

the standpoint of energy planing, shale oil is not the entire answer to the preservation of our petroleum independence. Instead, every source of liquid petroleum will be heavily taxed to meet our domestic needs.

STATUS OF THE OIL SHALE INDUSTRY

So much, then, for the need for new domestic liquid petroleum supplies and the related need for shale oil. In the light of those needs it is timely to examine the facts as we understand them concerning the present status of the development of the shale oil industry.

Those facts divide into two categories: The status of technology and the status of reserves.

Status—Technology

The technology needed for commercial shale oil production is not merely the retorting technology required to heat the oil shale so as to produce condensable and non-condensable vapors yielding liquid and gaseous petroleum. Before the material can be retorted, it must first be obtained by a mining operation on an unprecedentedly large scale. When the material is obtained, it must be crushed to appropriate size. Having been crushed, it is retorted and the valuable products of retorting are collected but the remaining material, as much as ninety weight per cent of the original feed, must then be disposed of consistently with contemporary high standards of the purity of air and streams. The product stream must be treated for recovery of valuable by-products; and the crude oil, which contains significant amounts of nitrogen and sulphur, must be further treated with established techniques, either by the producer or a refiner, to render it suitable for conventional catalytic refining processes.

Mining, retorting, recovery, waste disposal and pre-refining treatment are the component operations and costs of shale oil production.

In 1964, The Oil Shale Corporation joined together with an experienced mining company and an experienced oil company to establish definitively the operability and economics of a TOSCO-developed system for shale oil production. The results of that work are now substantially all in hand. The feasibility and costs of mining the material have been established to a high level of certainty, and well within original projections, notwithstanding adjustments in the national economy in the intervening years. A development mine has been and is being operated, and more than 500,000 tons have been mined to date.

In June, 1965, the three companies completed construction of a semi-works retorting facility designed to operate at 1,000 tons per day of rock throughput. The plant represented a design scale-up from pilot plant operations carried out by TOSCO from 1957 onward at twenty-four tons per day. The semi-works retorting operation, originally scheduled for completion early in 1966, encountered difficulties associated both with the problems of joint management and of the initial operability of the facility. As a result, in September, 1966, TOSCO assumed sole operating responsibility for the plant. Since that time, albeit well over a year behind schedule, the objectives of the retorting and shale disposal operations have been met. The process, called the TOSCO II SYSTEM, operates continuously at yields of above 105 volume per cent of the so-called modified Fischer assay, and continuing operations indicate further improvements. The oil is produced substantially free of solid sediments and well within original specifications. The plant is mechanically reliable and simple to operate. Spent shale disposal operations have been achieved consistently with high standards of air and stream pollution control and the preservation of wilderness and wild life. The current operating program, which is devoted to further process optimization, is nearing completion.

Based upon these operations, and utilizing only equipment of a type proved in these semi-works scale operations, TOSCO in the fall of 1966 commissioned a distinguished and experienced contracting company to design the commercial plant, including final plans and specifications for its construction. The contractor's resulting "definitive estimate" is now complete. The plant will process 66,000 tons per day of rock throughput. The cost of the plant, including all expenses associated with achieving full operation, is under \$130 Million, including hydrotreating and by-product recovery facilities. Without hydrotreating and related facilities, the same plant, to produce raw shale oil suitable for pipelining, will cost under \$100 Million.