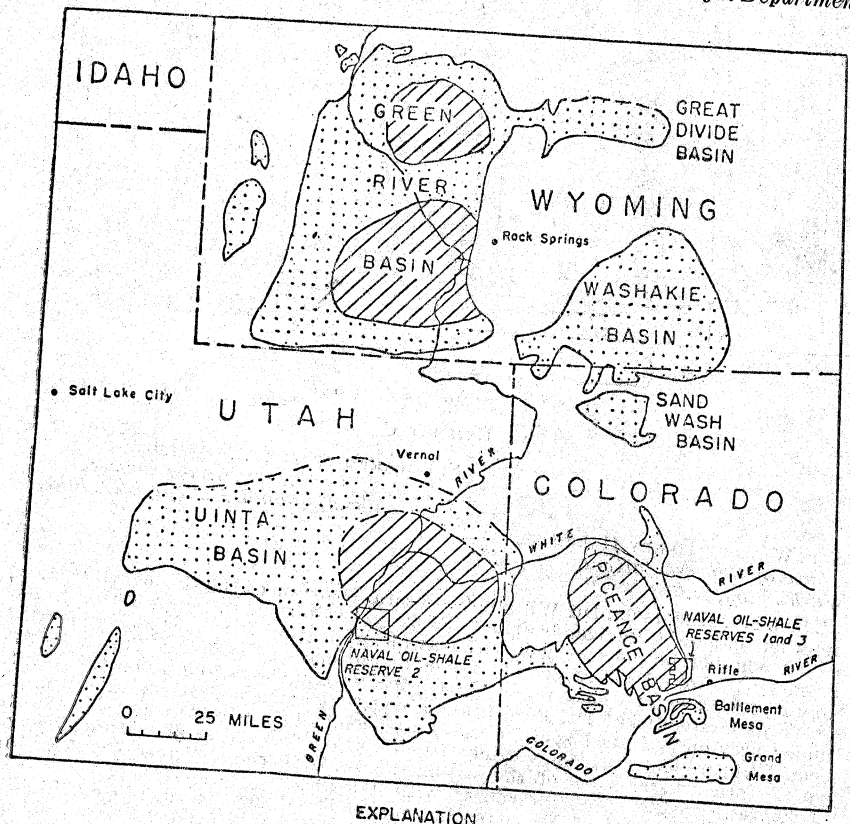


Figure 3.—Distribution of oil shale in the Green River Formation, Colorado, Utah, and Wyoming.

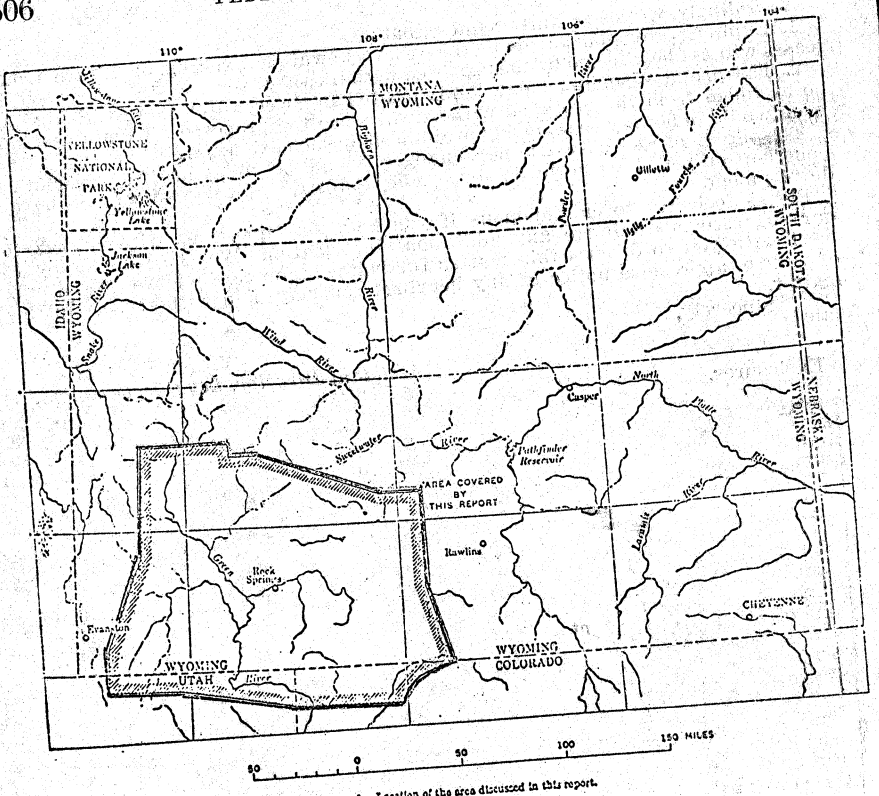


FIGURE 1.—Location of the area discussed in this report.

EXHIBIT C

U.S. DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., March 22, 1967.

Hon. WILLIAM HENRY HARRISON,
House of Representatives,
Washington, D.C.

DEAR MR. HARRISON: Dr. William T. Pecora, Director of the Geological Survey, tells us that at its budget hearings before your Subcommittee on March 2 you asked whether or not the new withdrawal application for oil shale lands filed January 27 would affect present trona operations in Wyoming. You were receiving inquiries and have noted a good deal of misunderstanding on this point.

We understood that Dr. Pecora explained that trona operations in Wyoming under previously issued sodium leases are conducted in relatively clean trona beds that can be mined separately from the oil shale beds above and below. On the other hand some of the sodium minerals in the Piceance Creek basin in Colorado are intimately intermixed with oil shale.

The Press Release of February 6, copy enclosed, was issued to explain to the general public the effect of the withdrawal order on leasing as well as on mining claims on oil shale lands. The order does not affect existing sodium leases or leasing operations, or prospecting under sodium prospecting permits already issued.

It does not preclude the issuance of new sodium prospecting permits or leases when development of the sodium deposits would not adversely affect in any significant way the oil shale values of the land. We do not anticipate that this proposed withdrawal would adversely affect development of trona deposits in Wyoming.

Sincerely yours,

J. CORDELL MOORE,
Assistant Secretary of the Interior.

ALLIED CHEMICAL CORPORATION,
New York, N.Y., June 28, 1967.

Re: Proposed Regulations Regarding the Leasing of Oil Shale Lands (43 C.F.R. Part 3170).

DIRECTOR, BUREAU OF LAND MANAGEMENT,
Department of the Interior,
Washington, D.C.

DEAR SIR: We are pleased to have the opportunity to submit our suggestions concerning the proposed regulations, set forth in 32 Fed. Reg. 7086 (May 10, 1967), to govern the leasing of federally owned oil shale lands.

First, add a new subsection (f) to Section 3170.0–1 reading:

"(f) Not interfere 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 underscored 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 designated 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 designated 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."

Attached hereto is this Company's letter of June 28, 1967, to the Bureau of Land Management, pertaining to the application by the Bureau of Land Management for withdrawal of oil shale lands. We trust that you will find that the statements made in that letter fully support the suggestions contained herein.

If there is any further information you desire, please feel free to call upon us.

Sincerely yours,

VICTOR FUTTER,
Assistant Director, Legal Department.

THE SUPERIOR OIL COMPANY,
Houston, Tex., July 26, 1697.

Hon. CLIFFORD P. HANSEN,
United States Senate,
Washington, D.C.

DEAR SENATOR HANSEN: I thank you for your letter of June 13, 1967, soliciting the views of The Superior Oil Company with regard to the Department of the Interior's proposed oil shale leasing regulations. Our company has reviewed these proposed regulations, and, while we believe that they will not accomplish the purpose for which they are designed, there are certain things contained therein of merit. More importantly, however, is the fact that these proposed regulations indicate that after more than 30 years of inactivity, the Department of the Interior is thinking about oil shale development. Unfortunately, in our estimation the problems of economic development of oil shale are far too complex to be solved by any regulations within the existing legislative framework.

We take exception to the assumption explicit in the proposed regulations that the private sector of the economy cannot accomplish the task of developing an economic method or methods of extracting shale oil. The activities of a number of companies within the past few years indicate that techniques may soon be

available with the extraction of shale oil on a profitable basis. Additionally, the proposed atomic explosion in the oil shale section followed by in-situ retorting also holds great promise. While cooperation between industry and the government will be necessary, the task may be carried out without adoption of regulations such as those proposed by the Interior.

While no one can predict precisely how the proposed regulations would operate if adopted, it is apparent on their face that they give a substantial advantage to the mammoth international oil companies, some of them foreign controlled. We seriously question that it would be in the best interest of the United States to have the development of techniques to exploit the oil shale lands in the hands of those whose economic self-interests might dictate the delay of the development of workable processes while such companies, foreign petroleum reserves are fully exploited. We also oppose the sliding scale royalty provision.

We feel that the provision in the proposed regulations with regard to blocking up of acreage has great merit. More study should be given to this concept, since it appears to be one method by which an accommodation can be reached between the conservationists and the petroleum companies. The majority of lands held in fee in the oil shale areas are along creek beds and in the meadow low lands. In many instances, these are the prime areas which the conservationists would seek to preserve. Provisions, whether by regulation or legislation, which would permit companies owning fee lands in these areas to exchange them for lands in other areas of less interest of conservationists would be helpful to both groups.

As mentioned earlier, we believe that legislation will provide the only workable solution to the problems of exploitation of oil shale reserves. Of paramount importance is the problem of the conflicting claims in the oil shale areas. As I am sure you know, these arise because the oil shale lands also contain many other minerals of great value, two principal ones of which are aluminum and sodium. Under our present law, aluminum is locatable but sodium is leasable. We would expect, of course, that any legislation with regard to oil shale lands would provide for their leasing rather than sale. Our studies indicate that the probable economic methods of extraction of shale oil will probably be coupled with the extraction of other minerals. For this reason, we would urge that any statutory change with regard to oil shale lands provide that the leasing of oil shale lands cover all minerals, including those leasable as well as locatable, and that on lands designated as oil shale lands that the placer mining laws no longer be applicable. Of course, such legislative changes would have to recognize such existing rights.

We also believe that oil shale lands should be offered by competitive leasing subject to realistic limits on the extent of holding of oil shale lands by any one firm. The operations of the Department of the Interior under the Outer Continental Shelf Act have shown that Interior can control to a great extent the development in an area by limiting the amount of lands offered for leasing at any time. They have been able to maximize the benefits of the federal government through bonuses for such leases while at the same time preventing there being too many leased by untested blocks. In a similar manner, the Interior Department through realistic leasing practices and acreage limitations can assure that large blocks of oil shale lands are not held for future exploitation; rather that the amount of land to be leased and developed will always be in near balance with the needs of the national economy.

In conclusion we would recommend that your committee hold hearings to consider the drafting of a leasing statute of covering oil shale lands. We feel that only after legislation can economic development of oil shale lands be possible.

Very truly yours,

F. P. JONES, Jr.
Executive Vice President.

HEINRICHS GEOEXPLORATION COMPANY,
Tuscon, Ariz., August 1, 1967.

Senator CLIFFORD P. HANSEN,
Senate Office Building,
Washington, D.C.

DEAR SENATOR HANSEN: Sorry that the search for a completely objective response to your letter of 13 June, 1967, has been difficult and obviously slow.

Interior's proposed regulations are the wrong approach for early orderly and desirable development of this natural resource. Apparently they want to preserve not conserve. The tiny allotted acreage will only promote monopoly and stifle competition and production.

Personally, I believe a viable oil shale industry must be implemented as rapidly as possible or the value of it to our present society will be lost. Naturally, there are a few potential disadvantages. I am afraid, Interior hopes with sufficient passage of time, a way can be found to have our cake and eat it too. This is entirely contrary to the whole successful history of this country.

To develop and utilize the resource for the greatest benefit to the country, requires rather drastic revisions in Interior thinking. One way that this might be accomplished would be to establish some sort of Blue Ribbon National and/or Industrial Committee, or engage a group, possibly like the Rocky Mountain Mineral Law Foundation, to draft an alternative set of proposed regulations. I have no idea how such might be practically initiated and invoked, and legally constituted, but somehow it might start and provide a more realistic and worthwhile approach.

Your committee would at least then have the benefit of proper guidelines completely surrounding the problem.

We welcome your questions at any time and meanwhile will continue to search for new and hopefully better ideas.

Sincerely,

Enclosure: Symposium Paper.

WALTER E. HEINRICHS, JR., *President.*

IMPACT ON DAWSONITE AND NACOLITE ON PICEANCE CREEK BASIN OIL SHALE ECONOMICS

BY WALTER E. HEINRICHS, JR., PRESIDENT AND GENERAL MANAGER, HEINRICHS GEOEXPLORATION COMPANY, TUCSON, ARIZ.

(Presented to Fourth Annual Oil Shale Symposium, Denver, Colo., April 6–7, 1967)

ABSTRACT

Recent identification of major quantities of dawsonite and nacolite oil shale in the Green River Formation of the Piceance Creek Basin may have crucial effect on local oil shale development. The total resource potential has been vastly increased and thus the ultimate importance of early conservative exploitation becomes even more essential.

It is incumbent upon government and industry to cooperate on ways and means to immediately initiate long range programs and begin testing various development methods. It will take the combined know-how of both groups, under a climate of healthy private enterprise incentives and competition to gain maximum public benefit. If this is not done soon, the tremendous value to our economy will soon pass and the opportunity to apply it toward improving our own living standard and that of others will be lost forever.

INTRODUCTION

Another year and here we commiserate again on the status of the oil shale industry. What progress did we make during the past year? How do we stand now? What does the future portend? What facts are available and what is rank speculation? Based mostly on a rather recently crammed birdseye background, and risking contradiction by the more constant experts, I want to outline the more salient factors as I see them.

For over a year, my company has been retained by Mr. Joe Juhan to make certain preliminary studies regarding the association of low grade soda ash and aluminum ores with the oil shale in the Piceance Basin. Other facilities and personnel at the University of Arizona contributed substantially, in particular Dr. John Anthony, who made extensive mineralogical examination of continuous drill core of the pertinent section from Mr. Juhan's well located near the center of the basin.

Seemingly the oil shale record is almost drowned in technical literature, studies and re-studies, dating back to 1920, and older. Although progress has been made each time, there are still important diverging opinions. Finally, now there may be more room for compromise and action.

Everyone agrees we are dealing with a resource potentially of major geo-political magnitude, but this potential will not last forever. If we are to most constructively benefit from this resource, we must move now, regardless of neces-

sary compromise. History and common sense inevitably tie the health of society to raw material production. No better example exists than our own case since 1850, Canada in 1940, and Australia since 1960, as a more recent example.

Certainly it is unfortunate that our best decisions too often do not meet the test of mass popularity, and here of course, is the root to much our present ecological conflict. Policy of our Interior Department can have profound effect on these matters, however, Interior is not part of Congress and should not operate on a Gallup Poll basis. Culmination of today's gravest mineral land problems are exemplified in our present oil shale situation. These are largely the result of mutual non-feasance, short sightedness, and past expediencies of both government and industry. Surely by now this nation has the technical knowledge, leadership, and foresight to forge broad, firm, and equitable policies for the urgent needs of long-range development and the orderly and increased production of our vital domestic mineral resources. Perhaps, the occurrance of other minerals besides oil will be the catalyst to help get adequate policy shaped and shale-oil development started.

RESPONSIBILITY OF GOVERNMENT AND INDUSTRY

To some, the ideal industry is totally invisable, odorless, soundless, with no waste product, and one hundred percent conservation of material involved. As yet, this is neither feasible nor practical. On the other hand, aside from simple self-preservation, we are morally committed to increasing living standards, fighting poverty, reducing our financial deficit, defending our nation and continually taking care of the general welfare of more and more people. Obviously, this requires constantly increasing domestic production of everything. Really, we have very little choice except to do the job as wisely as possible and without needless waste and destruction.

Fortunately, ancillary factors for the establishment of a viable major now basic industry are favorable in the Piceance Basin. These include unusual compatability with modern concepts of population and industrial dispersion, multiple use conflict, conservation, anti-pollution, wildlife preservation, and reclamation. Important agricultural potential, including timber, is minimum or nil, as would also be the effect on existing wildlife, and no exceptional scenic wonder is remotely involved. The natural basin configuration, with proper added safeguards, such as small dams, and other minor features, will control any potential groundwater or stream pollution. Much of the water used would be recycled. Any potential air pollution certainly can also be effectively controlled.

Some worry is expressed regarding wind-fall profits. If private enterprise competition is encouraged, then profit will only be proportional to maximum conservation and production efficiency, with market control and the real benefit going to the ultimate consumer, the public. Naturally the effect on foreign economy and imports must be considered, but so should all the other rapidly changing international factors. We can no longer act entirely on a unilateral basis in any field.

Much has been said, considerable funds expended, and major new tests are planned, for better ways and means to recover oil from the shale. The main considerations of mining and refining methods and costs have been studied and valuable work in this continues. However, by the addition of soda ash and aluminum into the picture, a new situation exists. If only maximum total recovery of all potential products is considered, then clearly, open cut mining is most desirable, but is it feasible? To answer this question, let's first look at the things involved besides oil.

NACOLITE AND DAWSONITE CONSIDERATIONS

The principle sodium minerals, near the basin center, begin to appear above 1800 feet below the surface and extend intermittently to below 2600 feet. The richest zone of these, though not continuous, is about 500 feet thick and lies between 1850 feet and 2375 feet below the surface. This zone, as well as the much thicker oil shale zone above, in and below it, all becomes shallower and thinner toward the basin margin. For discussion simplicity and correlation with previous reports, we can assume a maximum overburden thickness of approximately 1000 feet on top of 2000 feet of mixed pay zone, with proportionately less thickness for each as one approaches the basin edge.

Present value ratio per vertical column unit of recoverable material in the known maximum 2000 feet pay section, is approximately for each $9.00 worth of oil there is $7.00 worth of soda ash and $2.00 worth of alumina, or about $3.50 per vertical ton of ore on a weight average basis. Approximate recovered and refined equivalent products, expressed also as a ratio, is one ton of aluminum metal, to sixteen tons of soda ash, to thirty tons of shale oil with each of these being worth roughly $500.00 at today's market. Thus the total potential value of the basin reserves is approximately tripled by adding the sodium byproducts.

DEVELOPMENT, MINING METHODS, AND COSTS

In proposing open cut mining, I do not mean to totally ignore other methods. Block caving is still a possibility and of course, nuclear blasting may be justified for open cut preparation aside from the in-situ recovery considerations. Various types of very large continuous mining machines and semi-portable belt conveyors should receive careful scrutiny. Dr. Tell Ertl covered the basics in his 1965 paper, although his figures now may be too conservative.

Mining a full section of ore to 3,000 feet deep will need a trench no greater than 6,000 feet wide at the surface in the basin center. This width would decrease toward the basin edge and if controlled, self-induced open caving methods could be perfected, the width would decrease even more, with a corresponding reduction in stripping and blasting costs. Once room was developed to the bottom of the pay section, then overburden and spent shale can be back-filled into the mined out areas and the surface permanently reclaimed for other future uses. The fundamental procedure would be somewhat akin to placer dredge mining operations. Minimum unit rate of mining & stripping production for optimum efficiency would probably not be less than fifty thousand tons per day each from an area of about 5,000 acres per operation. Unitization of land holdings to fit this minimum order of magnitude scope will be desirable.

Initial strip ratio on first cut or pass would be in the vicinity of 1:1 but then would decrease approaching one half to one. Mining costs for ore and waste will be much less than $0.25 per ton and waste disposal and reclamation less than $0.10 per ton of material re-handled. Initial capital investment estimates may approach $250 million for the average operation, but this may vary somewhat depending on variation of factors over the whole basin, and especially the relative stripping ratios required to start production.

These elements can only be removed from the realm of speculation by completely and carefully drilling, sampling and testing, based on a statistical distribution and density of coverage. The next stage may be to confirm these results by sinking shafts and obtaining bulk samples for pilot plant tests. This would also allow for a more accurate appraisal of mining methods and costs, water disposal, availability, requirements and related problems. Such programs often consume five years or more before any real production is achieved. Concurrently, in other areas, other approaches such as underground block-caving, room and pillar, or in situ nuclear blasting techniques should be under way, if the need otherwise continues to be indicated.

Although other power may be available at less cost, conceivably the shale oil (and some soda ash) might be utilized in aluminum reduction. Very cheap soda ash might find and develop new markets eventually, but much would depend on related transportation factors which will also affect the aluminum economics.

In any event, if most of the sorting out is done on a competitive private enterprise basis, in a climate of reasonable and equal rules for all concerned, the result will be the earliest establishment of a most important and worthwhile new industry for the maximum benefit of all.

Permission for this paper was provided by Mr. Joe Juhan of Tucson, Arizona and his assistance, together with that of Mr. Irvin Nielson of Wolf Ridge Minerals, Glenwood Springs, Colorado and Dr. John Anthony, Hawley & Hawley, assaying chemists and others of Tucson, Arizona is acknowledged.

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CITIES SERVICE OIL COMPANY,
Tulsa, Okla., August 2, 1967.

Hon. CLIFFORD P. HANSEN,
U.S. Senate,
Washington, D.C.

DEAR SENATOR HANSEN: As requested in your letter of June 13, we are enclosing a copy of our statement to the Bureau of Land Management.

We appreciate your interest in the role of private enterprise in the development of oil shale.

Very truly yours,

J. E. HESTON.

Enclosure.

CITIES SERVICE OIL COMPANY,
Tulsa, Okla., August 2, 1967.

Mr. BOYD L. RASMUSSEN,
Director, Bureau of Land Management,
Department of the Interior,
Washington, D.C.

DEAR MR. RASMUSSEN: These comments are submitted on the proposed amendment to the "Federal Regulations for Leasing Oil Shale Lands on the Public Domain," released May 7 by the Secretary of the Interior.

While we believe 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.

We believe the proposed R&D leasing program should be altered to:

Develop a basis for leasing of Federal oil shale lands by competitive bidding using a bonus system with fixed royalty of a dimension that would not penalize oil shale in relation to other energy sources, rather than sliding-scale royalty as proposed in the May 7 draft; and establish criteria under which prospective bidders could qualify.

Discourage lease-holding for speculative purposes by requiring annual expenditures, on a predetermined scale, for R&D purposes until the achievement of commercial production.

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.

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 lessee to hold and license patents under the same conditions as any other patents, rather than to require extensive public disclosure of data and assignments of patents.

In general, we believe the move to involve private enterprise in oil shale development through leasing of public lands to be sound; we believe private industry to be capable of and willing to finance extensive research on shale oil and to invest the large sums necessary for commercial operations when shale oil can compete economically with other energy sources. But we believe response will depend upon incentive.

In this connection, the limited scope of the proposed program (30,000 acres and a maximum of 5,120 acres per lease) would presumably result in only six successful applicants, restricting competition, or it would result in such small parcels that commercial operations would be economically unattractive.

Very truly yours,

J. E. HESTON.

SINCLAIR OIL CORPORATION,
New York, N.Y., June 28, 1967.

Hon. CLIFFORD P. HANSEN,
The United States Senate,
Washington, D.C.

DEAR SENATOR HANSEN: As requested in Mr. E. L. Steiniger's letter to you, dated June 16, 1967, I am attaching comments submitted to Mr. B. L. Rasmussen, Director, Bureau of Land Management, by Sinclair Oil & Gas Company, which is the domestic exploration and production subsidiary of the Sinclair Oil Corporation.

I am pleased to forward these comments to you, because we do appreciate the interest you are taking in the future development of oil shale.

We intend to make a statement before the Senate Committee on Interior and Insular Affairs concerning proposed regulations to govern oil shale leasing and land exchanges, but, at the moment, it is not in final form. This should be accomplished within the next few days, at which time I will send you a copy.

Very truly yours,

Attachments (2).

J. B. KENNEDY.

SINCLAIR OIL & GAS COMPANY,
Tulsa, Okla., June 20, 1967.

B. L. RASMUSSEN,
Director, Bureau of Land Management,
Department of the Interior,
Washington, D.C.

DEAR MR. RASMUSSEN: Sinclair Oil & Gas Company wishes to respond to Secretary Udall's invitation to comment on the Proposed Regulations to Govern Oil Shale Leasing and Land Exchanges, 43 CFR, Part 3170 and Subpart 2244. The stated objective of the regulations is to encourage development of a shale oil industry while safeguarding the public interest. Sinclair feels that the proposed leasing regulations would require a lessee 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. We also believe the regulations are so indefinite regarding granting of commercial leases that there is no incentive for a company to undertake a development project. None of the objectives will be met if development is prevented. We hope these comments will suggest modifications that will permit achieving the Secretary's stated objectives.

3170.1 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. The government representatives will in effect also determine the commercial life and size of the plant by determining the size of deposit leased for commercial operation.

Sinclair wishes to recommend, as it did previously in our letter of February 14, 1967 to Secretary Udall, 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 doing the development work. When the development proceeds to the point that commercial profitability is indicated and the company is willing to risk the tremendous capital needed to put up a commercial plant, the development phase is completed. There is no assurance that the development program will succeed; the company should not suffer the additional hazard that Interior

will apply criteria of success different from industry in general and wipe out the investment in development by denying adequate reserves for commercialization.

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. Whatever information is requested, we hope that it would not be used to deny a lease covering federal lands to companies that have been forward looking and have invested in private reserves.

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. We recommend that these provisions be made specific before any leases are granted. Otherwise, nonuniform application of limits, variations of limits, or designation of new criteria after the development phase is completed could wipe out the investment in development.

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. There should be a statement of the project life that will be permitted before development is started. This of necessity will determine the reserves needed on the basis of the mining program proposed. For example, a change from reserves permitting a twenty-year project life to reserves permitting a fifteen-year life could render such project unprofitable.

3172.3(d) states that no corporation can hold an interest in more than 5120 acres of oil shale land. This could be construed as meaning an undivided interest, no matter how small, in one such tract would preclude interest in any other 5120-acre tract, private or public. It is recommended that this be clarified to state that a "net" interest of no more than 5120 acres in United States oil shale leases may be held by a lessee at any one time.

3172.5(b) states that the royalty shall be "3 percent on the gross value at the point of shipment to market, of the mineral products from the oil shale, . . ." This could be construed as applying to raw shale oil sold at the plant gate in Western Colorado, gasoline produced at the Colorado plant and shipped to market, or gasoline produced at a midwest refinery from shale oil. We recommend 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. This will discourage both corporate and private investment. We therefore recommend reconsideration of the royalty rates.

3172.9(d) says that the lessee does not own the data or information from the project at any time and that no research personnel could publish technical papers on their work without the approval of the Secretary. We feel 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. We feel that confidentiality of data and design information will do much to foster competition in a developing shale oil industry. We would not object to a requirement of licensing at reasonable royalty rates after some waiting period.

3172.9(e) states that the public will acquire title to all patents and inventions made in the course of the lease, except where proper showing of exceptional circumstances is made. 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 give all the results away. The lessee would have no chance to recoup through licensing the moneys risked on research; this has been the heart of the free enterprise patent system. Many companies or individuals might prefer to wait and let someone else do the development and then apply for commercial leases to utilize the results without risk or prior investment. The "proper showing of exceptional circumstances" appears to be a formidable obstacle; some members of the proposed Bronco project consortium feel that this question may compromise the whole project.

There are a number of paragraphs in which the language leaves doubt as to the true intention of the Department of Interior. These questions are raised in the Attachment to this letter and have already been discussed with the Solicitor's office.

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. We feel the regulations, in their present form, are too stringent to foster private investment in development on public oil shale lands. It is hoped these comments may assist the Secretary in preparation of the final rules and regulations.

Respectfully submitted.

G. D. ALMEN, JR.,
President, Sinclair Oil & Gas Company.

[Attachment]

RECOMMENDED STATEMENT CLARIFICATIONS OF PROPOSED OIL SHALE LEASING REGULATIONS

3170.0–1 The announced purpose is to encourage participation by companies not favorably situated with respect to access to the minerals in oil shale. This could be interpreted as indicative of a policy of the Department to favor the less forward looking companies which have not previously obtained oil shale reserves. If it is intended to provide reserves for the "have not" companies to the exclusion of those companies which previously obtained patented reserves, this would unfairly penalize the companies having a present investment in reserves owned by the Government are richer in oil content and greater in thickness of deposition. This apparent intention on the part of the Department is further indicated by the requirement in 3171.2(c) (7).

3170.0–5 It is unclear as to which conditions must prevail in order for an oil shale lease to also cover Dawsonite and Nahcolite. Existing statutes and regulations provide for separate leases for sodium, carbonates, Nahcolite and oil shale. Is it certain that under the existing statutes the Secretary can issue one oil shale lease which would effectively cover the other minerals? Some of the shale land contains aluminum. This aluminum is a metalliferous metal which ordinarily would be locatable under the Mining Act of 1872. Has it been determined that the Secretary can effectively lease a locatable mineral in a shale lease?

3171.2(c) (3) This section requires a description of the land for which a lease is desired. Does the word "lease" as here used refer only to the research lease, or the production lease as well?

3171.2(c) (11) This section requires a description of the reserves owned or controlled by applicant of oil and other minerals believed present in land applied for. Does this require disclosure of all crude oil reserves? Governor Rampton of Utah stated it was so intended by the Secretary but that the Secretary would keep it confidential. This gives rise to the further question of whether all information in an application will be kept confidential unless and until a research lease is granted?

3171.2(c) (12) (10) These sections state the information required for obtaining a commercial or production lease. Many of these requirements must necessarily be based on estimates. In this connection, it is noted that Section 3172.2(b)(1) provides that you get a production lease only if the Secretary finds the lessee was in substantial compliance with research plan submitted. This presents the question of whether the required estimates furnished in good faith can result in your failure to obtain a commercial lease if the estimates were materially erroneous.

3171.3(d) Requires a showing of need for lands to conduct research and development and for commercial production. Is the requirement as to need for lands for research and development separate or different from the need for commercial development lands? If so, could this result in an applicant being given a research lease and later be denied a commercial lease for the reason of inadequate need as determined by the "then" Secretary of Interior. This provision again implies an applicant will be unfavorably considered if he owns fee shale land.

3171.3(f) This section requires a showing of need for minerals to be produced. An oil company can show a need for oil if it has more refining capacity than production. Can it show a need for aluminum or Dawsonite in the absence of a market? What is the nature and extent of the need required to be established?

3172.2(b) This section provides for a commercial production lease ". . . so long as mineral products are produced from oil shale in paying quantities . . ." Do these words constitute words of special limitation which would result in automatic termination if you cease production or if production ceased to be in paying quantities? If so, how long a period of cessation is necessary? Is paying quantities that amount required for a profit over operating costs or must it be sufficient to return the cost of the plant plus an operating profit? What would be the result of fluctuations in oil price and markets that would render the operation at least temporarily unprofitable?

3712.2(b)(2) Requires a research lessee to develop both a mining and a processing method which is commercial. If he developed a commercial mining technique but not a commercial processing technique, may he have a commercial lease and use the commercial processing technique of others who have made it available by license to the Secretary, or will he be denied a commercial lease unless he has literally developed both mining and processing techniques which are commercial?

3172.2(b) (2) (3) Requires compliance with pollution requirements which are not themselves specified or otherwise described. The nature and extent of these requirements should be specified.

3172.2(b) Provides in effect that upon the expiration of the designated Research Term of the lease the Secretary will, under certain circumstances, extend the lease for a Commercial Production Term for so long as there is production in paying quantities. Section 3172.3(c) provides that at the time for the commencement of the extended production term, the Secretary, in his discretion, will determine the amount of deposits needed to provide reasonable reserves for commercial production. Under this section, it would be possible to apply for and get a lease on as much as 5,120 acres. The Secretary could then designate the portion on which you are to conduct research. It would seem that after research is completed and the investment is made, the "then" Secretary of Interior could redetermine how much land and reserves are needed for a commercial operation in accordance with Secetion 3172.3(c).

3172.3(d) Provides ". . . no one may take, hold, own or control an interest in more than the total maximum acreage of land included in a lease hereunder, . . ." This can be construed so that if you own 1% or any small undivided interest in 5,120 acres of a shale lease from the U.S., you are disqualified from owning other leases or interests in other leases. The above provision can furthermore be construed to mean that fee ownership of 5,120 acres of shale land can disqualify leasehold applicants for shale land. The provision should be clarified and state that a "net" interest of more than 5,120 acres in United States oil shale leases will not be allowed.

3172.5(b)(d) Provides "The royalty rate on production shall be 3% on the gross value, at the point of shipment to the market, of the mineral products from the oil shale, . . ." At which point does this provision become effective? Does "mineral products from oil shale" include Dawsonite? If you merely mined the rock and shipped that to a market, would the value of mined or crushed rock be the basis for royalty? If you mined, crushed, and retorted the rock, then shipped the unhydrogenated oil to a market, would that be the value for royalty purposes; or must the rock be mined, crushed, retorted and hydrogenated before shipment to a market? If you have a refinery on the premises and made gasoline before shipping to a market, would the value of the gasoline constitute the value for royalty purposes? This provision must be clarified.

3172.5(e) Provides in effect for royalty rates based on percentage of net income on investment. Investment is defined as original cost less depreciation of capital assets used in production and processing shale oil. A question arising here is whether or not experimental and research costs are included in the term investment. If so, are all these costs, including those research costs previously incurred on privately owned lands, to be considered? In most cases, these costs of research previously incurred will nevertheless contribute toward the ultimate success of the research on the Federal leases. These points should be clarified.

The same section also provides for readjustment of base royalties after 20 years. This provision is consistent with the statute, but the advisability of any such readjustment is presumably within the unilateral discretion of the "then" Secre-

tary of the Interior. Without additional criteria and guidelines, this could result in a great deal of uncertainty as to the stability of a very large investment. To relieve this uncertainty, some reasonable and more definitive ground rules should be established in this regard. Additional legislation to accomplish this should not be necessary.

3172.6 Provides for automatic termination at the end of the research term unless the Secretary has previously authorized commencement of the commercial production term. As this provision now reads, a research lessee could lose the lease and all investment therein if the Secretary did not think the lessee was entitled to an extension into a production term. You could have the same result if the Secretary simply made a mistake or inadvertently failed to extend before expiration of the research term. The word "unless" is a word of special limitation and would result in automatic termination if given the usual construction. It is further noted that no provision is made for action by the lessee such as an application for extension. There is no way presently provided by which the lessee can protect his lease and investment against such an automatic termination.

An additional objection that could be raised to this section is the absence of any provisions regarding a lessee's right to remove his plant and facilities upon termination of the lease. Without provisions authorizing removal, the conventional laws of real property would require all facilities attached to the realty to remain with the realty. This would be particularly insupportable if the lease expired at the end of the research term and after construction of a plant.

3172.9(d)(3) Provides that the lessee must agree not to make available to anyone, except a representative of the Secretary, any information or results without written approval. It is not clear to the reader just how a lessee could effectuate this section. It is likely that numerous agents and individual contractors, as well as employees, will be aware of at least certain aspects of the research and at least some related information. This section needs clarification.

3172.9(e) Provides in effect that the United States will acquire title to all patents or inventions made during the research term of the lease. This title would also include the rights to patenting the discoveries in foreign countries which could be quite valuable. Presumably, any patentable discovery made during the production term of the lease would belong to the lessee. It is not clear just what the meaning is as to requirements to license previously owned patents "which are necessary to permit others to practice inventions made in the course of or under the research term of the lease, . . ." Does this mean the license to use another's discovery only during the research term of the licensee's lease, or would these rights extend into his production term?

3172.9(4) This section requires a lessee to allow access to the leased premises and all other facilities in which any part of the research is conducted to all persons designated by the Secretary. This requirement would appear to extend to allowing any "designated" competitors access even into our research laboratories.

MARATHON OIL CO.,
Casper, Wyo., August 11, 1967.

Hon. CLIFFORD P. HANSEN,
U.S. Senate,
Washington, D.C.

DEAR SENATOR HANSEN: Attached please find Marathon Oil Company's written comments on the proposed amendments to the regulations regarding the leasing of oil shale lands. We are forwarding this draft to you at this time in order to apprise you of the substance of Marathon's position with respect to the proposals as quickly as possible. The final draft is today being prepared by our home office in Findlay, Ohio, and will be submitted to the Department of Interior by our President, J. C. Donnell II. However, I am confident that the final comments will be the same in all material respects as the enclosed draft.

On the one hand Marathon concurs with the basic purpose of the proposed regulations which makes available a limited portion of the public domain for research and development of oil shale technology, but, on the other hand, we also believe that many of the detailed provisions of the proposed regulations inhibit rather than encourage industry participation in oil shale technology development.

It is our hope that these comments will be of value to you in your testimony before the committee.

Very truly yours,

R. W. MCCANNE.

Attachment.

MARATHON OIL CO.,
Findlay, Ohio, August 11, 1967.

Mr. B. L. RASMUSSEN,
Director, Bureau of Land Management,
U.S. Department of the Interior,
Washington, D.C.

DEAR MR. RASMUSSEN: This letter is in response to Secretary Udall's invitation to submit written comments on the proposed amendments to the regulations regarding the leasing of oil shale lands.

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. We believe that the development of techniques for commerical production of oil from oil shale is a necessary prerequisite to the determination of the need for statutory changes and the promulgation of regulations relating to commerical production. We further believe that the development of such technology through the competitive research efforts of the private enterprise system is the best method to accomplish this objective.

We also believe, however, that many of the detailed provisions of the proposed regulations inhibit rather than encourage industry participation in shale oil technological development. In order to get industry to participate in the envisaged research program, participation must be made attractive. It is submitted that the proposed regulations are too preoccupied with government controls and with provisions to insure revenue to the government from the research efforts. The development of oil shale technology has a much greater value and benefit to the United States than the rentals or royalties which the government might immediately realize from any research efforts which might prove successful on the limited amount of federal lands made available for research purposes. The discovery and development of such technology would greatly enhance the value of other federal oil shale lands and make a valuable addition to the available supply of energy resources in the United States.

An oil shale research program will necessitate a large investment. We favor regulations which require a company that acquires a tract for research to invest sums sufficient to demonstrate a bona fide intent to make a meaningful effort to develop oil shale technology; we further favor a requirement that such company meet certain work progress requirements. However, if such regulations are to prevail, the regulations should also offer the participating company an opportunity to recoup its investment plus a modest profit in the event its efforts prove successful. The amount of profit, if any, would not be large because of the limited acreage included in the lease. Unless some opportunity for profit is provided, it is our opinion that few, if any, responsible companies will be interested in the proposed research program. It must be remembered that a research participant will risk complete failure.

As previously indicated, many of the proposed regulations will discourage rather than encourage industry participation. In this connection some of the more important provisions are as follows:

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. It also contravenes the philosophy behind our free enterprise system. 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.

Marathon has elected not to comment specifically on other technical and substantive deficiencies in the proposed regulations since these matters appear to have been already adequately covered by the comments of other companies and trade association groups. Our comments have been confined largely to matters which we consider basic to the development of oil shale technology. We think they are constructive and hope they will be helpful.

Sincerely yours,

J. C. CONNELL II.

OIL SHALE IN FOCUS

BY RUSSELL J. CAMERON, CAMERON & JONES, INC.

(An Address Before Colorado Petroleum Council, Eighth Annual Meeting, Denver, Colo., May 25, 1967)

I know of no topic on the public scene, unless it be Viet Nam, on which there is more ignorance, confused thinking and dogmatic opinion than oil shale—thus the title for my presentation. Maybe the title should be "Oil Shale Out of Focus" because there is no assurance that I can clarify the subject for you. One of the frustrations of those who deal with oil shale every day, is that its problems are many sided and so involved, that we so-called experts may be the most confused among you.

I might add that the confusion in the public mind is greatly compounded by all sorts of uninformed individuals and organizations joining the fray, each with some axe to grind or some real or imaginary dragon to kill.

As an example, on April 7, 1967, a press release from the office of the Senate Antitrust and Monopoly Subcommittee began as follows:

"How and when to sell a national treasure—worth almost 20 times the annual federal budget—will be the topic of Senate hearings opening April 18.

"'The government owns more than 80 percent of the 10 million acres of this land in Colorado, Wyoming and Utah,' said Hart. 'It contains two trillion barrels of shale oil which conservatively is estimated to be worth $2.5 trillion—or enough for $40,000 for each American household. Its market value may be twice that.'"

It is this type of sensationalism that needs to be brought into focus.

GEOLOGY AND RESERVES

The oil shales of importance in the United States are found in the Parachute Creek member of the Green River formation, and were formed as sediments in brackish lakes about 50 million years ago. The organic matter in the oil shale is called kerogen and is not an oil nor is the rock a shale, it is a marlstone. Oil is formed by heating the rock to about 800°F. The kerogen decomposes to an oil, gas and a coke-like residue that remains in the spent shale. About 30 percent by volume of average grade oil shale is organic matter.

Our major oil shale reserves are in Colorado, Utah and Wyoming. The areas are well defined and we are confident that the largest reserve is in Colorado's Piceance Creek Basin. Utah has some areas that may be developed at reasonable cost by open-pit mining but much of its oil shale is deeply-buried and cannot be economically produced with technology now available.

Wyoming has only marginal oil shale prospects despite a large area of Green River formation, but additional exploration is needed especially with regard to associated minerals. I will have more to say on these other minerals later.

A figure of 1.744 trillion barrels was given recently for the oil shale potential of Colorado, Utah and Wyoming.[1] This estimate is based on the 15–15 definition (at least 15 gallons per ton in beds at least 15 feet thick) but such a figure is meaningless since much of this oil is not now nor is likely ever to be economically recoverable. Dr. Wayland pointed out in his testimony that only "about 80 billion barrels of shale oil is considered recoverable by demonstrated mining and retorting methods", or less than 10% of the total reserve. According to Dr. Wayland's figures, 21.1% of the reserve is in private hands or a recoverable reserve of about 16 billion barrels.

Eightly billion barrels or even 16 billion barrels is a lot of oil, well worth going after, but these numbers are a far cry from the trillions of barrels that lead people to think in terms of paying off the national debt with oil shale royalties or of the oil shale owners hoarding hundreds of years of oil supply. I am confident that ultimate recoveries of shale oil will be higher than Dr. Wayland's figures but decades will pass before the leaner, less-accessible oil shales become a part of the "recoverable" reserve. Any figures that do not take into account losses and uneconomic low-grade zones are misleading and have done much to confuse the real issues of the oil shale problem.

THE TECHNOLOGY

I would like to dispose of the subject of technology without involving you in details of the various techniques for producing the oil. The two suggested approaches for the recovery of shale oil are (1) mining/aboveground retorting and (2) retorting in place or *in situ*.

Shale oil has been produced for more than 100 years by mining/retorting and this is the only production method in use today. Russia and China both have sizeable industries. Current research and development in the USA is aimed mainly at improving these earlier mining/retorting techniques and applying modern engineering concepts and equipment to the job. Good results have been achieved, a sound technology is available and we are now in the prototype phase of testing some of our new ideas. This technology can and probably will be applied commerically by the early 1970's.

The *in situ* technique has many proponents, among them:

Oil people who would like to apply their background and experience to shale oil production.

Naturalists who look on mining as a despoiler of the aesthetic value of the landscape.

Proponents of nuclear technology who would like to develop peaceful uses for atomic explosions.

Engineers who think there ought to be a better way to get the oil from oil shale than to move hundreds of thousands or even millions of tons of rock every day.

All have some logic to support their position, but unfortunately research has not yet come up with a feasible *in situ* production method. The reasons are several but prominent among them are:

Oil shale has no permeability or porosity and in most areas little or no communication exists between holes even a few feet apart.

The rock must be brought to a high temperature to form oil before it can be produced.

The oil is waxy, viscous and flows with difficulty at ambient rock temperatures.

The nuclear concept that seeks by a massive explosion to create a rubble zone of broken oil shale is no cinch to work and the efficiency of oil recovery by a

[1] Dr. Russell G. Wayland, Acting Chief, Conservation Division, U.S. Geological Survey, before the Subcommittee on Antitrust and Monopoly of the Senate Judiciary Committee, April 18, 1967.

subsequent combustion phase is a question mark. There is a general misunderstanding of the $0.29 per barrel cost for the nuclear approach estimated by Dr. M. A. Lekas of the AEC.[2] Lekas took some highly optimistic assumptions and applied them to hypothetical situations to get some idea of the comparative economics of shale oil production by the nuclear method under various conditions. The lowest conceivable figure was $0.29 and even if achievable could be applied only to a limited part of the shale reserve in Colorado and not at all in Utah or Wyoming. Furthermore the costs would likely be considerably higher because ideal conditions are almost never encountered. This figure ($0.29/bbl) was used in congressional testimony to support the idea that oil shale royalties should be as high as possible,[3] a classic example of the misuse of information by those with inadequate background in the subject.

Before dismissing *in situ* retorting entirely let me make clear that an efficient economic *in situ* shale oil production method is a desirable objective and worthy of research effort. I have confidence that such a method can be developed but I am not optimistic that one will be available by the time we need shale oil. Therefore, it is my belief that shale oil will be produced first by mining and retorting using techniques already in an advanced stage of development and that these methods will be improved still further through commercial application. *In situ* methods of production may be in use within 20 years but they will not likely be more economical than the mining/retorting systems of that day.

THE NEED AND THE MARKET

Do we need shale oil now? Obviously with imports of 2,500,000 barrels a day, we have an adequate supply of oil for the present. The fact is that we cannot have shale oil in any significant quantity for at least 10 years. The more pertinent question is whether or not we will need shale oil by 1975 or 1980.

Take almost anyone's appraisal and you will find a prediction that domestic oil supply will fall short of demand by a wide margin by 1980 or thereabouts. Since we are now supplementing domestic supply with imports amounting to 20% of demand we obviously are going to have to find much greater quantities of oil, to increase imports or develop synthetic oil. Most likely we will do all three.

In this light, let me focus your attention on a regional situation. The Rocky Mountain area now produces about 1,000,000 barrels of oil per day from a proven reserve of less than 3 billion barrels. Both production and reserves have been static or declining in most of the producing states. Exploration also has declined significantly. Colorado is a striking example of production declining, with a decrease in 10 years from 160,000 to 90,000 barrels per day.

It seems to me that shale oil first will become a regional supply of oil making up the decline in production of conventional oil in the Rocky Mountains and this combined with increased demand for petroleum products in the area may take all the shale oil that can be produced for the next 10 to 15 years.

TIMING AND COST

Contrary to some expressed thought, oil shale will not emerge in a flood to drown the domestic oil industry. Many factors will see to this, not the least of which is the time required to build an industry and its cost. By the time the technology is proven to the degree needed to justify the large expenditures that are inevitable we may be into the 1970's. It has been stated that a 58,000 B/D oil shale plant using the TOSCO II system will cost $130 million.[4] If we round this off to $2000 per daily barrel, simple arithmetic tells us that 1,000,000 barrels per day will cost $2 billion. If we add the power plants, pipelines and other similar industrial installations, and the expansion of highways, schools, hospitals, and municipal facilities, this cost could double. To build a 1,000,000 B/D industry by the end of the 1970's will be a monumental task requiring that no time be lost at any step. To build the industry faster probably is out of the question owing to the physical size of the effort and the political, technical and financial barriers to be surmounted. It seems likely that there will be a need for the oil about as fast as it can be developed.

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[2] Lekas, M. A., "Economics of Producing Shale Oil by the Nuclear *In Situ* Retorting Method", Third Annual Oil Shale Symposium, April, 1966.

[3] Paul H. Douglas, testimony before the Subcommittee on Antitrust and Monopoly of the Senate Judiciary Committee, April 19, 1967.

[4] Morton M. Winston, Executive Vice President, The Oil Shale Corporation, testimony before the Subcommittee on Antitrust and Monopoly of the Senate Judiciary Committee, April 1967.

COMPETITORS OF SHALE OIL

The importation of overseas oil is the most serious competitor of a shale oil industry as well as the domestic producer. Shale oil can no where near attain the present dollar cost of a barrel of imported Persian Gulf oil nor can any oil being found in North America today. I need not dwell on this point in a talk to oil men but it is worth mentioning in the following context.

There is, in my opinion, an urgency to bring oil shale, coal and tar sands into production as suppliers of a part of our North American oil needs. First, we must protect against interruption of overseas supplies. The current Egyptian-Israel controversy is another example of the constant threat to mid-east oil. Second, but not less important, we should keep a strong bargaining position in the market for world oil. We may find Arabian oil much more expensive when we no longer have productive capacity in excess of normal demand. I would advance the thought that we should keep some of our shut-in capacity available for emergencies and use oil shale, coal and tar sands as a part of the "baseload" supply.

In respect to coal and tar sands, it seems to me that all will fit into our future oil supply, first as regional sources, later in the national oil mix of Canada and the United States. The technologies are remarkably similar, in that mining and materials handling and the up-grading of hydrogen-deficient hydrocarbons are involved in each. There is no reason that favorably situated "high-grade" deposits of all three sources—oil shale, tar sands and coal—will not be competitive with each other and with conventional petroleum.

OTHER MINERALS

The discovery of other potentially valuable minerals in some of the oil shale formations, while adding to the legal and administrative problems of the Federal government, already has had a beneficial influence. The minerals to which I refer are pabcolite (sodium bicarbonate), dawsonite (a sodium aluminium carbonate) and halite (sodium chloride). The more interesting of these may be dawsonite since if economically recoverable it could be a new source of aluminum. Bauxite, 90% of which is imported, is now our sole raw material for this strategically important commodity.

Will these other minerals be economically recoverable? How will they influence the shale oil future? These and other questions must await the detailed evaluation always necessary for nearly discovered minerals. Like oil shale itself there is no question but what the quantities are large—zones several hundred feet thick covering thousands of acres—but also like oil shale the economics of recovery must be established. At this time the potential is exceedingly interesting but no definite answer can be given. A number of companies, including chemical and aluminum companies, are making evaluations and will accelerate their efforts if lands containing these minerals can be obtained on a reasonable basis from the Federal government.

THE FEDERAL OIL SHALE LEASING POLICY

I was tempted, because this topic is in the news, to devote my whole presentation to it. The reason I have refrained is that its importance can be overstated.

There is no assurance at the present time, although we are hopeful, that the leasing regulations will be acceptable to industry when issued in final form. Certainly they are not workable in their present form. Another thing, an important fact that often escapes notice, is that shale development is proceeding on private lands, will continue to do so, and may even accelerate if development on public lands is discouraged by oppressive regulation.

I sincerely hope that Secretary Udall will modify his proposed leasing regulation to the extent that a healthy, competitive and ultimately profitable private industry can be developed on the public oil shale lands. This is his stated aim but in my opinion the regulations as written will not achieve the objectives he seeks.

While there are other questionable provisions of the regulations, it is basically unsound to require that a lessee make public all the know-how, and give up title to any patents, resulting from his research on public lands. Not only is this stipulation likely to discourage qualified applicants for leases but if followed would surely result in a mediocre technology. I cannot visualize a company using its always limited research budget and its top personnel to do research on this basis when there are always more opportunities than resources available for proprietary research.

I look at those parts of the regulation relating to patents and disclosure as essentially a negation of the patent system, which is in large measure responsible for the industrial and scientific progress of our country. As a reward for innovation, and for disclosing the nature of his invention to others by publication of a patient, the inventor is given a limited monopoly (17 years) on its use. In practice the inventor almost always has been willing to license his technology, under the patent system, but the chance that a competitor may devise a better mousetrap usually has spurred others on to research and innovation. Requiring that patents be assigned to the Federal government and that all results of research be immediately made public will remove the most powerful competitive force that can be brought into oil shale development.

It is suggested by the regulation, and by public expressions of the Secretary, that granting ownership of the technology to the public is a necessary compensation for the opportunity to use the publicly-owned oil shale resource. I submit that royalties commensurate with the value of the product and its cost of production should be the means of direct compensation to the public.

I further submit that every means should be taken to insure the maximum degree of technological competition, for from this competition will flow the greatest benefit of all to the public—an ample supply of products at the lowest possible cost.

HUMBLE OIL & REFINING CO.,
Houston, Tex., June 8, 1967.

Subject: Proposed Regulations to Govern Oil Shale Leasing and Land Exchanges.

Mr. BOYD L. RASMUSSEN,
Director, Bureau of Land Management,
U.S. Department of the Interior,
Washington, D.C.

DEAR MR. RASMUSSEN: *The Federal Register* of May 10, 1967, contained the Secretary of the Interior's proposed regulations to govern oil shale leasing and land exchanges. This letter is written pursuant to the invitation to interested persons to comment with respect to such proposed regulations.

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. We are 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.

Humble believes that the mineral energy resources contained within the public domain should continue to be developed by private enterprise under a minimum of federal controls, as has been the case with oil and gas, and without further government expenditures on research. Private industry is capable of and willing to finance substantial research to evaluate the commercial feasibility of oil from shale and to invest in facilities for commercial operations at such time as shale oil can compete with other energy sources.

Since the Federal Government is the principal holder of shale oil reserves, it is essential that private research and development leading to the commercialization of shale oil not be impeded by unduly restrictive leasing regulations on the public oil shale lands. 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.

It is not necessary that an extensive amount of acreage be leased currently. Rather, land should be made available for lease on a periodic basis, similar to the procedure used in the leasing of federal oil lands on the Outer Continental Shelf. Leasing of the federal shale lands should be done on a competitive bid basis, using a bonus system with fixed, moderate royalty. The bonus system will result in the maximum leasing income to the federal treasury, the fostering of normal economic forces, the prevention of pre-investment by industry, and the avoidance of speculation in the leasing. Competitive pressures will automatically require that the lease bonuses reflect the profitability of shale oil operations; therefore, the royalty should be held to a relatively low, fixed amount so that the costs for shale oil will not be unduly handicapped compared

to competitive energy sources. 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 regulations.

In keeping with the foregoing statements, Humble offers the following specific comments concerning the proposed regulations:

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.

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 land, 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.

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. Information of this type is not relevant to the technical and financial capability of the applicant.

A number of provisions pertain to an applicant's need for reserves and require the applicant to set forth his non-federally owned oil shale reserves and conventional crude oil reserves. 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 succesful bidder perform a reasonable amount of research and development leading to commercial production. As has proved to be the case in oil and gas leasing on the Outer Continental Shelf, open competitive bidding would withstand public scrutiny and would stimulate early commercial development of public oil shale lands consistent with the needs of the Nation.

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 Secre-

tary, 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 on the land.

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 research 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.

3172.5 *Royalties*

The proposed royalty schedule would stifle the development of a viable shale oil and associated minerals industry on federally owned lands. Such a schedule based on a graduated percentage of net income, together with the current federal income tax structure, would operate to discourage the investment of private capital. Also, such a schedule would increasingly penalize an operator in proportion to increased operating efficiency. Thus, such a schedule would have the over-all effect of placing the commercial production of shale oil and associated minerals at a serious competitive disadvantage with alternate sources of supply having a fixed royalty schedule.

The royalty rate on hydrocarbon production should be a fixed amount not to exceed 5 percent on the gross value of the first products recovered from retorting. In case of in situ operation, the royalty rate should be the same based on the first products recovered from the well head. In either case, royalty should be payable only on products sold or used off the premises.

On all other minerals, the royalty should be 5 percent of the proceeds received by lessee for such minerals on the premises in their raw form after retorting and concentrating but prior to any treating or beneficiation. Should lessee sell such minerals in another form on the premises or remove such minerals from the premises, the royalty should be 5 percent of the market value of such minerals on the premises in their raw form after retorting and concentrating but prior to any treating or beneficiation.

The royalty payments should be waived during the first five years of the research term as permitted by the Mineral Leasing Act.

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 effect of these provisions would be to compel the lessee to disclose all of his technical "know-how" and operating data as well as background information and data accumulated from prior research efforts.

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. Patents obtained by a lessee should continue to be held and licensed by him in the same manner as other patents. Under this patent system, the United States has achieved outstanding industrial and scientific progress.

3172.10 *Antitrust Consultation*

This regulation is unnecessary because of the limitations contained in the Mineral Leasing Act and should be deleted.

2244.1–7 *Exchanges 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 land be of value approximately equal to or exceeding the value of the selected public land.

This concludes our specific comments on the proposed regulations.

Humble believes that the role of the Federal Government should be to encourage economic development of oil shale by private industry at the time when shale oil can make its optimum contribution to our economy as a supplemental energy source. The action of the Secretary of the Interior in issuing appropriate regulations could be a major step forward in accomplishing this goal.

We respectfully urge that the proposed regulations be revised in accordance with the foregoing comments.

Yours sincerely,

M. A. WRIGHT.

CER GEONUCLEAR CORP.,
Las Vegas, Nev., August 11, 1967.

Hon. CLIFFORD P. HANSEN,
U.S. Senate,
Washington, D.C.

MY DEAR SENATOR: In response to your letter of 13 June 1967, I am forwarding herewith a copy of our comments to the Department of Interior regarding its proposed oil shale leasing regulations.

We appreciate your invitation to make comments directly to you in the matter. Our remarks to Interior have been quite candid. You will note in the second paragraph of our letter that we intentionally limit the scope of our comments.

Very truly yours,

HERBERT E. GRIER, *President.*

Enclosure.

CER GEONUCLEAR CORP.,
Las Vegas, Nev., August 11, 1967.

Hon. BOYD L. RASMUSSEN,
Director, Bureau of Land Management,
U.S. Department of the Interior,
Washington, D.C.

DEAR MR. RASMUSSEN: CER Geonuclear Corporation is pleased to comment on the proposed rules and regulations for oil shale leasing.

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,[1] a proposed nuclear experiment in oil shale, CER does have a vital concern with the proposed rules. For unless these rules show promise of stimulating oil shale research, industrial support for Project Bronco and other oil shale research may cease, with the result that our nation's shale resource may not be developed. We are, therefore, limiting our comments to oil shale research and are not commenting on matters of royalties, competitive bidding or acreage limitations—matters the oil companies can more appropriately speak to.

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. For example, if Project Bronco successfully develops an economically feasible extraction process, the supporting companies should not have to go through an additional research and development stage as a condition for securing a commercial oil shale lease.

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. However, the provision that nothing can be released by the lessee without prior approval of the Secretary would have the opposite result. Perhaps the best way to handle release of date or information would be by joint agreement to its release by Interior and the lessee.

The most objectionable feature of the proposed rules is the provision which gives the Government, in the absence of exceptional circumstances, title to all

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[1] Project Bronco is a cooperative Industry/Government experiment to be conducted by the Atomic Energy Commission, The Department of Interior, and a score of private companies, with CER Geonuclear Corporation as program manager.

inventions. The President's Patent Policy from which the proposal stems is directed toward research bought and paid for by the Government. However, the grant of an oil shale lease is no more procurement than the grant of a homestead or a mineral lease. We see no justification for Government claims to any patents developed in the course of privately-financed research. We further believe that Government insistence on such a patent policy will prevent companies without extensive background from participation in the program. This, we are sure, is not what the Government really wants.

CER believes that the oil industry will be willing to assure that technology developed in the research is available on reasonable terms. Therefore, we suggest 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.

We sincerely appreciate the opportunity to address ourselves to the proposed leasing rules. We trust that our comments will be given careful consideration in your revisions of the proposed rules.

Very truly yours,

HERBERT E. GRIER, *President.*

TEXACO, INC.,
Washington, D.C., August 4, 1967.

Mr. BOYD L. RASMUSSEN,
Director, Bureau of Land Management,
Department of the Interior,
Washington, D.C.

DEAR MR. RASMUSSEN: This letter is written in response to your solicitation for comments with respect to the proposed Regulations for the development of oil shale, which appeared in the May 10 Federal Register.

We appreciate this opportunity of expressing our views on this most important subject. It is essential that the policy and the regulations thereunder, which are to result from your consideration, bring about the most effective and efficient utilization of this great natural resource.

Texaco has maintained a continuing interest in oil shale and its development. We are currently conducting research and development work on the recovery of shale oil of improved quality by a retorting process involving the use of hydrogen. Also, we are presently a participant in Project Bronco, a plan to utilize nuclear energy in connection with in situ retorting of oil shale. It is our hope that either or both of these endeavors will ultimately lead to an economically feasible procedure for production of marketable petroleum products from oil shale.

We feel 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 with reference to oil shale lands, in our opinion, would lead to orderly development and result in the effective utilization of this great natural resource.

Respectfully submitted.

L. C. KEMP, JR.

ROCKY MOUNTAIN OIL AND GAS ASSOCIATION,
Casper, Wyo., August 30, 1967.

Hon. CLIFFORD P. HANSEN,
Senate Office Building,
Washington, D.C.

MY DEAR SENATOR: As you undoubtedly know Secretary of Interior Udall, on May 10, 1967, published in the Federal Register proposed Rules and Regulations for the leasing of oil shale on the Public Domain.

Because of the importance of developing oil shale resources on Federal lands and because of the far reaching effect the proposed regulations might have, we felt you would be interested in the comments the Rocky Mountain Oil and Gas Association made to Secretary Udall concerning the published proposals.

Very truly yours,

Enclosure.

ROBERT H. MARTIN.

ROCKY MOUNTAIN OIL AND GAS ASSOCIATION,
September 14, 1967.

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

GENTLEMEN: The Rocky Mountain Oil and Gas Association would like to submit for inclusion in the record of the hearing commencing September 14, 1967, its views with respect to oil shale, and in particular the proposed leasing regulations published by Secretary Udall on May 10, 1967.

Our Association has a membership of 470 individual and company oil and gas operators of all sizes, ranging from small independents to major oil companies. Its region of industry representation includes the states of Colorado, Wyoming and Utah, in which oil shale is found, as well as the states of Montana, South Dakota, Nebraska and Idaho.

We are pleased that the Secretary of the Interior has recommended that private industry develop the oil shale resources located on Federal lands. We believe that this decision is in the best interests of the nation, because through competitive free enterprise our natural resources have been and are now being effectively developed at low cost to the consumer.

A key reason that the American consumer enjoys the cheapest energy in the world's history is that the United States Government policies have in general been quite stable, substantially assisting long range planning. The uncertainties and restrictions contained in the proposed regulations as discussed below may well defeat the development of this great oil shale resource by private enterprise.

1. We respectfully submit that we can see no persuasive reason why research effort should be restricted to a few applicants selected by the Secretary. Government owned acreage should be made available to all qualified applicants for the sole purpose of research. The acreage could be made available for research on a basis similar to a license or prospecting permit.

2. When a lease is granted under the regulations as presently proposed, the Lessee does not know if the lease will be extended for commercial production. Furthermore, if the lease is to be subsequently extended to commercial production he does not know the extent of acreage or reserves to be covered by the extended term lease. In effect, the Department of Interior proposes to require any oil shale lessee to expend very large sums of money on research without any assurance that he will have a production lease and no knowledge of what the production lease would cover if granted. This approach is entirely without precedent and will constitute a definite deterrent to research and production. Companies will be reluctant to make the sizeable investment in research without knowing in advance both the term of the lease and the acreage covered by the lease.

3. The royalty provisions of the proposed regulations would operate to discourage investment and thereby deter competition and development. The graduated royalty scheduled based on net income, in addition to income taxes, would make it most difficult, if not impossible, to compete with other sources of energy. It would be difficult to administer and it would also operate to penalize the more efficient operators. We recommend that the lease provide for a fixed royalty rate not to exceed 5% of the gross value of the product from the retort or at the in situ wellhead.

4. The proposed regulations will operate to curtail research by not allowing a research lessee to retain the benefits of his research discoveries and thereby have an opportunity to recover his large investment. Because of this, many companies or individuals may wait for someone else to do the research and use the results without cost in a commercial operation.

If our oil shale resources are to be effectively developed to meet the need 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.

Our recommendations are as follows:

1. 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.

2. We recommend that tracts of public lands be made available solely for research purposes, limited in size, with the provision that once the research pro-

gram 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 information as is customary in any private research project. The benefit to be derived by the United States would be encouragement of research and development of this vital natural resource.

3. 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.

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. Uncertainty in the laws and regulations is one of the greatest deterrents to progress in the development of oil shale. Necessary guidelines must be set in order to attract the necessary capital.

While oil shale has enormous potential, it cannot be utilized without solution of a number of economic and technical problems which now impede its development. Great effort by both industry and government will be required to resolve these problems. Oil shale also faces severe competition from other energy sources. We believe, therefore, that if this great resource is ever to be made available to the nation, the emphasis of the government's policy must be an encouragement rather than restricted development by private enterprise.

We hope that the views of our Association will be of assistance to the Committee on Interior and Insular Affairs in its consideration of this complex subject.

Respectfully submitted.

COLLIS P. CHANDLER, Jr., *President.*

PROPOSED REGULATIONS TO GOVERN OIL SHALE LEASING AND LAND EXCHANGES

Hon. BOYD L. RASMUSSEN,
Director, Bureau of Land Management,
U.S. Department of the Interior,
Washington, D.C.

DEAR MR. RASMUSSEN: The shortage of oil resulting from the Mid-East crisis has again pointed up the importance of maintaining a dependable supply of domestic oil. Publication of the proposed oil shale regulations on May 10 has thus proved especially timely.

The Rocky Mountain Oil and Gas Association is gratified that the Secretary has recommended that private industry take the responsibility for a program of development of oil shale resources on federal lands which will serve and protect the best interests of the nation. We do not believe, however, that the regulations as proposed will generate a broad base of competitive research and production of oil shale. To the contrary, in our opinion the regulations will have the effect of stifling both research and commercial production operations on Government owned lands.

COMMENTS ON THE PROPOSED REGULATIONS

A. General Comments:

1. We respectfully submit that we can see no persuasive reason why research effort should be restricted to a few applicants selected by the Secretary. Government owned acreage should be made available to all qualified applicants for the sole purpose of research. The acreage could be made available for research on a basis similar to a license or prospecting permit.

2. When a lease is granted under the regulations as presently proposed, the lessee does not know if the lease will be extended for commercial production. Furthermore, if the lease is to be subsequently extended to commercial production he does not know the extent of acreage or reserves to be covered by the extended term lease. In effect, the Department of Interior proposes to require an oil shale lessee to expend very large sums of money on research without any assurance that he will have a production lease and no knowledge of what the production lease would cover if granted. This approach is entirely without precedent and will constitute a definite deterrent to research and production. Companies will be reluctant to make sizeable investment in research without knowing in advance both the term of the lease and the acreage covered by the lease.

3. The royalty provisions of the proposed regulations would operate to discourage investment and thereby deter competition and development. The graduated royalty schedule based on net income, in addition to income taxes, would make it most difficult, if not impossible, to compete with other sources of energy. It would be difficult to administer and it would also operate to penalize the more efficient operators. We recommend that the lease provide for a fixed royalty rate not to exceed 5% of the gross value of the product from the retort or at the in situ wellhead.

4. The proposed regulations will operate to curtail research by not allowing a research lessee to retain the benefits of his research discoveries and thereby have an opportunity to recover his large investment. Because of this many companies or individuals may wait for someone else to do the research and use the results without cost in a commercial operation. The statement of Government Patent Policy issued by President Kennedy has no application to oil shale research on Government owned lands. The Government is not financing the research costs as contemplated by the Patent Policy, but is merely making public lands available for research for an economic method or technique of extracting oil from shale.

5. These inherent uncertainties make it impossible to do the advance planning and financial evaluation necessary for financing a research and production operation. Difficulty of obtaining conventional financing will operate to restrict competitive research and development.

These problems should be eliminated by drafting a prescribed form of lease and amending the regulations to spell out in detail the rights, duties and obligations of the lessee. The lessee from the outset should know the term of the lease and the lands covered by the lease for production purposes. The duties and obligations prescribed by the lease and regulations must be detailed and specific so that immense investments will not be subject to the continuing and unilateral discretion of successive Secretaries of the Interior. An additional benefit of having the lease and rules spelled out with particularity is that this will eliminate the necessity of the Department of Interior having to continuously make decisions requiring factual evaluation and judgment. This will also eliminate unnecessary exposure of the Secretary and Department of Interior to criticism for having negotiated leases on terms not in the best interest of the public.

B. We respectfully submit the following specific comments concerning the proposed regulations:

1. Section 3170.0–1 and other sections indicate an intent of the Department to favor those who have not previously obtained oil shale reserves and to unfairly penalize those having a present investment in reserves and who have already spent large amounts of money in research. We believe that participation by "have not" companies can be encouraged without discriminating against those who now own oil shale lands.

2. Section 3170.0–5 defines oil shale but leaves it unclear as to which conditions must prevail in order for an oil shale lease to also cover dawsonite, nahcolite, and other minerals, as they occur in the Piceance Basin. The lease and regulations should specifically provide that an oil shale lease will cover oil shale and all other minerals unless those other minerals are not intermingled with the oil shale and are capable of being separately mined or produced. In the event other minerals are capable of being separately produced, the oil shale lessee should be accorded a preferential right to a lease on such separate minerals in order to avoid problems arising from reciprocal covenants of support, maintenance, and non-interference which might occur if such minerals were under lease to another party. It would also

avoid problems of liability arising from interference, cave-ins and other casualties arising from operations.

3. Section 3171.2(c)(11) appears to require a disclosure of conventional crude oil reserves. This information is not necessary or relevant to the determination of an oil shale lease applicant's qualifications and should be deleted.

4. Section 3171.3 sets forth considerations to be used in evaluating applications. It requires a showing of "need" for lands and reserves of minerals for research and commercial operations. There is no indication of the nature and extent of the need required to be established. No measure or standard is provided. The applicant's "need" is not material to a determination of an applicant's capability of conducting a commercial oil shale operation. This requirement would also appear to have the effect of stifling free and open competition and should be deleted from the regulations.

Section 3172.2(b) provides for a commercial production lease ". . . so long as mineral products are produced from oil shale in paying quantities . . ." These words may result in automatic termination of the lease if production ceases for any cause or if production ceases to be in paying quantities even temporarily. This language should be changed to provide reasonable safeguards against automatic termination of a lease resulting in loss of investment in plant and facilities.

Guide lines should also be spelled out in this section with respect to the requirements for commercial feasibility, optimum recovery of minerals, prevention of pollution and damage to surface resources. Unless the nature and extent of these requirements are specified, appropriate designs cannot be incorporated in the original plant construction.

6. Section 3172.3(c) provides that at the time for the commencement of the extended production term the Secretary, in his discretion, will determine the amount of mineral deposits needed to provide reasonable reserves for commercial production and will extend the term only as to the area which contains such deposits. After a substantial investment in research by the lessee, the Secretary could unilaterally reduce the acreage and reserves covered by the lease. The amount of reserves available for commercial production should be known by the lessee prior to making an investment. It is most important that the Secretary not have the right to reduce the acreage covered by the least. Another cogent reason why the lessee should know the exact amount of acreage which will be covered by his lease is that 30 U.S.C.A. 241 provides that only one oil shale lease not to exceed 5,120 acres will be granted to any one person, association or corporation. Most individuals and companies would be reluctant to accept the one oil shale lease to which they are entitled by statute if they did not know the extent of acreage and reserves to be covered by that lease for commercial production.

7. Section 3172.3(d) provides ". . . no one may take, hold, own or control an interest in more than the total maximum acreage of land included in a lease hereunder. . . ." This provision could be construed in such a way that a smaller undivided interest in 5,120 acres of a shale elase from the Government would disqualify the ownership of other leases or interests in other leases. This provision can also be construed to mean that fee ownership of 5,120 acres of patented shale land can disqualify applicants for oil shale leases. The provision should be clarified and state that a total "net" interest of not more than 5,120 acres in United States oil shale leases will be allowed.

8. Section 3172.5(b) provides "the royalty rate on production shall be 3% on the gross value, at the point of shipment to the market, of the mineral products from the oil shale. . . ." At which point in the entire process does the provision as to gross value attach? Some processes include mining, crushing, retorting, hydrogenation and perhaps elements of transportation and refining. We suggest that the gross value as provided in this section for royalty purposes attach to the product from the retort, where the mining and retorting process is used, or at the wellhead of the in situ well. If the royalty rates are designed to make shale oil competitive with off-shore oil operations, we believe that the rules fall short of this purpose. A royalty rate of 3% to 5% of the gross value of the product would more nearly achieve this objective.

This section is also unclear as to whether previous costs of research and experimentation which provided necessary information for the commercial operation are included in the term "investment."

9. Section 3172.5(e) provides for readjustment of royalties after twenty years. The provision is consistent with the statute, but we suggest that additional criteria and provisions are necessary to avert uncertainties vitally affecting a very large investment, such as the date from which such 20 year period would be measured.

10. Section 3172.6 provides for automatic termination at the end of the research term unless the Secretary has previously authorized commencement of the commercial production term. If the Secretary inadvertently failed to extend the lease before expiration of the research term, or if in his opinion a lessee was not entitled to an extension, the lessee would be powerless to avert an automatic termination of the lease on which a substantial investment has been made. We propose that the extension of the lease for a commercial production term should be at the option of the lessee, subject to his having complied with specific requirements, rather than by the unilateral discretion and action of the Secretary. The lease and regulations should also provide specifically for the right of the lessee to remove his plant and facilities upon termination of the lease.

11. Section 3172.9(d) and (e) cover disclosure of information and patent provisions. As discussed above, RMOGA believes that these provisions would discourage competition in the development of techniques for the production of shale oil. In short, these provisions undercut, obstruct and thwart some of the most important purposes of the regulations as set forth in Section 3170.0–1, which are to foster and improve technology and encourage competition in development and use of oil shale and related mineral resources. We refer to the requirements for complete disclosure of all data from the prior research efforts of the applicant as well as that obtained under the research program. The Secretary then owns the information and has sole publication rights. Under these regulations the applicant must go even further and submit conclusions and recommendations derived therefrom, together with proposals for further improvements. He is allowed to retain nothing except the use, along with others, of the information and inventions which have been made at his sole expense and without cost to the others then benefiting therefrom.

The patent provisions are in effect a denial and rejection of the philosophy of the patent laws of the United States, which is to encourage research and development by preventing others from taking without compensation to the inventor, the invention in which he has invested his knowledge, time and money. Under the proposed rules, the lessee's new inventions must be given to the government and to his competitors free of charge—even the inventions owned by the lessee which he had made and patented in years past would in some instances be required to be licensed to others at an undetermined royalty rate.

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:

(1) 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.

(2) 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 re-

taining all patents and research information as is customary in any private research project. The benefit to be derived by the United States would be encouragement of research and development of this vital natural resource.

(3) 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 purposes should be drafted and introduced in Congress.

We appreciate the opportunity to present our views and hope that they will be of assistance to you in the issuance of regulations whereby these oil shale reserves can be properly developed by competitive free enterprise which has proved so effective in the past in developing the other natural resources of our nation.

Should you desire to discuss our comments and recommendations, we would be glad to confer with you at any time. We believe that our representatives could make a valuable contribution of their experience and knowledge in your consideration of regulations.

Very truly yours,

COLLIS P. CHANDLER, JR., *President.*

MOBIL OIL CORP.,
Denver, Colo., July 18, 1967.

Hon. CLIFFORD P. HANSEN,
U.S. Senate, Washington, D.C.

DEAR CLIFF: This is in reply to your letter of June 13, 1967, inquiring as to our views, comments or objections tto the proposed oil shale leasing regulations. The Rocky Mountain Oil and Gas Association has not yet completed preparation of its comments although we are now working on them and expect to have them finished and approved by our Executive Committee so that they may be submitted to the Secretary in advance of August 10. I had delayed in replying to you, for which I apologize, because we have been expecting that RMOGA's comments would have been finalized before now.

Basically, I think there is no question but that the regulations are unworkable as written. Indefiniteness as to amount of acreage to be made available for commercial production, the stringent patent and disclosure provisions and the royalty provisions are among the major obstacles.

We very much appreciate the interest taken by you and your staff in this complex problem and on behalf of the RMOGA General Legal Committee, as well as Mobil, I want to assure you that we are ready at any time to furnish you with such assistance or information as may be helpful to you. In the meantime, I am enclosing a copy of Mobil's letter of May 24, 1967, which contains our response to Interior's request for comments on the proposed regulations, together with our letter of March 17, 1964, wherein we outline our views in greater detail.

Best personal regards.

Sincerely,

Enclosures.

BURNS H. ERREBO.

MOBIL OIL CORP.,
New York, N.Y., May 24, 1967.

Re comments and suggestions, proposed amendment of 43 CFR Part 3170—Oil shale.

DIRECTOR, BUREAU OF LAND MANAGEMENT,
Washington, D.C.

DEAR SIR: On May 10, 1967 notice was published of proposed amendment of regulations regarding the leasing of oil shalelands, which notice invited comments and suggestions prior to June 9, 1967. This letter is in response to such request for comments and suggestions.

Since the proposed regulations introduce some rather radically new concepts, we have had some difficulty in giving them the in-depth analysis which they deserve. We have some concern as to whether they will be workable.

You have previously invited our comments on leasing regulations of oil shale which were furnished to you in our letter of March 17, 1964 (copy attached). We think the comments furnished at that time are still appropriate and valid. In my statement to the Oil Shale Advisory Board, we made one additional suggestion, namely, that for in situ research purposes, it might be appropriate for the Secretary to issue experimentation permits for tracts not exceeding 640 acres, but we reaffirmed at that time, our strong feeling that it was unnecessary and unwise to tie the leasing of Federal oil shale lands to research and development programs. We strongly reaffirm such view and feel that the attempt in the regulations to do so has created many problems which would make the regulations unworkable and will probably not result in intensified research and development work.

We would continue to recommend that leasing considerations be completely divorced from research and development matters past, present and future.

Very truly yours,

T. W. NELSON,
Senior Vice President.

SOCONY MOBIL OIL CO., INC.,
New York, N.Y., March 17, 1964.

Re comments and suggestions, proposed revocation of 43 CFR Part 197—Oil shale leases.

DIRECTOR, BUREAU OF LAND MANAGEMENT,
Washington, D.C.

DEAR SIR: On November 5, 1963 notice was published of the proposed revocation of the leasing regulations relating to oil shale, which notice requested comments and suggestions prior to February 1, 1964, such date subsequently having been extended to April 1, 1964. This letter is in response to such request for comments and suggestions.

Studies which we have conducted have caused us 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. Ultimately we can expect that supplies of shale oil may become a significant factor in this country's total energy requirements.

Based upon such conclusions, we have caused the expenditure of substantial sums in the investigation of shale oil production research and technology. At this juncture, we have not satisfied ourselves that existing technology and development work have demonstrated the commerciability of a shale oil venture, but we have reason to believe that additional research and development work will provide the technology and definitive economic parameters to demonstrate the commerciability of a shale oil venture. The indicated activities and expenditures by various other companies supports the conclusion that a substantial number of companies share our view.

In the light of present technology and the lack of definitive economic parameters, it is our firm belief that the adoption of hastily conceived leasing regulations, without having attempted the solution of certain problems, and without having available additional information and data to assist in determining critical elements of leasing regulations, would not best serve the development of an

oil shale industry. We recognize and firmly support leasing as the most equitable means for making available oil shale deposits under unencumbered federal public domain lands.

Among the problems which we consider critical and which we think must be resolved are the following:

1. Revocation of the Executive Order of Withdrawal with accompanying legislation to amend the Mineral Leasing Act with respect to chargeable acres, competitive leasing, plan of development provisions and similar matters hereafter discussed.

2. The validity of unpatented oil shale placer claims.

3. The respective rights of an oil and gas lessee, and a lessee of oil shale deposits, both with respect to ownership of production and operational conflicts.

4. The conflict of rights of surface users and lessees of oil shale deposits.

We firmly believe that an orderly and thorough consideration of some of the problem areas and means of solution will not interfere with the continuation of necessary and required research and development work which has been conducted by various companies heretofore. As indicated, the development of an oil shale industry will require a period of such further research and development work. Postponement in the issuance of leases so as to more properly consider the various matters relating thereto should not interefere with such efforts if such postponement does not extend over a protracted period.

One approach to solution of the many problems involved would be the appointment of a committee of qualified experts from both federal and state governments and from industry, which committee would have the task of making recommendations as to solution of such problems, appropriate legislation, and proper lease terms and provisions.

Although, as indicated, we find great difficulty in attempting presently to comment on suggested lease terms and provisions, we should like to suggest the following in the light of present information and our experience in connection with oil and gas leasing procedures, terms and provisions:

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. We believe that the most equitable means of accomplishing competitive leasing is on the basis of sealed bids on a cash bonus basis only, with the royalty, rentals and other lease terms fixed.

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. We would suggest that sales be held no oftener than once in a two-year period and that a limitation of three nominations (each to cover not more than 5,760 acres) per prospective bidder should adequately protect the needs of any bidder.

3. We believe that any lease should cover an area up to 5,760 acres, the equivalent of nine sections of land as nearly in the form of a square as possible. 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. With leases of such size and in view of the lands available, we should like to see the acreage limitation of a prospective lessee eliminated. It is our thought that the competitive bidding procedure removes the necessity of acreage limitations.

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. This would result in any plan of development being qualified to take into account any changed technology. 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. Clearly, until the technology is better established, this will be a very difficult administrative problem. 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 definitively 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. At this time, we cannot make any particular recommendation as to how to handle this problem, since it is dependent upon transportation, marketing and other considerations which are not clearly known.

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.

Obviously, some of the suggestions we have made will require legislation. It is our view that an earlier development of an economically sound oil shale industry may well result from the adoption of comprehensive legislation and regulations prior to the granting of leases on a piecemeal basis. Our experience in various areas convinces us that it is most difficult to secure needed amendments to improve laws and regulations where rights have vested on the basis of incomplete laws and regulations or laws and regulations adopted in the light of insufficient technology.

If you should desire additional discussion concerning our comments and suggestions, we will be pleased to confer with you at your convenience. Should you consider the appointment of a committee to study some of these matters, we would look forward to participation as a part of industry representation in such committee. Hopefully our representatives could make a valuable contribution of their experience and knowledge in such a consideration of the problem areas.

Very truly yours,

T. W. NELSON,
Senior Vice President.

JUSTHEIM PETROLEUM CO.,
Salt Lake City, Utah, June 95, 1967.

Hon. CLIFFORD P. HANSEN,
Senate Office Building,
Washington, D.C.

DEAR SENATOR HANSEN: Received your nice letter of June 13 informing me of the extension of time from June 15 regarding the Senate Interior Committee discussions on oil shale, for which I wish to thank you.

The enclosed is a copy of a letter of June 9, 1967 which I sent to the Senate Interior Committee and explained, as shown in the last paragraph, that if the government would develop U.S. Patent 3,237,689 to the extent that it could be used in situ as shown in the patent as basically protected by 3,237,689, that all oil shale holders outside of the government holdings as of today, would have the great help of the government development and could then develop

their own oil shale lands by the Justheim Petroleum Company patent for a fee which would be compatible to the parties concerned.

Senator Hansen, I believe that the oil companies are not of the mind as of now to spend money for the development of in situ oil shale treatment, and would desire, if possible, if it were put to a vote, to let the government develop it under 3,237,689, and then have its use as mentioned in the letter of June 9. I believe this is a great step forward in the oil shale business.

Please let me hear from you.

Sincerely,

CLARENCE I. JUSTHEIM,
President.

APPENDIX B

(Under authority previously given, the oil shale resources development program and the Myers report for the Secretary of the Interior were ordered printed:)

OIL SHALE RESOURCE DEVELOPMENT PROGRAM

PURPOSE

The Nation's oil-shale resources are of tremendous importance to this country's future because of their vast size, because technology has demonstrated that useful forms of energy—oil and gas—can be produced from them, because they may also contain appreciable quantities of aluminum and sodium minerals, and because the costs of exploitation may soon become economically competitive.

Since the major portion of the known richest domestic oil-shale resources are on public lands, the Department of the Interior, as their custodian, has a unique opportunity to insure their wise and effective use in a manner most beneficial to the public interest and the Nation's long term economic growth and security. In particular, the wise use of the vast deposits of the Rocky Mountain Region, as the world's largest single known concentration of hydrocarbons, requires perceptive policy and administrative decisions of major import. To be most effective, such decisions must be made with full and complete knowledge of the economic, social, and technologic factors that determine and influence when and how products from this source become significantly competitive with those from other sources. Liquid or gaseous products from oil shale will enter the market gradually, competing in certain geographic areas with marginal products from other sources. But eventually the products from oil shale will dominate some markets—particularly the oil market.

While extensive information on oil shale and conventional oil-shale technology already is available, very little is known about the mineral content of the oil-shale reserves, or about the possibilities for production of both shale oil and minerals from them. There is a pressing need for more and better knowledge on alternative means of retorting oil shale, on the extent of mineral occurrence in oil shale, and on possible methods combining shale-oil production and mineral recovery.

In addition to extensive studies by the Bureau of Mines and the Geological Survey, industry has invested heavily in oil-shale research and is clamoring for policy decisions on leasing of public lands which will encourage competitive and diverse exploitation by private enterprises.

The following program of research is aimed at furnishing such information. To assure timely and effective implementation, it is proposed that the program be carried out as a joint venture between Federal interests; including the Bureau of Mines, the Geological Survey, the Bureau of Land Management, and other agencies of the Department of the Interior; the Division of Peaceful Nuclear Explosives of the Atomic Energy Commission; appropriate universities under contract, and private firms, including those enterprises that wish to develop an oil-shale and mineral industry.

A 10-year program is proposed herein, at a total cost of $101 million. At the earliest practicable date, after decisions are made to determine the basis upon which the public oil-shale interests should be exploited, appropriate Federal research activities should make an orderly withdrawal from this field in favor of private enterprise, and resume a baseline research- and resource-development program.

WALTER R. HIBBARD,
Director, Bureau of Mines.
W. T. PECORA,
Director, Geological Survey.
BOYD L. RASMUSSEN,
Director, Bureau of Land Management.

SUMMARY

The program is designed to provide, over the next 10 years, information that will lead to the development of the latent oil-shale resource as a means of increasing the domestic energy and minerals supply, to contribute to the economic growth and well-being of the Nation.

The Green River oil-shale deposits of Colorado, Utah, and Wyoming are to a major extent a publicly owned resource of great magnitude. The equivalent of several hundred years supply of petroleum at present consumption rates exists in these beds on lands owned by the people of the United States. America's economic growth and security in this age is in large part determined by our ability to meet the petroleum needs of our industrial and military machines. An adequate supply of gasoline, jet and diesel fuel, and other liquid and gaseous fuel products can be made available within our borders by development of these resources.

National economic growth is gained by using our natural wealth wisely, so there is good reason to seek the development of effective processes for producing oil and minerals from shale. Inasmuch as the major portion of the richest oil-shale reserve is on public land, our Government has deep public responsibilities to enlarge the knowledge about the resource and, in cooperation with appropriate private interests, to stimulate development through research and experimentation in the mining and processing of oil shale.

There is much evidence of strong interest in oil shale by private industry, and there is widespread belief that technologic advance will bring production costs within competitive range of petroleum within the next 10 years. Six companies have joined with the Colorado School of Mines Research Foundation to conduct research at the Bureau of Mines facility at Anvil Points, Colorado. These and other companies are also undertaking other technologic research; also, the Federal Government is continuing research on oil-shale technology.

Within the United States oil shales occur in at least 29 states. Based on potential oil yield, the best oil shale occurs in the Green River formation in Colorado, Utah, and Wyoming, where in the thickest portions a continuous 2,000 foot section will yield an average of 25 gallons of shale oil per ton of shale. The other domestic oil shales may be considered to be of secondary importance, as they commonly yield less than 15 gallons of oil a ton and occur in thicknesses less than 25 feet. Even though these shales may not be of immediate interest as potential oil sources, there are possibilities of their development as gas sources.

Many of the western oil-shale lands also contain oil and natural gas, minerals, and ground water. Water—essential for shale oil refining, for the communities that would support the oil-shale industry, and for many other existing or potential enterprises—is not in abundant supply, and must be used wisely. The land surface itself—through agriculture, grazing, wildlife, and recreation—is also of considerable value. Plans for mining and processing oil shale must aim

not only at high recovery of shale oil, but must take into account other resources and the atmosphere as well and must work to preserve or restore their value.

Despite the fact that much of the knowledge of recovering shale oil is old, the technology is still in its infancy, and many promising new approaches remain to be explored. The in situ process, for example, under which oil would be converted and thermally driven from fractured oil shale underground without mining and without much, if any, effect on the land surface, is an especially promising process for recovering oil from the thicker and deeper parts of the Piceance Creek Basin of Colorado. The vast extent and physical characteristics of the oil shale offer an excellent opportunity for innovations and radically advanced mining systems that would result in low-cost extraction with maximum conservation of the resource and preservation of land and water quality.

Under the proposed program, primary emphasis is placed upon the development of new or improved technology where the promise of improving the economic feasibility of an industry based upon the exploitation of oil shale seems greatest. In particular, a variety of in situ retorting procedures will be developed. Because of the variety of physical conditions under which the resources exist, alternative low-cost extraction processes must be devised. The program will seek to advance technology in this regard. Concurrently, means will be sought to improve upon known techniques and to develop new methods of winning shale oil from oil shale and of studying the products obtainable from shale oil.

While a broad understanding has been gained of the nature and extent of the most significant occurrences, information necessary to objectively appraise specific sites is lacking. Such knowledge is necessary to determine which extraction procedures are practicable and applicable and which local factors might encourage or inhibit commercial development. The program will seek to develop such information, initially to define the sites likely to attract earliest attention, and then to define the conditions under which such sites can be exploited to satisfy both public and private interests.

Major environmental problems are common to the development and exploitation of oil shale, and these must be understood and solved as they relate to all other technologic and economic inquiries concerning oil-shale resources. The proposed program places strong emphasis on determining the impact of an oil-shale industry on its environment.

The research program also is aimed at determining the nature and quantity, and the feasibility and economics of recovery of minerals that occur within deposits of the Green River oil shale.

In addition to the technical research program, it is vital that multiple-resource planning be accelerated so that when oil shale development takes place, adverse effects on other resources, including other minerals such as oil and gas, are minimized. Advance planning will permit other resources to be accommodated to the maximum extent possible. Pollution and aesthetical damage can be minimized and good planning for urban development and roads can be achieved. Techniques of land and resource planning and economic analysis will be used. Close cooperation with other Federal, State, and local agencies is essential. An integrated and interrelated plan for development of the Federal lands would be prepared.

Finally, the program proposes strengthening the Department's capability to provide continuing and timely competence in appraising the complex economic interrelationships among oil shale and other energy sources, both on a regional and national basis and among mineral resources.

The program plan assumes the direct participation and support of many Federal agencies both within and outside of Interior. Similarly, State, institutional, and private interest participation is anticipated in all elements of the program.

Finances, oil-shale program [1]

[In thousands of dollars]

	Fiscal year											Total
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977		
Oil shale mining methods research	1,248	2,194	2,304	4,234	5,279	3,809	3,744	3,544	3,044	2,354		31,754
	1,036	2,327	1,395	2,098	2,365	1,448	1,371	1,281	739	491		15,051
Oil shale in situ retorting [2]											1,436	12,980
Oil shale composition, surface retorting, and shale-oil utilization	759	1,305	1,557	1,509	1,263	1,239	1,241	1,303	1,368	510	1,500	5,900
	300	310	370	490	500	1,060	870	890	600	1,500	400	24,000
Oil shale composition, in situ retorting	2,000	2,500	2,500	3,000	3,000	3,000	2,500	2,500	1,500	1,400	150	4,350
	2,300	2,500	474	500	500	500	500	400	400	275	125	3,500
Minerals associated with oil shale (oil shale and minerals)		375	300	525	550	450	450	350	350	125		1,250
	200	250	125	125	125	125	125	125	125			2,500
Resource appraisal studies	125	125										
Resources-development planning	350	2,150										
Impact of an oil-shale industry on the environment												
Oil shale economic studies												
Oil shale research facility												
Annual total	6,318	11,536	9,526	12,481	13,582	11,631	10,801	10,393	8,051	6,966		101,285

[1] Estimated total costs, including both Government and industry funding. Fiscal year 1969 through 1973 retorting research, exclusive of Atomic Energy Commission nuclear-explosive and health and safety costs.

[2] Fiscal year 1968 includes simulated nuclear experiment, as well as other in situ retorting experiment, includes Bronco, nuclear-explosive, in situ retorting experiment.

ANCILLARY SUPPORT

1. Industry will be invited to participate in joint ventures and to cooperate in the program with work being undertaken under the general direction of joint Government-industry committees which can be formed in cooperation with industry and scientific groups, such as the American Petroleum Institute, university research foundations and others.

2. Provisions will be made for cooperative studies between Government and individual companies or consortiums of companies, including those not now connected with the petroleum industry. In fact, with respect to in situ retorting research, a consortium of some 24-plus companies, with CER-Geonuclear Corporation, Las Vegas, Nevada, as interface, now is negotiating with the United States Government, represented by the Department of the Interior and the Atomic Energy Commission, for joint financing and conduct of a nuclear-explosive, in situ retorting experiment on Federal oil-shale lands.

3. The Federal Government will actively support research directly or through contracts with private organizations, including industry, universities, and foundations.

4. The costs indicated herein are estimated total costs, with the exception of AEC costs of providing and firing nuclear explosives, and conducting the necessary health and safety programs required for nuclear detonations. Any contributions from industry or elsewhere will reduce the costs correspondingly.

5. Multiple-resource planning will involve close cooperation with State and local as well as Federal agencies.

OIL SHALE MINING METHODS RESEARCH

Objective

The mining-research program is intended to develop a mining system technology for the economic extraction of oil shale that is compatible with the requirements for resource conservation and land preservation. The optimum mining system will be correlated to the determinable physical properties and geological conditions of the oil-shale deposits so that the design system will be as universally applicable as possible for oil-shale mining. The system will incorporate the most advanced technology available through research and development.

Program

A ten year program estimated to cost $31,754,000 is proposed that will provide for concurrent research in the major subsystems of rock fragmentation, ground control, materials handling, and environmental control and development of a model mine system design to mine oil shale. At an early stage the investigation will include developing the design and specifications for prototype equipment and testing prototypes. A full-scale demonstration of the design mine system and equipment should follow the 10-year program.

A key element in a conceptual system now under consideration is the use of spent shale as backfill for ground support. A mining system developed around this concept, whereby most of the material mined is returned to the voids from which it was obtained, will vastly reduce surface disposal, and will in addition stabilize the ground during mining, prevent later surface subsidence, permit almost 100-percent extraction of the rock layers being mined, and leave the unmined shale in good condition for later recovery of other minerals if desired. Such a system will require the development of advanced subsystems, particularly for rock breaking and materials handling. It probably will require continuous-mining machines of a type and size that do not now exist, and transportation devices and systems of radically different design. From the standpoint of economics, the system described conceptually offers greater potential than any of the existing conventional mining systems. The physical properties, thickness, and structure of the shale are favorable to the introduction of large, high-capacity machines to eliminate the inefficient drilling and blasting cycle inherent in most existing underground-mining methods and to permit automation in such systems to a high degree. This is a mining method that can yield thousands of tons per man shift rather than the 150 tons per man shift now obtained in the most efficient underground mining methods. At the same time it will accomplish the major conservation objectives.

The program will be conducted as two related phases. Much of the work in phases A and B will be carried on concurrently with constant feedback so individual components can be refined as data are developed.

A. Establish controlling parameters and evaluate their effects—
(1) Resources evaluation and site selection and delineation.
(2) Subsystems research directed to oil-shale mining problems.
(3) Initial mine-system model design (evaluate research data for design purposes).
B. Develop a mining system for oil shale—
(1) Derive, test, and evaluate design components of the system.
(2) Prepare specifications, and contract for and test prototype equipment and techniques.
(3) Complete design of model mining system. Following is a description of the work contemplated in each phase.

Work Plan

Phase A: Establish controlling parameters and evaluate their effects.

(1) Available data on oil-shale deposits will be evaluated to determine the resource and engineering data applicable for mine-system design purposes. It is anticipated that currently available data will have to be supplemented by additional drilling and sampling directed to a specified purpose. This work will be correlated with drilling and sampling proposed under other projects of this program. On the basis of the evaluation of these data, a site (or sites) will be selected.

(2) Basic subsystems and engineering research will include work on all of the subsystem elements of a complete mining system, including rock fragmentation, ground control, materials handling, and environmental control. Systems analysis for each specific subsystem will be made.

(3) Analysis of the total mining systems will incorporate the findings of the individual subsystems elements. This work will be expanded and directed to the investigation of oil-shale mining systems. An initial mine-system model design will be made for preliminary testing of proposed systems on the basis of available data and eventual refinement to an acceptable model.

All parts of Phase A will be carried on simultaneously and continued at varying levels for the life of the project. The basic part of the work should be completed in two years.

Phase B: Develop a mining system for oil shale.

Phase B, part B (1) can start and be carried on concurrently with the work on Phase A. Parts B (2) and B (3) depend on basic input from Phase A and part B (1) and will start upon completion of that work. Phase B work will continue at varying levels for the life of the project, but the basic part should be completed in four years.

(1) On the basis of available information and additional data derived from research directed to the purpose, the opportunities and limitations of each subsystem of oil-shale mining methods, techniques, and equipment process will be determined, tested, and evaluated as a valid component of a mining system.

(2) Based on Phase B (1), specifications will be prepared for applicable methods, techniques, and equipment; R and D contracts will be let as appropriate, and tests will be conducted on a prototype scale.

(3) The model mine system will be completed, tested, and specifications will be prepared for full-scale demonstration.

(4) Complete, test, and prepare specifications for full-scale demonstration of the model mine system.

Phase C: The final stage of the project will be a full-scale demonstration of the designed mining system at a selected representative site. The demonstration will serve to both test the system and provide an opportunity to debug and refine the system. The major part of the work is planned to start during the fifth year of the ten-year project and to be completed by the tenth year.

IN SITU RETORTING

Objectives

1. Develop techniques for *in situ* retorting of oil shale that will be applicable to various deposits of Green River oil shale in Colorado, Utah and Wyoming.
2. Correlate these techniques with properties of the deposits to determine the best technique to employ for conditions at any specific location in the area.

Program

A 10-year program is proposed, with provision for later further extension, that will demonstrate the potential of methods for fracturing and retorting Green River oil shale and that will develop additional techniques to supplement or

improve now envisioned methods. The cost of the program for the 10-year period is estimated at $15.0 million. The proposed research will complement other research on above-ground methods of converting kerogen to shale oil and will utilize data derived from proposed basic research.

Work Plan

A. Determine the nature of oil shales of the Green River formation, by laboratory and field measurements and analyses, to establish the conditions in the deposit and to relate results of an in situ experiment at a given location to the entire deposit. The study will include:

(1) Core sampling of oil shales believed to have different characteristics in four intervals in Colorado deposits, in three different beds and one unexplored deposit in Wyoming, and in one interval in Utah. Core sampling will be done largely during the first two years of the program. It will involve drilling boreholes and recovering about 6-inch-diameter cores of oil-shale intervals and adjacent intervals that may affect the in situ process. The following holes will be required in the three States:

Colorado: Core mahogany zone, poor core-recovery zone, nacholite zone, and basal Parachute Creek formation. This will require at least three holes, each of which will be 3,000 feet deep, with some 2,000 feet of core.

Utah: Core mahogany zone. This will require a 1,000-foot hole and 500 feet of core.

Wyoming: Drill two coreholes to sample the Laney member and two coreholes to sample the Wilkins Peak and Tipton members. These holes will total 7,000 feet, including some 3,000 feet of core.

This work will be fully correlated with coring, sampling, and resource-appraisal work proposed under other projects of this program.

(2) Conduct laboratory analyses and research on representative cores to determine richness, composite (organic content), lithology, and physical (mechanical) rock properties. Use holes from which these cores are obtained to conduct selected rock-property determinations on oil shales in place where they are affected by depth of burial and other formation conditions.

(3) Based on the determined properties of rock specimens and rocks in place, use statistical and other techniques to design experiments to select rock parameters and conditions that appear the most promising for creating desired permeability and in situ combustion conditions at different locations in the Green River formation. This work will start as soon as data are available and will continue for the remainder of the program.

B. Conduct a field experiment, or experiments, to develop an in situ technique utilizing methods of fracturing and underground combustion considered to be the most promising.

The steps involved in such an experiment are to select a suitable site, conduct controlled fracturing tests, set up necessary surface facilities for conducting and controlling an in situ combustion experiment, conduct the experiment, and evaluate the results obtained. Site selection and establishing the characteristics of the deposit will be largely handled through phase "A" of this program so that only rather minor preparatory work will be done during the first year under this phase of the program. Development of an efficient recovery experiment may require 4 to 8 years, with much of the work being done during the fourth to seventh years of the program.

C. Perform laboratory and field research on novel methods of fracturing oil shale in place such as electrical fracturing and the use of chemical high explosives in preinduced fractures to develop techniques applicable to shallow or thin oil-shale beds.

D. Determine the feasibility of using nuclear explosives for fracturing large quantities of shale preparatory to in situ retorting for use in deep, thick sections of the deposit amenable to the required scale of operation. This investigation consists of four parts:

(1) Based on laboratory and bench-scale results, design and conduct simulated nuclear experiments to approximate the known and expected conditions that will exist in a nuclear chimney following fracturing by a nuclear explosive. The primary purpose of the experiments will be to develop retorting and recovery methods applicable to large quantities of ungraded shale. The advantages of such experiments, rather than proceeding directly to a nuclear blast, are that extensive analyses of the shale are possible and instrumentation for following

the course of the retorting can be installed readily. Designing, conducting, and evaluating this part of the investigation will require about two years.

(2) Design and conduct an experiment using a single nuclear explosive. Because the criteria for selecting a site for a nuclear fracturing experiment are different from those for selecting a site for other types of in situ experiments, considerable additional exploratory work over that designated in phase "A" will be required. A site for a nuclear experiment must be located in an area where the thickness of the shale is great enough to make complete use of the fracturing potential of the device and where the combined thickness of shale and overburden is great enough to insure complete containment. For experimental purposes, this site should also be in a sparsely populated area away from other developments including mine workings and tall above ground structures. The location of aquifers, if any, must be known. Following the nuclear fracturing, an extensive program to determine the characteristics of the broken shale will be completed before retorting and recovery are started. Preparations for nuclear experiment will be started in the first year of the program. Following selection of a suitable site, which is currently underway, one to two years will be required for preparing the site and detonating the nuclear device, and two or three years to evaluating the fracturing results, conducting the retorting and recovery experiment, and evaluating the results.

(3) Develop recovery techniques suitable for application to masses of rubble created by multiple nuclear explosions. Site selection for this experiment will probably have been accomplished at the same time that the site for the single explosion is selected. The placement of the nuclear devices, the conducting of the actual detonations, and the post-shot exploratory work on the extent of fracturing accomplished will be similar but on a larger scale than when a single device is used.

This investigation of multiple nuclear explosions will not be started until sufficient information has been obtained from the single shot experiment to indicate that the multiple shot concept has merit. This will be in the sixth to seventh year of the program. Then, as with the single device experiment, one to two years will be required for the nuclear fracturing phase of the experiment and two to three years for the combustion and recovery phase of the experiment. Therefore, this part of the program will be started and completed during the 10-year program. If successful, experimentation may extend beyond a total of 10 years.

(4) Develop techniques suitable for recovering oil from the fractured zone adjacent to or between nuclear chimneys.

OIL SHALE COMPOSITION, SURFACE RETORTING, AND SHALE OIL UTILIZATION

Objectives

1. Develop improved techniques for obtaining shale oil from oil shale.
2. Upgrade the quality of shale oil.
3. Investigate products obtainable from shale oil, particularly chemical by-products.
4. Determine characteristics of oil shale and shale oil and how these characteristics affect the technology of shale-oil production.
5. Investigate problems of spent-shale disposal.

Program

A 10-year program is proposed to perform both basic and applied engineering research on: (1) The physical and chemical properties of oil shale and kerogen (the solid organic material in oil shale from which shale oil is derived by heat treatment) as related to occurrence in the deposit and how the properties vary with geologic conditions; (2) composition of shale oil, shale-oil components, and shale-oil fractions with particular reference to heavy hydrocarbon fractions; (3) application of basic data on the properties of oil shale to improve processing methods; (4) fundamentals of catalytic, thermal, and chemical treatment of shale oil; (5) effects of retorting temperature variables; (6) effect of physical properties of oil shale on efficiency of crushing; (7) methods for retorting oil-shale fines; (8) techniques of utilizing spent (retorted) shale; and (9) spent-shale disposal problems.

The total cost of this research over the 10-year period is estimated at $13.0 million.

Work Plan

The following work plan assumes that the various projects will be conducted concurrently, all beginning in the first year that research is authorized, with the relative effort dependent upon staffing and obtaining required equipment.

A. Study the nature of oil shale with emphasis on changes with depth or location of shale and relationship between nature of shale and oil produced. Investigate chemistry involved in conversion of organic material to oil to provide data for improving present conversion processes or devising new ones.

B. Study composition of various shale oils with emphasis on the heavy hydrocarbon fractions about which little information is available. Correlate data with engineering research on the production of shale oil and end products. Develop techniques for separating materials from shale oil for other than fuel uses, emphasizing engineering applications. Apply data on chemistry of shale-oil components and process variables to improve processes. Develop analytical techniques useful in research and process control.

C. Study physical properties and physical chemistry of oil shale to obtain basic engineering data on which improved processes may be developed.

D. Study fundamentals of catalytic, thermal, and chemical treatment of shale oil to devise techniques for improving refinability and properties. Develop techniques for producing a suitable source material for the production of valuable products other than fuel.

E. Study effects of pyrolysis variables (temperature, rate of heating, etc.) on crude shale-oil properties and composition to devise techniques whereby crude shale oil of improved refinability may be produced.

F. Obtain data on physical properties of oil shale and apply such data to devising more efficient crushing techniques.

G. Conduct laboratory and pilot-plant studies to develop an efficient retorting process capable of handling fines as well as larger particles.

H. Conduct laboratory and field studies on spent-shale disposal problems.

MINERALS ASSOCIATED WITH OIL SHALE

Objectives

1. Identify and determine the amounts and characteristics of valuable minerals in Green River formation oil shales on Federal lands in Picenace Creek Basin, Colorado.

2. Develop new processes and determine their technical and economic practicabilities for recovering the alumina and soda (and other minerals that may be discovered during other segments of the program) contents of the specified oil shales.

3. Provide information for determining the geology and reserves of the minerals.

4. Determine the economics of preparing marketable mineral products for oil shale.

Program

A 10-year program is proposed to perform both basic and applied research on:

1. The identity, amounts and properties of valuable minerals in presently available representative samples of oil shales in Piceance Creek Basin through the procurement and analysis of representative core samples of the mineral-containing oil-shale beds that have not been adequately sampled.

2. The metallurgy of extracting and converting the oil-shale minerals to commercial products.

3. The geology and resources of the minerals

4. The economics of recovering the mineral values in oil shale in conjunction with processing the oil shale for its shale-oil value.

The total cost of the research on the identity, amounts, and properties of the valuable minerals over the 10-year period is estimated at $5.9 million.

Work Plan

A. Identify, estimate the amount, and determine the chemical and physical properties of the minerals occurring in the oil-shale deposits. Fort Picenace Creek Basin, Colorado, this involves the rock matrix minerals, but applies principally to incompletely identified sodium and aluminum minerals such as nahcolite and dawsonite that are large and important potential sources of industrial chemicals. This basic information must first be obtained to initiate other studies

for appraising deposits and means of recovering the minerals. Work can be started immediately after authorization on samples now available. It can then be expanded to other deposits by procurement of samples held by the Geological Survey and private companies and by new core drilling.

B. Study the metallurgy of the minerals, devise processes for extracting the valuable ones in conjunction with the production of shale oil, and develop methods for converting the extracted minerals to basic industrial chemicals.

1. Amenability of unretorted oil-shale minerals to chemical extraction. The possibility of recovering the valuable minerals before retorting will be investigated in order to cover all possible facets. Minor effort will be expended here.

2. Determine amenability of retorted oil-shale minerals to chemical extraction. All plausible techniques for extracting alumina and soda from retorted shale will be investigated. Studies will be based on optimum retorting practice for oil extraction to take advantage of chemical and physical properties imparted during retorting. Testing will include oil shale both hot from retorting and cold after storage. Effect of moisture from open storage will be determined.

3. Determine effects of changing oil-shale retorting practice on extracting alumina and soda from oil shale. Optimum retorting practice for oil recovery may not yield the most suitable material for extracting other valuable minerals. Assuming alumina and soda are coproducts with oil, optimum processing for the total system of oil retorting and mineral extraction will be determined. Additional work under this element will include investigation of processing techniques in which, simultaneously, oil will be removed and minerals rendered readily extractable by subsequent chemical action.

4. Evaluate laboratory data and determine most feasible processes. Results of investigations for research phases 1, 2, and 3 will suggest the most promising processing routes. Additional investigations will be required to determine the optimum sequence of operations for processes based on best methods of extracting alumina and soda from oil shale. Optimum process for recovering final alumina and soda products will be based on most economic sequence of operations, not the best means of extraction alone.

5. Develop pilot-plant design data by large-scale laboratory study of the more likely processes. Design and sizing of process equipment and flowsheets will require substantial investigation to establish material and energy balances, materials of construction, and probable effect of recycle streams in large-scale operations. Effective operation under this element will give information to narrow choices of possible processes and give data required for a well engineered pilot plant.

6. Evaluate large-scale laboratory data to choose optimum process for pilot-plant study. This research phase will consist primarily of estimating capital and operating costs for the better processes to select the least expensive for development in pilot plant. Also included will be technical evaluation to expose possible areas of operating difficulty in the pilot plant and to point out areas where additional investigations might provide techniques to lower costs.

7. Design and construct pilot plant. Design of pilot plant will be based on process information provided by research phases 5 and 6.

8. Conduct pilot-plant investigation to develop optimum process for treating appropriate types of oil shale. Pilot plant study will develop the single most promising process and provide a base for possible commercial demonstration efforts. In addition, suitability of process to varying types of oil shale from other horizons as disclosed by concurrent phases of oil shale program will be demonstrated.

9. Final evaluation of pilot plant data. This work element will complete the process-development package by providing accurate estimates of capital and operating costs for a commercial plant and by resolving technical problems uncovered in the pilot plant.

C. In cooperation with geologic appraisals of the deposits under resource appraisal, study the extent, character, and resources of the minerals.

D. Evaluate the economics of commercially extracting the minerals, as well as shale oil, from the deposits and their conversion to industrial chemicals.

Concurrent with part C above, a minor research effort will be conducted as necessary to provide additional information relating to varieties of oil shales disclosed as geologic and mining investigations progress.

RESOURCES APPRAISAL STUDIES (OIL SHALE AND MINERALS)

Objective

The objective of this program is to provide geologic and engineering information and analyses of data on the oil-shale resources in relationship to their location, extent, quality, physical and chemical properties, and inclusive up-to-date technology. These data will be necessary to both industry and Government as a basis for decisions in the planning for the commercial production of shale oil as a supplement to petroleum and natural-gas supplies. The geologic data become input to additional economic and technologic appraisal and feasibility studies of the mining, processing, and marketing of these resources; such as the location of industrial operations; the size and accompanying technologic-economic factors in mining, processing, and production; present and future markets and transportation; and the effects on other resources.

A 10-year program is proposed on oil-shale resource appraisal studies requiring $24 million.

Program

The principal initial studies to appraise oil-shale deposits will be concentrated on the Nation's largest and most nearly commercial deposits in Colorado. Previous studies have led to rough estimates of extent, thickness, and approximate quality of the oil shales in the Piceance Basin. More precise knowledge of the deposits, essential to general planning for utilization, will be sought, as well as determination of the extent and quality of the deposits in Utah and Wyoming, which are less well known.

Work Plan

The program of appraisal will consist of integrated topographic and geologic quadrangle mapping as a basis for detailed planning and engineering appraisal; drilling for geologic information necessary to better define oil-shale thickness and grade trends in the basins as a whole; the relations of oil shale to associated saline deposits such as nahcolite, dawsonite, and salt; and to oil and gas accumulations, gilsonite, and tar sands; drilling for engineering uses such as the specific oil-shale content of selected areas; economic analysis and treatment tests; and related topical investigations. During the 10-year period the principal oil-shale deposits of Colorado, Utah, and Wyoming will be studied in sufficient detail to permit the evaluation of their production potential. Quadrangle mapping will upgrade existing geologic maps, which are on planimetric or other low quality base maps, as well as provide detailed coverage of the several potentially valuable mineral deposits that are thus far unmapped except in reconnaissance. Geologic core drilling, supplemented by drilling done for reserve determination or economic appraisal, will provide information necessary for understanding and appraisal of the basins as geologic units. This coring and sampling will be correlated with other coring and sampling proposed under other projects of this program. Geochemical investigations will be made of other valuable resources, such as sodium minerals, and geophysical investigations will be made to determine physical properties of both the economic deposits and the adjacent wallrocks; ground water and brines within the oil-shale bearing rocks will be appraised to determine their relationship and possible uses and effects on mineral utilization.

Utilization of oil-shale depends on many factors such as grade properties, thickness, and depth of the formation. The surrounding rock formations, the locality and mine-sites access, haulage, and suitable plant sites are all of prime importance.

Coring and sampling of the Piceance Basin is proposed as the major initial part of a 10-year national coring and sampling project. The first three years of the 10-year technical studies will be in the Piceance Basin on Government lands. Private ownership of the western oil-shale lands has been concentrated on those areas where the shales crop out. The very much larger deposits deep underground, away from the outcrop areas, have remained in the possession of the Federal Government and less is known about them. Some broad estimates are that about 80 percent of the Green River oil shale is in public domain. Delineation of these deep lying deposits by means of coring and logging is necessary to assess their extent and quality. Selection of specific areas for mining projects requires development drilling at closer intervals to verify tonnage and grade estimates that are now based only on widespaced exploration drilling.

In the first year, key sites will be core drilled. Analyses of cores and samples from these coreholes will be used in directing additional coring and sampling work that will be needed to complete the delineation and mapping of the deep-lying Piceance Basin deposits. In subsequent years the work will be extended to include the Uinto Basin of Utah and the Green River and other basins of Wyoming and Sand Wash Basin, Colorado.

RESOURCES DEVELOPMENT PLANNING

Objective

The objective of this program part is to provide comprehensive plans for development of the publicly-owned resources in the oil shale areas. Comprehensive planning will provide:

1. Evaluation of best mining or extraction methods for the various oil shale areas in terms of mineral conservation, prevention of pollution and aesthetic damage, safety, and economic operations.
2. An estimated schedule of oil shale development by area.
3. An evaluation of all the resources involved in the region and the opportunities for multiple-use of selected areas.
4. An evaluation of water, electric power and other utility needs and transportation and communication needs.
5. Urban planning for an oil shale industry.
6. Economic analysis of conflicting and complementary resource use, alternatives in leasing, incentives, and allocation of receipts.
7. An overall plan for development of the various oil shale basins and the portions thereof. Tentative identification of basins into various multiple-resource units for various types of mining or extraction, and for solution of possible pollution problems.

A 10-year program costing $4,350,000 is contemplated.

Program

A. *Evaluating of mining and extraction methods:*

1. Mine site and type.—Studies will be made of different methods for mining oil shale, including the data from mining research proposed elsewhere. Each method will be identified and analyzed to set up selection criteria of systems and sites based on such factors as topography, water supply, delivery of shale to plant sites and spent-shale disposal as related to industrial applications.

The methods fall into three main categories: 1. Open-pit mining, 2. Underground mining, 3. In situ retorting.

Factors to be investigated in evaluating different techniques include pit- or underground-mine design with respect to physical setting, optimum size of operation, allowable cost of shale delivered to processing plants, and safety.

Data from in situ retorting research proposed elsewhere in this program will be studied with respect to choice of methods for preparing shale beds for retorting, initiating and maintaining a retorting process, and recovering the shale oil produced. The techniques to be considered for preparing the shale beds include use of nuclear energy, chemical high-explosives fracturing, electrical fracturing, and hydraulic fracturing.

2. Mine design and economics.—Design of a mining operation will consider tonnage and grade requirements, safety and health aspects, and optimum extraction of the material. The design will incorporate current conventional methods, as well as adaptation of new concepts resulting from the research program on extraction and transportation methods. Estimated costs for each mining method—that is, surface, underground, and in situ—will be considered at various tonnage levels.

3. Safety considerations.—Safety is a primary consideration in the planning and design of any minig system, whether it be underground or on the surface. The type and degree of protection that can and must be provided for both men and equipment may well determine the technical and economic feasibility of any large oil-shale development. Most design factors based on the strength and character of the rock, such as the size and shape of underground openings or the depth and slope of surface pits, must be considered in relation to their effects on production workers and expensive equipment. Actual production operations, such as breaking and handling of rock, are more flexible but also must be planned for maximum safety. Environmental health of workmen is another important consideration, particularly in the design of ventilating systems to control dust, temperature and humidity.

B. *Multiple resource planning:*

The key to orderly and wise resource development is planning. For example, many people consider the Piceance Creek Basin oil shale area of Colorado as possessing value for oil shale only. This is not the case. Not only oil shale but valuable and potentially valuable oil, gas, aluminum and sodium are also known. Surface values include watershed, significant wildlife and recreation, scenic values, grazing and ranching. Depending on methods of extraction, mineral development could cause air and water pollution and aesthetic damage. Proper planning can minimize these undesirable impacts.

Conflicts of resource use are inevitable and even if mineral development predominates, as seems likely, all the development will not proceed at the same time or place. Multiple-use, with proper planning, can still take place. Other uses can often be accommodated elsewhere.

Mineral development will place increased demands on water and electric power supplies. Urban development planning and road planning will be vital.

All of the previous planning has been on the basis of an industry on private lands near the edge of the Basin with urban development taking place along the Colorado River. Planning of development of the Federally-owned center of the Basin is needed.

The first step in proper planning is to bring together the basic information. This step is called resource analysis or inventory which involves gathering information from all available sources on all the various resources involved and placing this information in useful form—often on maps. For example, even on oil shale, the information on the resource is badly fragmented and scattered. Where and what quality are the low grade resources in relation to the richer deposits? What is the land ownership and status? Often this phase alone will reveal certain relationships or inter-relationships which are not readily apparent—yet are vital in proper planning.

The second step would be the analysis of the invention information and tentative subdivision of the Basin into various resource units. This might involve leasing units considering such things as types of multiple-mineral deposits, types of mining or extractions, surface values, aesthetic values, pollution control, etc. It is possible that because of pollution or aesthetic or other considerations certain special controls or stipulations would be required in some areas. It is conceivable that units would be established for nuclear and other in situ testing, various types of underground mining, open pit mining, oil-shale-development-only areas, multi-mineral development areas, buffer or pillar areas around oil and gas wells, urban sites, plant sites, critical water areas, etc. The timing and scheduling of development is obviously an important factor. The key to this step is comprehensive planning for the Basin as a whole and relating the individual units to the whole and to each other.

The third phase which can be done concurrently with steps 1 and 2 is economic analysis. The lack of adequate economic analysis has been a continuing criticism of resource planning since the Paley Commission Study. Decision makers need the results of such analysis in order to make informed decisions. Economic studies are needed in such things as: conflicting and complementary resource-use benefit-cost analysis; alternatives in leasing, such as, terms and royalty; need for and possible effects of various types of incentives; allocation of receipts from leasing (in view of potential revenue, what alternatives may be worth considering); economic effect of alternatives in extraction, such as, recovery and conservation; and benefit-cost analysis of environmental effects of mineral development. No duplication of existing or planned economic studies by other agencies, universities or others is planned; in fact, the proposed studies complement each other.

This resource offers unique opportunities for close cooperation with private industry and local and State governments in the development of plans.

IMPACT OF AN OIL SHALE INDUSTRY ON ITS ENVIRONMENT

Objectives

1. To obtain solutions to problems arising from waste materials—especially air and stream pollutants—that will be produced in industrial oil-shale operations.
2. To devise and demonstrate economical methods of restoring mined areas and converting spent-shale dumps to attractive and useful grounds.

Program

The cost of a 10-year program, based on these objectives, is estimated at $3,500,000.

The work planned for the initial phase of the program will consist primarily of the following:

(1) Determining the amounts and nature of gaseous emissions from above-ground retorts of various types; (2) ascertaining the relationship of terrain to retort location and evaluating factors that bear on area-toxicity dispersion; (3) investigations of landfill requirements and possible utilization of spent-shale fill for constructive use as industrial sites and restoration of mined-out areas; (4) studies of spent-shale dumps from past operations to determine the siltation of water courses, amount of leaching of contained salts by rainfall over the intervening years since the dumps were originally formed, and the relationship of leaching of retorted shales to naturally weathered shales from talus slopes.

During the second phase samples and data will be obtained from experimental or commercial operations for detailed studies concerning pollution problems due to burning, fuming, smoke, and dust from fresh spent-shale dumps.

As commercial operations develop, continued and enlarged studies will be conducted on these problems. Among these are development of methods and determining costs of shale-dump stabilization and of reconstitution of retorted shales. Using spent-shale to fill arroyos on eroded lands; leveling and stabilizing spent-shale erosion moraines; and possible application of self-cementing and compacting procedures, using the cement type materials naturally present in spent shale also will be studied. These procedures, combined with methods that allow natural reconstitution into soil, will be investigated as well as the possible use of soil and vegetation cover, with a view toward ultimately rendering the spent-shale dump areas usable as agricultural and grazing lands.

Ways of preventing the leaching of excessive amounts of soluble minerals from spent shales by water from rain and melting snow will be sought. These dissolved minerals, if allowed to enter streams in uncontrolled quantities, could create problems for downstream communities.

Methods and costs of collecting and utilizing or disposing of dust from large-scale crushing and screening of oil shale will be studied. Shale fines may be screened from retort feeds and discarded. Measures may be needed to stabilize the shale-fines dump areas.

Liquid waste materials produced by oil-shale and shale-oil processing, such as waste oils, sludges, treating liquors, water contaminated with various oils, chemical and organic substances, and gaseous refinery emissions present serious potential difficulties. Methods must be found to prevent these substances from entering the atmosphere or draining into streams.

OIL SHALE ECONOMIC STUDIES

Objective

The objective of the general economic studies is to provide continuing and timely understanding of the complex economic interrelationships among oil shale and other energy sources, both on a regional and national basis, to serve as an aid in guiding the overall research program, and to aid in establishing Federal, State, and industry policies. The energy industry consists of a complex network of relationships among suppliers, processors, and consumers. Any change in the availability or cost of a source of energy, or the introduction of a new source either regionally, nationally, or internationally, can have far flung and subtle effects throughout the industry. The objective here is to understand the impact of the development of oil shale in all its ramifications and, conversely, to understand the responses of the other energy sources as they affect oil shale. Such an understanding will permit more perceptive policy responses. Economic studies related to resource planning are included under the Resources Development Planning Program.

Program

A series of special studies, as well as a continuing analytical appraisal, will be undertaken over a 10-year period at a cost of $1,250,000. This series of studies will use as major inputs the analytical models developed in the general program.

One such special study will investigate the developmental impact of various assumed levels of shale-oil costs. This involves integrating with the assumed level of shale-oil availability the price elasticity responses of other energy sources and the development regional impacts resulting from alternative levels of market penetration. Corollary to this study will be in-depth examinations

of costs from an overall view and the implications of successful research on these costs. This study is distinguished from the process-evaluation studies in that it is of a general purpose nature.

The development of an oil-shale industry in the Rocky Mountain area will clearly have a major effect on the general economy of the region. The implication of this effect as reflected in population shifts, demands for materials, expansions of service and utilities, and the transportation network will be examined. The net effect on other regions will also be included. Such a study will indicate potential problem areas in ample time for steps to be taken for their solution.

The competitive impact on alternative fuel sources will be examined. From such an examination, judgments as the disruptive effects of various rates of growth in the oil-shale industry itself can be made. Possible dislocations can be pinpointed and their seriousness evaluated.

The petroleum industry is, and the potential oil-shale industry will be, subject to Government controls that affect their profitability, rate of investment, and rate of growth. Federal import controls, tax provisions, and public-land leasing directly bear on the operation of the petroleum industry. This industry also operates under prorationing regulations enforced by the various States. These policies also have implications for an oil-shale industry, both directly and indirectly. The studies under this program will be aimed at understanding the effects of alternative policies in different areas under direct Governmental control. This will permit a better achievement of Government objectives with respect to these energy industries.

OIL SHALE RESEARCH FACILITY

Objective

It is anticipated that some of the research proposed herein, especially much of that described under In Situ Retorting; Oil-Shale Composition, Surface Retorting, and Shale-Oil Utilization; and Minerals Associated with Oil Shale, will be conducted at or correlated from existing facilities. Present facilities are not adequate for an appreciably expanded research program. Consequently, the additional facilities proposed herein will be necessary if the entire program or significant parts of it are approved and authorized.

Program

1. Complete present building to three stories by adding three floors to North wing and one floor to South wing. According to plans drawn up some years ago, this would provide space for twelve laboratories, six offices, and a combined library-assembly room. The cost would be about $350,000.

2. Replace present annex with a 4-story L-shaped building to provide about 40,000 square feet for new work and 15,000 square feet for activities now quartered in the annex. The cost of this building would be about $1,650,000. The two construction projects would nearly double the present floor area. It would require about $500,000 to furnish and equip the added construction, totalling $2,500,000.

ALTERNATIVES

As custodians of the Public Domain, the Department of the Interior must maintain a high level of competence and knowledgeability in regard to both the technology of extraction and utilization of oil shale and the factors that influence its value under various economic and emergency conditions.

Present programs permit the Department of the Interior to observe what others are doing, within the limits of proprietary information, and to mount a modest effort to add to the knowledge of the nature of the oil-shale resource and the chemistry of shale-oil products. This is a minimal effort that is inconsistent with the potential significance of the resource; however, it is the only realistic alternative to the program proposed herein.

MYERS REPORT FOR THE SECRETARY OF INTERIOR, UNITED STATES GOVERNMENT, WASHINGTON, D.C.

PHASE V (CONCLUSIONS)

The problems of shale mining have been much the same as those of coal mining, and could be resolved in the same manner, however, under the Carl Belser patents and method of extracting the kerogene from the shale, seems more feasible, than any other known method at present writing.

The obtaining of oil is a chemical process, and chemical reactions depend upon physical conditions. The physical conditions are imposed by the apparatus we use and the way to which we handle the apparatus. If our apparatus or our handling of it imposes physical conditions out of harmony with the results desired, it is useless to look for success.

The secret lines in knowing what reactions must take place to produce the desired results, and in shaping the apparatus and operating it to secure those reactions.

Considering the shale deposits as a whole, the following points appear to stand out.

(A) *The shales contain no hydrocarbons liquid at atmospheric temperatures.*

(B) There are no direct relationships between the oil yield and the presence of these hydrocarbons. Shales apparently free from the hydrocarbon particles may give a high yield of oil, while others in which such particles are numerous may give a low yield.

(C) Solid hydrocarbon in minute particles and in widely differing quantities occur in specimens the writer has examined.

(D) The specimens examined contain partially bituminization vegetable matter (and possibly some animal matter), and the quantity of this and the hydrocarbons together determines the possible oil yield.

In my considered opinion the shales are related to lignite or coal on the one hand and the true hydrocarbons on the other. The closeness of the relationship to each depends upon the nature and degree of the alteration of the vegetable matter of the shale. While the facts I have just stated throws some light on the origin of the shale, there is only one problem to be worked out, before the whole story of the oil shales can be written. I shall cover that problem shortly.

Comparison of Scotch and Colorado Shales

Analyses of the Scotch and the Colorado shales vary from place to place and from stratum to stratum, both in their organic and inorganic contents.

The average yield of Scotch shales is reported at about 18 to 20 imperial gallons of 22 to 24 U.S. gallons, per ton. There are billions of tons of shale in the Colorado deposits which will yield double this amount of oil and vast quanities that will yield from 50 to 60 gallons per ton. In addition to these are immerse tonnages which will equal the Scotch in oil content.

The ammonia yield of the Scotch shales is probably double that of the Colorado shales, but there can be no reasonable doubt that the ammonia will prove a valuable product and will add considerably to the profits.

The writer is aware of the shales of Scotland, England, South America, Canada, California, Colorado, Wyoming, Utah and other states. These shales differ in details, but the fundamental problems of treatment are the same—*the problems of hydrocarbon chemistry.* The history of the shale oil industry is a story of scientific research by *chemists and engineers of the highest rank.* It is a story of evolution—the survival of the fittest in apparatus and in manipulation.

The road is strewn with discarded apparatus—the best in its day. It is marked by abandoned theories and processes, each having played its part in reaching the goal.

Instead of profiting by the half century or seventy-five years of experiment and experience of Europeans and learned Americans including *Mr. Carl Belser, the name well known to the Department of Interior and United States Bureau of Mines in Colorado,* most of our experimenters have ignored all progress made at the expense of ceaseless toil and millions of dollars, and have chosen to be "pioneers," secretly cherishing the thought that chance, inspiration, revelation, or their own superior mentality will enable them to present to the world a process beside which the poor old Scotch process will recall the days of the stage coach.

If the major oil companies of the United States wish to improve on the past methods of extracting the oil from the Colorado and Wyoming and Utah shales, they must start with a feasible method of extracting the hydrocarbons from the shales and modify their methods of refining the extracted oil. The Colorado shales far exceed the European and Canadian shales in oil content and consequently, the tendency to coke and clog will be greater. This is no longer an insuperable difficulty. Colorado shales contain a smaller percentage of nitrogen available for ammonia. This fact will make certain modifications of extracting

and refining necessary. But it is not fundamental. Colorado shales appear to contain more *pyridines* than do the Canadian and European shales.

The scientific problems being faced by the industry, who seek to establish a shale oil industry and to reach the final goal is going to fall into two groups.

(A) The method of extraction.

(B) The problems of refining.

In the United States up to the present time, attention and effort have been directed almost entirely to the solution of (A). This has been due to the natural, but erroneous assumption that crude shale oil is like crude well petroleum, and may be successfully refined by the present refinery methods.

This assumption would be reasonably safe if oil shale were merely shale saturated with petroleum. True oil shales like those of Colorado contain no ready made oil, but are rich in the materials from which oil may be formed if the shales are properly treated, from extraction of the crude to the final phases of refining; thence will Colorado shale set off the biggest economic boom in the history of the United States.

Inasmuch as I have reported all of the chemical engineering aspects of one of the world's greatest potential industries, in Phases I–II–III and IV, I will now conclude this report as briefly as possible so as to get on personally with the promoting and praying for the successful culmination of (A) under Scientific Problems.

(Steam)

After securing the Carl Belser patents #2,725,939—to extract the true hydrocarbons and gases thereto from the shales of Colorado, and the world, I engaged the services of one of the better known oil consultants, Mr. Kenneth Record of Denver, Colorado to examine the Belser patent for the removal of said hydrocarbons from the shale *in situ*, a copy of this report, your office has in its possession.

After engaging Mr. Record, a terrible tragedy occurred to my daughter, and the disintegration of my family; therefore, the long delay in completing this report.

When steam is used in retorting or extracting the hydrocarbon components from the shales the conditions in the earth or (retort if you please) will resemble those which are obtained in the manufacture of water gas, but the best temperature for the formation, of the oil vapors, will be too low to convert the carbon into carbon monoxide. If after the oil vapors are driven off, the shale is exposed to a much higher degree of temperature to get the maximum yield of ammonia, steam passing through this highly heated mass will not only aid in getting the ammonia, but will cause the formation of water gas by the union of the oxygen of the steam with the fixed carbon of the shale, and the freeing of the hydrogen. In this method the fuel value of the carbon may be saved and the full value of the hydrogen added. The temperature should be from 1000 degrees F. to 1300 degrees F. When super-heated steam is used under the Belser patent the desirable gases will be given off at lower temperatures.

The gases evolved at the lower temperatures are the best, the proportion of condensable gases are the largest, the percentage of paraffin gases is highest, and that if impurities will be the lowest. The oil obtained will be more easily refined and the proportion of light oils will be greatest.

Time must be given for the heat to penetrate the shale, and for the gases to form and escape. Under the Belser patent it will take approximately 21 to 28 days before the aforesaid will be accomplished and the hydrocarbons will begin to flow from the heated mass and thence to the surface for storage or transportation, via pipeline or transport to the refinery.

It is certain, that certain gases, are formed at low temperatures, others at intermediate temperatures and others at high temperatures. Therefore, the heat must be started at lower temperatures and applied slowly to give time for same to penetrate the shale, to heat the surrounding shale mass. The heat must then be increased to the higher temperature to gain the desired results. Too rapid application of the heat at higher temperatures causes sintering of the stone and will close the pores by which the condensable gases must escape.

Time is an important factor in all chemical reactions. Heating the shale mass at too high temperatures will result in the formation of considerable fixed gas, a low content of gasoline and kerosene in the crude oil, inferior lubricating oil a crude hard to refine. It would be called "burnt oil." To raise the tempera-

ture too high will decompose the hydrocarbons into the elements hydrogen and carbon, in which case no oil would be obtainable. It should be stated that with the use of super-heated steam in the shale mass, the last hydrocarbons and the larger yield of ammonia will be secured at the lower temperatures than by *dry distillation.* In fact, they shall find it *impossible* to secure the full possible yield of ammonia without the super-heated steam.

Heat distribution is greatly aided by super-heated steam throughout the shale mass, thereby reducing the chances of overheating or spot heating and the objectionable results which would follow.

Even the best crude shale oil will contain a large percentage of *unsaturated hydrocarbons* called *olefins.* Removal of the *diolefins* that are the chief trouble makers in gasoline produced by cracking.

Diolefins are responsible for the foul odors, change in color, and for the formation of the heavy resinous oil that commonly formed in gasoline.

The chemical properties of the olefins and diolefins are so similar that the problem of separating them is a difficult one. However, that can and will be resolved in the near future.

The problem is not to secure from shales a "gasoline" or motor spirit composed of hydrocarbons, but to secure a motor spirit or motor fuel which will do the work or produce the greatest energy regardless of its composition. Experiments have proved that the explosive energy of an olefin motor spirit is delivered more slowly, but through a longer period of time, than is that of a paraffin gasoline. It has also been proved that the total energy delivered weight for weight is from 12% to 17% greater for the olefin motor spirit than for the paraffin gasoline, therefore the mileage obtained from the olefin gasoline would be much greater. The olefin gasoline will vaporize at a lower temperature than does ordinary gasoline of the same gravity, and is, therefore, a better winter fuel. The gist of these facts is that shale oil gasoline has 12% to 17% more energy, and will deliver it in a steadier or less jerky fashion, causing less vibration and therefore, less strain upon the motor or the machinery driven by it. Carburation over the years have solved the minor problem of carbon deposits in cylinder heads.

Paraffin wax of high grade and readily marketable will be produced from the shale crude in commercial amounts and very profitably.

Lubricating oils produced from Colorado shales, rich in olefins will hold their body (or viscosity) better under high frictional heat than do the paraffin rich lubricating oils of the same density, and are therefore from this standpoint the more desirable lubricants. It is evident, then, that the next problem of the refiner will be to work out a refining process that will save all olefins and pass on to the consumer the benefits of their superior qualities, whether in the engine or on the bearings.

In the event the refinery of the future is modified to produce gases, similar to the propane gas used, to run certain combustion engines today, one can expect the automobile manufacturer to exchange carburators of their engines, eliminating carbon in the cylinder heads, longer lasting, cleaner, crank case oil, considerably added thrust energy, longer lasting longevity to the engine, reduction of motor repair bills, better mileage per dollar spent for motor spirits, (but far more important will be the partial elimination of the pollutants which are escaping from the present day engines into the atmosphere, (unfit to breath by human beings), and then being written up in newspapers etc: and called smog.)

Not to be overlooked is the potash potential from the spent shales; the high temperatures from the Belser super-heated steam method into the mass shales will render a part of possibly all of the potash water soluable (K_2O) content of about (0.9%) or about 18 pounds per ton of spent shale. The range of water soluable potash mentioned will be from 0.25% to 2.02%. There are no relationships between the oil content and the potash content. It will be very easily extracted under the Belser patents, (the steam heat dissolving the potash in its entirety.) For example, a super-heater heating 1000 tons of shale per day would have 600 to 700 tons of spent shale in situ which would yield, approximately 10,800 to 11,000 pounds of potash. This is a by-product worthy of consideration.

Also to be considered is the fact that all true oil shales, as well as oils from lignitic shales contain phenolic compounds, and may be regarded as a source of carbolic acid. I doubt as to the quality being sufficient to warrant an expensive installation to save them as they occur more plentiful as a by-product of coking.

The shales from which the crude oil will come will also contain aromatic hydrocarbons and derivatives such as benzol, toluol, phenols, and pyridine compounds, sulphuric acid, sodium hydroxid and members of the carbonate family. (Sodiums) and ammonium sulphates.

You will find it to be a fact that under the Belser method of steam extraction, (in situ,) at intermediate temperatures, to be the best.

You will also find that under the Belser patent and method the asphalt content will be reduced considerably.

Example shale containing 2.5% to 3.5% will be reduced to approximately 1.4%, yielding a much superior crude energy.

The writer has spent many months of research as a chemical and geological engineer on the shales of Colorado, Wyoming and Utah and would like to come to my

Final Conclusion

1. *The present refining methods and refinerys will have to be modified.*

1. A. *The automobile manufacturer will have to modify his carburation and fuel tanks.*

1. B. *Recent publications in the press have shown that both medical authorities and optometrists are concerned with the effect of "smog" on not only the health, but the eye-sight of the people of the United States due to the contamination of the atmospheric conditions created and caused by exhaust of automobiles, buses, trucks, etc., which is taxing the waiting rooms of doctors and clinics, etc. to over-flowing.*

2. The method of retorting the shales must be of an in situ process, most likely the Belser method.

3. The refined products obtainable from shale crude will be primarily, gasoline, kerosine, light and heavy lubricating oils, paraffin wax, residual tars and potash. The gasoline and kerosine will be clarified. But in matters of use they will equal, if not surpass those from well petroleum. The lubricating oils will be superior to those from well oil. The wax will be of superior quality.

As to the commercial possibilities of the shale oil industry there can be no reasonable doubt, but it must be kept in mind, (as I stated in paragraph number 2 of Conclusions on page 261) and that the happy go lucky methods of petroleum winning will spell ruin if followed in the shale oil industry. It is and will be an industry demanding technical skill (chemical engineering, geological engineering, drilling engineering, etc.). Considerable expenditures of capital will be necessary to success. It is anything but a gamblers enterprise, or a get rich-quick proposition. It is essentially a manufacturing industry, and is destined to be the largest in Colorado.

With the use of the Belser patent #2,725,939—in situ method of extracting the hydrocarbons from the shales, increasing the crude oil yield with superheated steam by nearly 20 gallons per ton or nearly 60% and the ammonium sulphate increase of 13.31 pounds per ton or almost 300%, I can come to no other conclusion that the extraction of oil from shale is essentially *a process of destructive distillation* necessary for the good of humanity for a thousand years and longer. (Energy).

Respectfully yours,

RALF MYERS.

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