THE ROLE OF OIL SHALE IN THE U. S. ENERGY INDUSTRY

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My subject this morning is the role which oil and gas produced from the western United States oil shales are expected to play in the domestic energy mix of petroleum, coal, electric and nuclear sources between now and 1980. I can sum up most of my remarks in the simple statement that shale crude oil ought to and will provide a significant but modest supplement to domestic petroleum supplies, a supplement which will be tardy even if it begins to arrive in the market place as early as 1970.

Others who have addressed this distinguished audience have considered the role of other energy sources in the energy mix. The conclusion which seems evident is that the total energy demand is growing at such a rate that each element of the mix must make added contributions which will tax our collective ability to expand resources development. Each energy source will feel the strain and that

seems likely to be true notwithstanding any shifts for particular uses from one energy source to another in the foreseeable future.

In the case of petroleum, an inexorable increase in demand has been evident for many years, despite some shifts in utilization as, for example, towards coal and atomic energy. In 1964, when The Oil Shale Corporation, among others, stated its views to the Oil Shale Advisory Board appointed by the Secretary of the Interior, we suggested that the continuing increase in U. S. petroleum demand was seriously outstripping additions to proved domestic supplies, and that, as a result, crude shale oil was becoming an increasingly necessary supplement to conventional domestic supplies.

The statistical facts on which we relied in 1964 have not changed in the intervening years. Demand was then increasing steadily at three per cent or more per year, and it has continued to do so. But drilling costs were increasing with the need to go deeper, and drilling activity generally was on the decline. It appears to have reached its lowest ebb since World War II in 1966. Net additions to proved reserves had practically ceased to occur by 1964 and, despite the fortunate growth of the technology of secondary recovery, significant net additions have not since then arisen. Nothing in the present statistics suggests an improvement in this pattern through 1980, whether by a leveling off of demand or by a very substantially increased finding rate.

In recent months distinguished government and industry figures have projected with surprising unanimity that the United States demand for liquid petroleum by 1980 will amount to seventeen million barrels per day. We agree with that projection and, I might add, that seventeen million barrels is a lot of oil.

In addition to producing oil from presently unconventional petroleum sources such as oil shale, coal or tar sands, there are three obvious means of reducing the rate at which our petroleum resources 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 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 would reduce that demand thereafter. Finally, there is always the alternative of conservation of domestic reserves by increased reliance on foreign sources of supply. Other nations, experiencing diminishing viable domestic energy resources, have adopted such a policy out of necessity.

This background, we think, makes plain
tember 1966, the sole responsibility for prototype plant operations indicates, we believe, that these difficulties have been overcome.

The semi-works facility has been operated briefly at its design capacity to establish mechanical feasibility and is presently being operated at lower rates for data gathering purposes.

Yields of between 103 and 104% Fischer assay have been continuously achieved and improvement is anticipated.

A new ceramic heat carrier, developed in cooperation with the Coors Porcelain Company of Colorado, is now in use and its rate of consumption appears to be well within the economic requirements originally projected for the process.

Similarly, solids carry-over into the oil is now continuously well within the range originally established for the semi-works operation, and here too further improvement is expected.

With the assistance of The Cleveland-Cliffs Iron Company, a spent shale disposal system has been designed, installed and operated, which, from the standpoint both of pollution control and of convenient materials handling, is successful.

At present our program of operations has three principal objectives: further testing of mechanical reliability and of the ceramic heat carrier; simplification of mechanical equipment; and process optimization.

When we assumed operating responsibility in September we carried forward our detailed engineering design and cost estimate for commercial facilities to take account of the actual semi-works plant and its operations. The tentative results to date give us no ground for discouragement on the competitive role of shale oil in the present petroleum environment.

Since 1964, others have also been at work. Most prominent has been the operation of the Government facility at Rifle, Colorado by a distinguished consortium of companies. Of course, the earlier work of the Union Oil Company has contributed materially to oil shale technology.

In the very different field of in situ processing, we have joined with twenty-four other companies, at the instance of CER Geonuclear Corporation, in the study phase of a project which may ultimately utilize the detonation of an atomic device to provide sufficient fracturing of the deep oil shale deposits located towards the center of the Piceance Creek Basin to permit them thereafter to be retorted in place. The study project is interesting for its potential for cooperation between Government and industry. Technologically, the problems appear formidable. Apart from the uncertainties which today exist in the effects of controlled underground nuclear explosions in new materials, there is the equally critical uncertainty whether, even after a successful detonation and extensive fracturing, the resulting material can be retorted in place at reasonable costs and consistent with sound
conservation practices in utilization of the deposit.

These problems have perhaps been rendered still more difficult by the discovery, at various places within the deep deposits of the Basin, of potentially significant quantities of a variety of minerals from which alumina and other metal compounds may be recoverable. If these minerals are economically recoverable and if they are as widely distributed in the deeper part of the Basin as now indicated, it is apparent that the technology used to produce oil should not destroy them. The technological problems involved to develop in situ retorting techniques which preserve the other minerals may indicate, as the available information is increased, that mining of the materials and treatment at or near the surface of the ground is preferable. However, a very great deal of work must be done before these questions can be answered. That they will ultimately be answered we have no doubt.

Oil shale development has come far in the last few years, but large risks and costs remain if shale oil is to provide a significant and timely supplement to domestic supplies. Such risks and expenditures are not, however, unusual in the energy business. A striking example of the petroleum industry’s ability to devote capital and labor at substantial risk to provide novel sources of supply is evident in the energetic attempts to develop gas production in the North Sea. The Oil and Gas Journal has recently reported that in the short life span of the North Sea projects, nearly one-half billion dollars has been expended, lives and material have been lost under the difficult conditions of water-borne exploration and, although apparently a geological success, as yet it does not appear that the undertaking has proved economic. The challenge in Colorado is, at worst, neither as difficult nor as perilous.

Moreover, in aid of the great expenditure of funds and energy which industry has devoted to North Sea exploration, several governments had to, and did, in a relatively short time, adjust their external and internal affairs to define an equitable and stable climate in which the undertaking could go forward.

Governmental policy—particularly Federal Government policy—is significant to the short-term development and critical to the long-term development of the oil shale deposits. Against the background of increasing need, it is appropriate to consider the questions of oil shale policy which have thus far emerged and the steps which have been taken in recent months.

As these remarks have probably already made plain, we believe that the first shale oil production will utilize reserves located at or near the rim of the Piceance Creek Basin in Colorado. For the most part, such reserves, amounting to less than ten per cent of what we estimate to be presently recoverable Colorado reserves, are privately owned and not subject to title controversies. As to production from such reserves, Federal policy will have its chief impact in three areas that have often been mentioned in recent years.
The most prominently discussed of these areas has been the depletion deduction available for purposes of Federal income taxes. The Internal Revenue Service has taken the position that the Internal Revenue Code confines the depletion rate applicable to oil shale to fifteen per cent; 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 half the value of the oil. The Internal Revenue Service’s position that the fifteen per cent rate is applicable to the crushed material therefore has the result of reducing the depletion allowance for oil shale to fifteen per cent of one-half the value of the extracted crude 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. All this is as obvious to the responsible executive departments as it is to us. While the inequity seems great enough to be corrected without a special act of policy, it is apparent that the time for an active policy has arrived. This material must compete as petroleum in the marketplace. Competitive discrimination in the tax laws against petroleum from shale reserves ought to be promptly eliminated.

A second area of Federal policy relevant to the privately owned reserves is the qualification of shale crude oil as a refinery input for purposes of import quota allocation. The present import regulations do not make it as plain as it might be that domestic shale crude oil will be treated as a qualified refinery input like all other domestic crude production. It is perfectly clear that the aim of the import quota system to maintain a vigorous domestic petroleum industry would be defeated by any other result; but there is no reason why the cloud of unclear regulatory language should remain.

Finally, Federal policy, and to an equal or greater extent, State policy, concerning air and stream pollution will affect the development of the privately owned reserves. In our own operations and plant designs, effective systems have been designed and operated for the avoidance of air and stream pollution. We, of course, are ready to discuss the problems and to consider the means for controlling them with any competent Government agency.

As you probably are aware, some five per
cent of the estimated economic reserves in place in Colorado are contained in properties at or near the rim of the Piceance Creek Basin which are the subject of pending litigation between private claimants and the Department of the Interior. We, among others, are party to the litigation, and we therefore will not comment upon it beyond expressing the hope that both sides will continue as they have to speed the dispute to its earliest possible conclusion.

For the long-term development of the industry, Federal policy directly affecting the approximately eighty-five per cent of the reserves which are indisputably owned by the Federal Government will be controlling. Recently several steps have been taken by the Secretary of the Interior towards the formation of a Federal policy for the public domain reserves, and others are promised in the near future. Thanks to the cooperation of the Secretary and his delegates in Washington and in the field, we and our partners have recently completed a small but important exchange of properties by which the property which we hold under option from the Dow Chemical Company and the neighboring Government properties have both been improved. The Secretary’s statement of policy on January 27 of this year indicates that additional exchanges with a similar purpose will be entertained.

On that date the Secretary published a new Federal order affecting all of the public domain oil shale lands. The new order is apparently intended to clarify the withdrawn status of oil shale lands created by the Executive Order of President Hoover in 1930 and to make it plain that except as that earlier Order has been expressly modified to permit certain Federal leasing, no private rights may be acquired in oil shale-bearing lands in the public domain. This new Order, designed as it apparently was to insure that the oil shale-bearing lands of the public domain are preserved for orderly oil shale development, is unquestionably in the national interest.

Finally, the Secretary’s January 27 statement suggests the outline of a leasing policy under which public domain lands will apparently be made available to companies interested enough to commit themselves to substantial programs of research and development or of production. We welcome the establishment of such a program and await the promised proposal of regulations which will give it substance.

The Secretary has recently also proposed a program estimated to cost $101 million and devoted in large part to various forms of mining and retorting research. While the Bureau of Mines, particularly in the mining phase of its work, has, by its recent publication of the work carried out by it in the 1950’s, contributed to mining know-how in oil shale, further dedication of funds in the public sector to mining or retorting research seems to us unlikely to advance technology beyond the level to which substantial private expenditures are now carrying it. Nor is such public expenditure likely to have any other compensating benefit.
There are, however, other areas deserving of consideration for expenditure of public funds in which the relationship of expenditure to the rate of development of the industry and the return to the public could be more significant. Two such areas which I would like to mention briefly in closing these remarks are transportation of shale crude oil out of the Western Rockies into major refinery areas, and water resource planning.

Let me say first that we have no doubt that the job of transportation can and will be done by private industry without financial assistance from the public sector. However, transportation cost and therefore ultimate cost to the consumer is within wide limits a direct function of pipeline capacity. We think it is obvious that in development of this industry more than in the development of any other fluid hydrocarbon in the United States, the role of developing Federal policy could sharply affect the rate of development. The construction, therefore, of very substantial pipeline facilities early in the development of the industry may well require either a basis for very great confidence on the part of industry in Government policies dedicated to timely substantial development or the financial assistance of the Government in large pipeline construction.

The participation of the Government to make low-cost transportation available at an early time, when similar investment by industry might not be justified, is not without precedent. Secretary Ickes you will recall caused the first Big Inch pipeline to be built when industry could not justify its economics. Subsequently when the second World War was ended, it was sold competitively to the highest private bidder.

We believe that the possibility of cooperation in long-term transportation planning should be the subject of joint study by Government and industry. Such study could find out whether Government-industry cooperation in pipeline installation would materially aid industry development and benefit the consumer.

Although the western slope of the Colorado Rockies is an arid region, there appears today to be ample water available to satisfy the early needs of a developing oil shale industry. We and our partners, as well as others, have for some time been engaged in planning for our own water requirements. We have been assisted by a contract from the Bureau of Reclamation for a supply of water from the existing Green Mountain Reservoir. Other reservoirs, public and private, have been discussed or are in the planning stage. But there has not, to our knowledge, been a comprehensive study of the water resources of the Western Colorado and Eastern Utah region, and without such a study comprehensive long-term water resource planning is hazardous. The location of reservoirs, whether public or private, must take into account not only available sources of water and water losses inherent in stream transportation, but also the burden of cost of petroleum products to the ultimate consumer which the undesirable location of water stor-
age or inadequately planned reservoir capacity could impose. We, and I believe others, would be pleased to cooperate with the responsible State and Federal authorities in an attempt to design a comprehensive water resources study which could provide the basis for public and private long-term planning. The Government portion of any such effort would help not only the public interests in orderly industry development, but also those responsible for population movements and orderly planning for conservation of the wilderness.