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