

THE OUTLOOK FOR OIL SHALE

Harry Pforzheimer
Vice President
Sohio Petroleum Company
300 Enterprise Bldg.
Grand Junction, Colorado 81501

With the grip the federal government has on all forms of energy produced in this country, what our President says or does not say, or does or does not do, about energy is most important. As most of us know, he said nothing about oil shale in his energy message to the nation on April 20, 1977. This is not surprising since very few people, outside of those in the industry, know anything about oil shale and its promise as a source of energy.

At this particular moment, the production of crude shale oil from the rich oil shale deposits of Colorado, Utah and Wyoming is commercially feasible at current world oil prices. This is not only my opinion, finally arrived at after many years of searching for a viable process; others are saying so too.

Occidental Petroleum Company and Superior Oil Company, as well as the Paraho Development Corporation, following its conduct of the oil shale demonstration at Anvil Points, near Rifle, Colorado - a program in which I served as director - have all made encouraging, independent public statements about oil shale's current economic attractiveness. I believe Union Oil Company agrees but is a little more conservative in approach. This, in spite of our industry's many problems.

So far, the major obstacles to launching a shale oil industry in the United States include:

- (1) Unrealistic environmental standards that the bare ground in oil shale country cannot meet.

- (2) U.S. price controls on domestic oil, including a legislative price roll-back at the end of 1975: a roll-back imposed two years after the Arab embargo when incentives rather than restraints were badly needed.
- (3) Lack of a national energy plan containing proper incentives. Such a plan may now begin to unfold.
- (4) Need for a land exchange with the federal government to block-up private land holdings for development.

I have no reason to doubt any of the recent statements by others that oil production from oil shale is commercially feasible. These statements are consistent with the conclusions reached at the completion of the three-year, privately-funded, \$10 million Paraho oil shale demonstration and the current Paraho operations under Navy contracts. These tests of the Paraho process and hardware have been and are being carried out in the presence of government observers. They have been conducted in full public view and will continue to be so. We are proud of what is being accomplished: making oil from rock!

I have been involved in oil shale since 1963, when Sohio, in association with Cleveland-Cliffs Iron Company and Tosco, began Colony Development. We also began acquiring oil shale reserves and water rights for future development when the technology was ready and the economics justified.

Over the earlier years, gradual technical progress was made in spite of any disappointments. We would move ahead one step and back two. During the last few years, however, significant and very real technical breakthroughs have occurred. These have been made in many areas by a number of developers, witness the recent record.

Paraho itself has achieved many breakthroughs. It is significant that on April 20, 1977, Paraho completed the current run on its semi-works retort after 105 days of continuous operation. Not only has Paraho equipment operated 24 hours a day, seven days per week, at essentially 100 percent service factor, since being re-lit on January 5, 1977, it has survived a number of power outages, courtesy of Colorado Public Service Company.

Other Paraho breakthroughs include:

- (1) A significant reduction in water requirements. Like Superior and Oxy, the Paraho retort makes water. We have uses for that water and a little more. But, to produce crude shale oil commercially, our water use will be only 20 percent of what earlier work indicated would be necessary. Most of this will be returned to the atmosphere by evaporation. It will not be locked up in the retorted shale. To go all the way to a high quality synthetic shale oil will take only one-third as much water as we once thought.
- (2) The major reduction in water requirement results from the improved characteristics of Paraho's retorted shale. Because of these same characteristics, we have been able to develop improved methods for disposing of it.
- (3) High thermal efficiencies, which result from burning the residual carbon on the retorted shale, and high net yields of oil are obtained day in and day out. Net liquid recovery of C₅+ oil is 94 to 96 percent of Fischer Assay. In addition, a net yield of low Btu gas equivalent

to about 5 gallons of fuel oil per ton of rock is obtained. These figures are all net yields. They are over and above the fuel consumed in the process.

- (4) Pour point depressants have been identified by others which make Paraho crude shale oil and probably most other crude shale oils transportable by pipeline. This should transfer the refining problem, including its investment, its refinery people and its refinery water requirements, to existing refineries where these requirements are already available. These existing plants, some of which are already running below capacity, can be modified at much lower cost than building new pre-refineries out here. Moreover, these existing plants are able to produce products where the people and markets already are.

Paraho has reported the results of its latest commercial evaluation study. The final report of the Paraho oil shale demonstration projected production of crude shale oil of pipeline quality in a nominal 100,000 barrel per day plant for \$11.50 a barrel. This compares to \$13 to \$15 per barrel for imported crude. Paraho's price is projected to yield a 15 percent investor's discounted cash flow rate of return on an estimated investment of \$1.2 billion (100 percent equity - 1976 dollars). All the engineering design standards used in this commercial evaluation have been equalled or exceeded during the initial 105 day Navy run.

Superior and Occidental are reporting similar and sometimes lower prices. I believe their results and their processes complement ours. This is another important breakthrough for oil shale. If the underground areas we mine out for above-ground retorting were subjected to a follow-up, using in situ retorting of some type, overall economics would be improved, even if

there were a relatively low yield of secondary recovery of shale oil. Or, alternatively, rock mined out by others before in situ retorting could be run through a Paraho retort, thus improving the economics and conservation aspects of a purely in situ operation.

In those areas that have appreciable quantities of nahcolite or dawsonite in the oil shale deposits (most do not), Superior has developed promising processes for recovering these materials. Their recovery would also improve the economics of shale oil production.

I have always been an optimist, believing that "right is might" and will succeed. It begins to look as if I was correct in my beliefs - the outlook for oil shale in this country has never been better. We finally seem to have succeeded in developing a number of technologies that work and are environmentally acceptable. Their developers claim that each method, by itself, offers a way to produce shale oil at a profit. I think a combination of methods would prove even more attractive. But, very few people outside our industry know anything about these advances and their promise of success.

We are going to have to overcome this lack of public and governmental knowledge. After hearing President Carter's message, I am even more convinced we must get together and work harder to get our message across. Unfortunately, we have not done so in the past and, need I remind anyone, we have suffered accordingly.

An encouraging sign, however, is the federal government's shift toward a more enlightened position. So far, the U.S. Navy has been the leader in this move. This is evidenced by the Navy's involvement with Paraho and its planning for the Navy's shale oil reserves. I believe the new Energy Department is preparing to continue along the lines initiated.

I quite agree with President Carter that we are running out of natural crude oil in the world. Certainly, we cannot expect to

find crude oil in large enough quantities to sustain the current growing world consumption. Conservation is a must. I also agree whole-heartedly with the tenth point in Mr. Carter's plan: the need to develop unconventional sources of energy. I consider oil shale such an unconventional source. Keep in mind that the recoverable oil in the oil shale deposits of Colorado, Utah and Wyoming is estimated at 600 billion barrels. This exceeds the known natural crude oil reserves of the entire world. It is a resource we cannot allow our government to overlook.

To accomplish this, we must start working together on the next two logical steps in commercialization of oil shale.

First, we must proceed with a series of crude shale oil refinery runs. These have been initiated by the Navy with a recent request for proposals to run up to 100,000 barrels of Paraho crude shale oil.

Second, a development planned by many of us, is the construction and operation of full-size retorting modules of both the above ground and in situ type.

Concurrently with these steps, we should make every effort to correct the present unrealistic environmental standards. Where the terrain itself, bare ground, fails to meet environmental standards, to construct commercial plants would be ludicrous. We also must try to obtain more investor confidence if we are to keep shale oil production in the hands of private enterprise, not government. The key to gaining such investor confidence is successful refinery runs and successful full-size module operations, all properly publicized. And, given success with both, we may be able to make a case for lowering environmental standards to a more realistic level.