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Avoiding an Oil Crunch

Philip H. Abelson

Global resources of conventional petroleum are limited. Competent geologists, geochemists, and geophysicists have identified and explored the Earth's sediments in which favorable circumstances existed for the creation and containment of hydrocarbons. They know that vast areas of the globe have no resources of oil, and the amounts of conventional oil that will ultimately be produced can be estimated.

New exploratory and production technologies have been continually improved. During the past 5 years, the pace of change has quickened. Improved computerized seismic programs and guided drilling have been highly effective. Marine formations located in deep water on the continental shelves off western Africa, Brazil, and in the Gulf of Mexico have been drilled and found to be productive. Nevertheless, some knowledgeable petroleum geologists assert that conventional oil is being consumed faster than new reserves are being found.* An example of what will occur on a global scale is provided by events in the United States. Production peaked there in 1970. Imports of foreign oil have risen since 1982. They now supply more than half of U.S. consumption of petroleum and its products. In spite of huge investments in exploration using new technology, U.S. reserves of oil have diminished. In 1998, the costs of finding oil soared while rates of replacement of production dropped.† Reserves declined to 18.2 billion barrels in 1998. Consumption last year was more than 4 billion barrels.

"[T]he United States could help create large sources of nonconventional petroleum..."

Global consumption is growing. The world will become increasingly dependent on supplies from the Persian Gulf. In a few years, production there will supply 38% or more of global consumption. Then history might be repeated with huge price increases, supply interruptions, and attendant economic hardships. The United States and other advanced countries are conducting research that could eventually result in less dependence on oil. Those efforts are commendable and merit governmental funding. However, it is unlikely that the research will lead to substantially decreased consumption of oil for a decade or more.

To insure against an oil crunch, the United States could help create large sources of nonconventional petroleum. Great resources, technical capability, reliable equipment, and experience exist in the Canadian province of Alberta, where a vast area of tar sands contains about 1.7 trillion barrels of bitumen. Some of this has already been converted into more than a billion barrels of high-grade crude oil. With current techniques, more than 300 billion barrels of oil could be produced from the bitumen of these tar sands. This is more than the oil reserves of Saudi Arabia.

At present, the largest installation for extracting bitumen and converting it to a premium clean crude oil is operated by the Syncrude Corporation. Facilities are located at Mildred Lake 30 kilometers north of Fort MacMurray, which is about 600 miles north of the U.S.-Canadian border. First production there occurred in July 1978. In 1979, 18 million barrels of Syncrude Sweet Blend (SSB) were produced at an operating cost of $25 Canadian. As a result of persistent incremental process improvements, production in 1998 was 76 million barrels with operating costs of $13.57 Canadian ($8.85 U.S.). The cost of finding and developing new oil in the lower 48 states in 1998 was about $12.00 per barrel. Many projects are planned, under way, or recently completed in Alberta. Some of them involve bitumen in sands that are deeply buried. Its viscosity is being reduced by steam heating and the resultant fluids are brought to the surface. This process has been improved, and deep sands will become an important source of bitumen.

Alberta's technical ability to substantially increase the production of high-quality oil is evident, as is a desire to export more of it. Delicately conducted negotiations by U.S. authorities might ultimately lead to substantially increased U.S. imports of Canadian oil products. This would diminish the probability that Persian Gulf states would choose to conduct an economic squeeze of the United States.

* *Science* **281**, 1128 (1998). † *Oil Gas J.* **97**, 26 (1999).