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Progress Toward Energy Independence

Recently, several oil-producing countries have announced small decreases in their prices for oil. They have done so because supply has been exceeding demand. The world, and particularly the United States, is lessening its consumption and dependence on imports of oil. Saudi Arabia could cut its production and cause higher prices, but these would provide further impetus to curtailment of the use of oil. In 1978 U.S. imports of oil and its products totaled about 8.3 million barrels a day (mbd). This year the annual rate is about 5.6 mbd. A further reduction to 3 to 4 mbd would make this country relatively secure against a disruption of supplies. Attaining such a goal in a few years is looking more and more feasible.

The three principal factors in the decline of use of oil have been conservation, enhanced energy efficiency, and substitution of other energy sources. Of these, conservation has been the most substantial contributor, but in the future the other two items will be important. In addition, a new factor is becoming significant. The refining of oil is being improved to obtain higher yields of essential products.

Conservation has had a substantial effect on the use of oil, natural gas, and electricity. Suppliers of fuel oil and natural gas have noted that, on average, individual householders have decreased their use in the home by about 15 percent. Higher prices for gasoline and mandated changes in new automobiles have resulted in a decrease in consumption of motor fuel. In 1978 demand was 7.4 mbd; currently the annual rate is 6.1 mbd. As older cars are replaced by fuel-efficient models, consumption will probably drop further.

However, the major potential for diminishing consumption of oil is in nontransportation uses, which in 1979 consumed 8.4 mbd. At least 5.5 mbd of oil is burned in applications for which coal or natural gas could suffice. This replaceable oil includes 3.0 mbd of residual and distillate oils (mainly residual) burned in utility and industrial boilers. Another 2.1 mbd of fuel oil (mainly distillate) is used for residential and commercial space heating. Natural gas, if it were available, could replace oil in some of the uses not filled by coal. At this time precise data on 1980 discoveries of natural gas are not available. However, industry sources say that the amount of gas discovered last year was the largest in a decade. In part this reflects record-breaking drilling activity. It also reflects exploration of hitherto untouched areas and depths. Favorable prospects for more discoveries enhance the desirability of further substitution of natural gas for oil. The American Gas Association has stated that if taxes on natural gas and federal regulations governing its use were relaxed, substantial substitution of gas for oil would occur quickly.

A major target for replacement is residual oil—a dirty, asphalt-like material that remains after vacuum distillation of petroleum at temperatures up to 550°C. It is made up of very large complex molecules, some of which contain sulfur and nitrogen; vanadium and nickel are also present. In electric power stations residual oil is in competition with coal and nuclear energy, both of which are cheaper energy sources. The major oil companies realize that they must find higher-value uses for residual oil, and they have been adding equipment to their refineries to enable them to convert it into gasoline and light fuel oil. As a source of gasoline, residual oil is an inferior feedstock, but it is still much better than coal. It has a hydrogen-to-carbon ratio of about 1.4 to 1.5; the corresponding value for bituminous coal is about 0.8. There are two methods for upgrading residual oil: adding hydrogen through hydrogenation at high pressures and temperatures, or subtracting carbon through a coking process. Both methods are practical, and successful plants based on them are in operation.

Substitution of coal, gas, and wood in applications where they can replace oil is the quickest practical means of further reducing dependence on imports. Technical know-how is well developed. What is needed is a continued infusion of national will.—PHILIP H. ABELSON