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Dependable Supplies of Hydrocarbons

Reliable new sources of petroleum are under development. In northern Canada, through a \$235-million facility, the Athabasca tar sands, which hold 600 billion barrels of oil, are now beginning to be exploited. At Cresap, West Virginia, construction is beginning on a pilot plant designed to test a process for producing gasoline from coal at a cost of 11 cents per gallon. In Colorado a new facility is being planned to produce petroleum liquids from the Green River shale. This formation contains the equivalent of 2000 billion barrels of oil, of which about 80 billion barrels is recoverable under present economic conditions. Conventional sources of petroleum are being extended by discoveries from drilling on continental shelves. While additional sources of petroleum are being developed, proved reserves are adequate to meet present demand of about 4 billion barrels per year.

In the development of additional petroleum reserves, a present focus of interest is the Green River shale, which extends over 16,000 square miles in Wyoming, Utah, and Colorado. The richest parts of the shale contain 25 to 65 percent of organic matter. They also include unusual resources of carbonate minerals such as nahcolite (NaHCO_3) and dawsonite [$\text{NaAl}(\text{OH})_2\text{CO}_3$]. Dawsonite, an excellent potential source of alumina, constitutes as much as 25 percent of the weight of some parts of the oil-rich shale.

The organic matter occurs as a complex, high-polymer-like solid disseminated through the rock, which in polished section is reminiscent of mahogany. To produce oil it is necessary to pyrolyze the shale. To accomplish this quickly, temperatures of 500°C are required. At 300°C, pyrolysis would take some weeks.

The processes ready for use involve mining the shale, breaking it up, retorting it, and disposing of the waste. To supply a tenth of the petroleum needs of this country would require the mining of about 2 million tons a day. The spent shale, which would be highly alkaline, would have to be disposed of so as not to ruinously pollute the Colorado River.

A possible alternative is development of methods for underground pyrolysis, which would leave the countryside relatively undisturbed and would minimize pollution. To accomplish this, methods must be found for increasing void space in the shale. Various means are under study, including underground detonation of nuclear devices. Other proposed methods include electrical fracturing and the use of chemical high explosive in pre-induced fractures. To investigate these and other problems, agencies of the Department of the Interior, including the Bureau of Mines and the Geological Survey, have proposed a 10-year oil-shale research and development program costing \$101 million.

Most of the resources of the Green River shale are located on public lands. Naturally, many individuals and corporations would like to acquire for a nominal sum a national asset that ultimately may be worth trillions of dollars, and this should not be permitted. Moreover, this country has seen enough of ghost towns and polluted streams from mining operations. Achieving optimum development of the Green River shale is a task worthy of our best minds. Some of them are to be found in government, and implementation of the proposed 10-year program is highly desirable. However, articulate, public-spirited citizens must also become involved if the public interest is to be adequately protected.

—PHILIP H. ABELSON