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EDITORIAL

Supplies of Oil and Natural Gas

Natural gas is the principal source of energy for U.S. homes, commercial establishments, and industry. In 1993 U.S. energy production in the form of methane plus natural gas liquids exceeded that of oil or coal. Domestic production of crude oil continues to decline and is now exceeded by imports. What are the prospects for continued adequate supplies of petroleum? What are the prospects for natural gas?

The major oil companies have indicated their assessment of prospects in the United States for discovery of petroleum by sharply cutting R&D and increasing their exploratory efforts elsewhere. Large reserves of oil now exist, but under the control of other countries. Some analysts now predict that current low prices will prevail until 2010. But the United States is vulnerable. It is the world's biggest debtor, with a continuing large imbalance of trade, much of it because of oil imports.

In contrast, the United States has abundant resources of natural gas. Proven reserves continue to amount to about 160 trillion cubic feet (TCF) or 4.6 Tm^3. Annual consumption is about 20 TCF. The estimated resource base is more than 1500 TCF. Who will conduct the necessary drilling and other activities to convert resources into reserves and then into gas in the pipelines? Most of the necessary effort will be supplied by small companies. The natural gas industry is highly fragmented. The ten leading producers provide a total of 25% of the gas; the next 35 companies, 15%. The remaining 60% is supplied by more than 1000 companies, none of which produces as much as 0.05% of the total. These producers cannot individually afford to conduct R&D to improve their capabilities. The situation requires concerted action. Much of it is being supplied by the Gas Research Institute (GRI). This Chicago-based organization manages R&D for the benefit of many facets of the natural gas industry, including production of raw gas, processing of it, transmission, local distribution, and improvements in the energy efficiency of usage. It also conducts environmental R&D, some of it devoted to better means of cleaning up ancient and modern production sites. The total annual budget of the GRI is about $200 million, most of which it dispenses to contractors who conduct selected R&D projects. The staff of the GRI supplements its judgment by obtaining inputs from advisory bodies. About $55 million is devoted to R&D aimed at improving costs and availability of supplies of natural gas. These expenditures are supplemented by co-funding contributed by contractors and by producers. The resources that are to be converted into reserves are in part located in old oil-producing areas of the United States. Some are at depths of 3000 m and more. Some are below deep water. Others are in coal, shale, or relatively impermeable sands. Western basins are future major sources. Improved geophysical techniques will be required to pinpoint optimum prospects. Drilling technology, and methods of achieving maximum production per well in the diverse circumstances, will need to be improved. Processing the raw gas is another challenge, for most of it contains many substances. The composition of the contaminants varies from region to region and even among adjacent wells. Moisture is a universal constituent that must be reduced to low levels. Other constituents of the raw gas include H_2S, CO_2, N_2, ethane, propane, butanes, and higher saturated hydrocarbons plus benzene, toluene, and xylenes.

When present, H_2S is of particular concern. It is highly poisonous and it would be corrosive were it freely admitted to transmission pipelines. At present H_2S and part of the CO_2 are removed through contact with amines. Moisture content is now limited by absorption in triethylene glycol. Ethane, propane, and butanes are valuable products, and they are isolated. Their presence in pipeline gas is limited so that the BTU content will meet specifications. As a result of GRI-managed R&D, improved processes have been devised and demonstrated for finding, producing, and processing raw gas. In these instances and in others in which improvements are demonstrated, GRI is active in transferring technology to the many components of the natural gas industry.

In principle, consumer needs for natural gas can be met for many years by conversion of resources to reserves. Insuring future adequate supplies of liquid fuels is likely to continue to be an orphan problem.

Philip H. Abelson