

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

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

POINT III. PLAN TO CONSIDER PROVISIONAL DEVELOPMENT LEASES

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

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

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

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

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

Captain MOORE. Thank you, sir.

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

POINTS IV AND V. AEC ASSISTANCE AND FUNDS FOR RESEARCH

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

- (1) Can currents to carry oxygen to the combustion chamber be maintained?
- (2) Can permeable channels or fractures through which the retorted oil can flow to wells be opened and maintained?
- (3) Can the size and location of the combustion zone be satisfactorily controlled?

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