

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 impossible 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