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EDITORIAL

U.S. Petroleum: Past and Future

Information overload focused on events of the moment must not be allowed to divert attention from matters of long-term importance. At times it is necessary to turn away from the current excitement and consider more significant problems. One of these is supply and use of energy—key determinants of standards of living.

At the moment, crude oil is readily available at comparatively low prices. But what of the future? The topic is complex. Two recent reports provide substance for thought. One, issued by the Department of Energy, is *The Petroleum Industry—Past as Prologue 1970–1992*.^{*} It reminds us of many sudden, unexpected events that occurred in the 22-year interval. Some, such as the Arab oil boycott of 1973–1974, were of foreign origin. But many were due to federal legislation, the effects of which were sometimes beneficial, but often counterproductive. The report lists 22 significant events affecting the U.S. petroleum industry. It describes each, together with their collective impact on the industry and the economy.

One of the major trends from 1970 to 1992 was a decrease in oil production in the contiguous 48 states. In 1970 the rate was 10 million barrels per day (mbd). Currently it is about 5.5 mbd. The decrease was largely a result of depletion of reservoirs combined with a lack of new major discoveries. Federal laws and regulations have also fostered the decline. Were it not possible to import a net of about 8 mbd of petroleum and its products, the economy and the transport system of the United States would be in disarray.

The second report was issued by the National Research Council (NRC) under the title *Advanced Exploratory Research Directions for Extraction and Processing of Oil and Gas*.[†] It mentions a profound change that has occurred in the domestic petroleum industry during the past 7 years. It also points to interesting research and development (R&D) opportunities for reducing costs of discovering and producing oil and natural gas. During the past 7 years 450,000 jobs in the U.S. petroleum industry have been lost. The major oil companies have curtailed local activities and have transferred efforts overseas. They have sharply decreased expenditures for R&D. A side effect of these trends has been a deleterious impact on earth science departments at universities.

Small independent companies are having an increasing role in the U.S. petroleum industry. If the decline in production is to be arrested, the independents will have a large part of the action. There are major known targets for them. In the past, when discoveries were exploited, wells were spaced far apart in a geometrical pattern. The procedure assumed a homogeneity of sedimentary formations. Reality is often one of geological heterogeneity with impediments to flow of oil. In consequence, only part of the mobile oil in place was produced. It is estimated that more than 100 billion barrels of mobile oil are present in known formations. Economics is the barrier to producing it. But costs could be reduced by R&D.

Two important keys to cost reductions are improved knowledge of reservoir structure and much improved drilling technology. Both involve new ways of using computer devices. The NRC report states, "Current technology facilitates an integrated understanding of basin evolution via computer tools that allow three-dimensional visualization of basin architecture...." The report also discusses seismic imaging and states, "The use of borehole recording and tomographic methods holds promise for improving resolution by nearly two orders of magnitude. Also promising are crosshole-reflection methods." This new knowledge could be coupled with innovations in drilling technology that include "downhole motors that simplify directional or horizontal drilling operations and measurement-while-drilling tools that utilize downhole computers."

To implement R&D opportunities leading toward increased production from old fields, the NRC committee recommended that the Department of Energy now consider increased support for long-term petroleum research. Such a change of policy is highly desirable. In comparison to funds devoted to clean coal technology or nuclear physics, the amounts provided for petroleum R&D have been trivial. An expanded program for oil and gas would be highly relevant to addressing national energy needs and would provide a measure of insurance against unexpected vicissitudes in the future.

Philip H. Abelson

^{*}Energy Information Administration, Washington, DC, 1993. [†]Committee on Applied Research Needs Related to Extraction and Processing of Oil and Gas, Washington, DC, 1993.