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Summary of the National Petroleum Council's "Initial Appraisal" of the U.S. Energy Outlook through 1985

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PREFACE

This report summarizes the National Petroleum Council's "Initial Appraisal" of the U.S. energy outlook through 1985. Supply-demand relationships are projected assuming that current government policies and regulations* and the present economic climate for the energy industries would continue without major changes throughout the 1971-1985 period.

<u>The initial appraisal assumes</u>:

1. Recent levels of oil and gas exploration and exploration success trends would continue into the future.

2. All presently feasible sources of oil and gas supply, both domestic and foreign, would be utilized. It was also assumed that political, economic, and logistical considerations would not restrict the availability of foreign oil and gas.

3. Nuclear power would be utilized to the maximun extent consistent with a feasible development program.

4. Coal production would rise to the degree necessitated by demand, and technological advances would permit coal producers and consumers to meet environmental requirements.

These assumptions are generally optimistic. In particular, the assumed levels of oil and gas exploratory activity are not likely to be realized without substantial improvements in economic conditions and government policies. Similarly, the availability of foreign oil and gas to meet deficiencies in domestic supplies cannot be assured, as significant limitations could arise for political or logistical reasons.

This initial appraisal, therefore, is <u>not</u> a forecast of what will probably happen in the future, and it should not be so interpretated. It is soley a set of projections, reflecting an optimistic view of what might happen without major changes in present government policies and economic parameters. These projections will be used as reference points by the National Petroleum Council in its subsequent

*Particularly in respect to oil import controls, natural gas price regulation, leasing of federal lands, environmental controls, tax rates, and research funding.

task of identifying and evaluating the changes in government policies and economic conditions which might contribute to an improved national energy posture.

This report discusses (1) the principal findings of the National Petroleum Council's appraisal of the U.S. energy outlook through 1985, and (2) the implications of this appraisal.

FINDINGS OF THE ENERGY APPRAISAL

Energy Demand

In 1970, the United States consumed daily 14.7 million barrels of oil, 59.5 billion cubic feet of natural gas, and 1.4 million tons of coal. The energy derived from these fossil fuel sources, plus small amounts from hydro, nuclear, and geothermal sources, was utilized primarily for:

1. Residential and commercial heating, cooking, and water heating (19%).

2. Manufacturing and mining operations (26%).

3. Transportation (24%).

4. Electric power generation (25%).

5. Miscellaneous (6%).

The estimated growth rate for U.S. energy consumption during the period 1970-1985 is 4.2 percent per year. This outlook, however, is predicated on important assumptions regarding environmental restraints, basic economic trends, prices, fuel availability, capital requirements, and technological developments. It should be noted that at this rate, energy demand will double over the next 15 years. Although all major markets for energy will participate in the expansion, the electric utility market will outpace all others with an anticipated annual growth rate of 6.7 percent. The projected growth rates by other market sectors would be as follows: nonenergy uses, 5.4 percent; transportation, 3.7 percent; residential and commercial, 2.5 percent; and industrial, 2.2 percent.

Oil Demand

Total domestic oil demand is estimated to increase from 14.7 million barrels per day (MMB/D) in 1970 to about 26 MMB/D in 1985, an average annual increase of 3.8 percent compared with that for total energy of 4.2 percent. As a proportion of total Free World oil demand, U.S. demand will fall from 36.7 percent in 1970 to 30.9 percent in 1980. Consumption of energy outside the United States must be considered in order to permit viewing U.S. needs in proper perspective. As the United States becomes increasingly short of indigenous supplies, U.S. markets will need to compete with Free Foreign markets for the available foreign supplies.

Oil Supply

Domestic reserves of crude oil, condensate and natural gas liquids, were consumed at the rate of 11.3 million barrels per day in 1970, which was 31 percent of the total energy consumption. Despite the addition of an estimated 4.7 MMB/D from the North Slope of Alaska and from new discoveries, the total U.S. production in 1985 is estimated to be only slightly over 11 million barrels per day. Therefore, in order to meet growing demands for petroleum liquids, imports would have to increase more than fourfold (to about 15 MMB/D) by 1985. Assuming the availability of foreign supply, oil imports would then account for well over half of our total petroleum supplies; this amount of oil would also represent 25 percent of our total energy consumption. Most of the imports would have to originate in the Eastern Hemisphere because of the limited potential for increased imports from Western Hemisphere sources.

Gas Supply and Demand

In the absence of supply limitations, potential gas demand in the United States would approximately double between 1970 and 1985, reaching a level of almost 40 trillion cubic feet (TCF) per year. Under current regulatory policies and federal leasing policies, the supplies of domestic natural gas (excluding North Slope) could be expected to fall from 21.8 TCF in 1970 to 13.0 TCF in 1985. By this time, an additional 8.5 TCF per year could become available from the North Slope, Canada, imports of liquefied gas, and from synthetic gas manufactured from coal and naphtha. Supplies from these sources could be made available only at prices substantially above those postulated for production of domestic natural gas. Even so, 1985 supplies would total only 21.5 TCF, slightly less than the 1970 supplies, and this would only supply a little over half the anticipated gas demand in 1985. This shortfall in energy supply between potential gas demand and available gas supplies would have to be made up from increased supplies of other fuels.

Coal Supply and Demand

U.S. coal demand is expected to grow at a 3.5 percent rate from 519 million tons in 1970 to about 863 million tons per year in 1985. This does not include a potential added demand to reconcile deficiencies in other fuel supplies. The coal reserves of the United States are felt to ample and would easily permit a much faster growth rate should coal be called upon to furnish a bigger share of the U.S. energy demand, whether for conventional uses or for conversion to liquids and gases.

Potential restraints on the growth of the coal industry are (1) the availability of trained manpower, (2) transportation facilities, (3) health and safety regulations, and (4) the need to develop a commercially proven technology for control of sulfur dioxide emissions.

Nuclear Fuels

The U.S. demand for nuclear fuels is expected to grow from 6,900 tons per year of U_3O_8 to almost 60,000 tons per year in 1985. All of this requirement comes from electrical utilities. The domestic uranium reserves appear adequate with respect to low cost uranium to meet the total projected demand for nuclear energy. Nuclear power supply would be expected to increase from 23 billion kilowatt hours in 1970 to slightly over 2,000 billion KWH in 1985. By 1985, nuclear energy would be supplying 48 percent of the total domestic electric power requirements. Achievement of this level would depend primarily on resolving delays from siting, environmental, and construction problems.

Other Fuels

Hydropower, geothermal power, and synthetic crude oil from shale would together contribute only 3 percent of energy requirements in 1985. Restrictions on the potential output of hydropower and geothermal power would be imposed by physical limitations. The potential production of "syncrude" from oil shale would be limited by government policy on leasing land, economics, and technology; consequently only about .1 million barrels of oil per day would be attainable from oil shale.

Capital Requirements

In order to achieve the initial NPC appraisal energy balance, capital outlays for resource development, manufacturing facilities and primary distribution in the United States would have to total approximately $375 billion over the 1971-1985 period. This figure includes capital outlays of $200 billion for electric power plants and transmission lines, but excludes capital outlays for Alaskan North Slope exploration, development, and production. Also not included in this estimate were other major sums for petroleum marketing, gas and electricity distribution, and the development of overseas natural resources needed to satisfy U.S. import requirements.

IMPLICATIONS OF THE ENERGY APPRAISAL

It is evident from the National Petroleum Council's Initial Appraisal of the U.S. Energy Outlook that, in the long run, all indigenous supplies that can be developed will be needed. It is extremely important to note, however, that these resources are not likely to be developed to their full potentials under the "status quo" assumption regarding government policies and economic conditions. For example, using the discovery rate projected in the initial appraisal, it would take almost a century to find the estimated discoverable oil left in future petroleum provinces of the United States.

The extent to which indigenous supplies could be increased by changes in governmental policies and economic conditions was not considered in this initial appraisal, but will be assessed in the final report scheduled for completion in July, 1972.

At this time, the NPC felt it appropriate to delineate certain areas of concern that are implicit in the continuation of existing conditions. These concerns are as follows:

1. Government Policies: Continuation of present government policies, particularly in respect to leasing of federal lands, environmental controls, health and safety, tax rates, research funding, natural gas price regulation, and import policies, will clearly result in a sharp rise in national dependence on imported energy sources, particularly petroleum liquids. These effects of these policies, and proposed changes in these policies will require careful assessment, in respect to both national security aspects and the impact on the U.S. balance of payments. Furthermore, the United States cannot expect to be able to increase imports of foreign oil indefinitely. Towards the end of the centruy, foreign oil supplies may prove insufficient to meet all potential demands.

   Continuation of present government policies will also result in available gas supplies being equal to only about one-half of market requirements in 1985. In view of the indicated availability of substantial undiscovered domestic reserves, a critical review of natural gas regulations and other parameters impinging on the incentives for expanded exploratory efforts is clearly in order and urgently needed.

2. Physical Facilities: Enormous additions of new facilities will be needed to satisfy the nearly doubled energy requirements of 1985. These will not be easily forthcoming under existing political, social and economic conditions.

In petroleum, the importation of an incremental 10-11 million B/D of foreign crude (above the 1970 level) would require more than 350 tankers, each of 250,000 deadweight tonnage. No U.S. ports are presently equipped to receive such tankers, so new terminals would have to be developed in coastal areas. Similarly, about 10 million B/D of domestic refining capacity would have to be added to present capabilities. This would involve construction at about 2.5 times the rate of the past decade.

In gas, the importation of 4 TCF of LNG annually by 1985 would require the building of 120 tankers each having a maximum capacity equivalent of almost 800,000 barrels. In addition, such operations would require the building of liquefaction plants at the loading terminals, and the building of unloading terminals, regasification plants and storage and transportation facilities at points of delivery.

In coal, the doubling of mine output would involve the development of Western coal reserves with associated transportation to markets as well as expanded development of underground mines in the East and Midwest.

In nuclear power, the pace of construction of new plants would have to rise very sharply from recent levels, reaching a capability of bringing thirty 1,000-megawatt plants on line each year from 1980 to 1985.

3. Financial Requirements: Annnal new investment required to finance development of natural resources and construction of new facilities would far exceed the levels of recent years.

4. Technology: The doubling of energy consumption over the next 15 years implies a sharp step-up in all kinds of measures needed to protect the environment, both at the points of energy production and use. The urgent need for energy also requires accelerated research programs. to develop new coal mining methods, new

exploration techniques, new methods of increasing the recovery of oil and gas, new energy transportation methods, advanced nuclear technology, and the development of commercial processes for flue-gas desulfurization and for manufacture of synthetic liquid and gaseous fuels from oil shale and coal.

Finally, it should be noted that long lead times are involved in the orderly development of energy resources. Therefore, it is essential that the many considerations bearing on the selection of an optimum national energy posture be brought into sharp focus at the earliest possible date. In its final report on the U.S. energy outlook (scheduled for completion in July, 1972), the National Petroleum Council will seek to provide analyses of alternatives open to both government and industry.

For more information concerning the assumptions upon which the projections in this report were based, the reader is urged to consult the original report or write to the Director of Administration, National Petroleum Council, 1625 K Street, N.W., Washington, D.C. 20006