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The National Energy Plan

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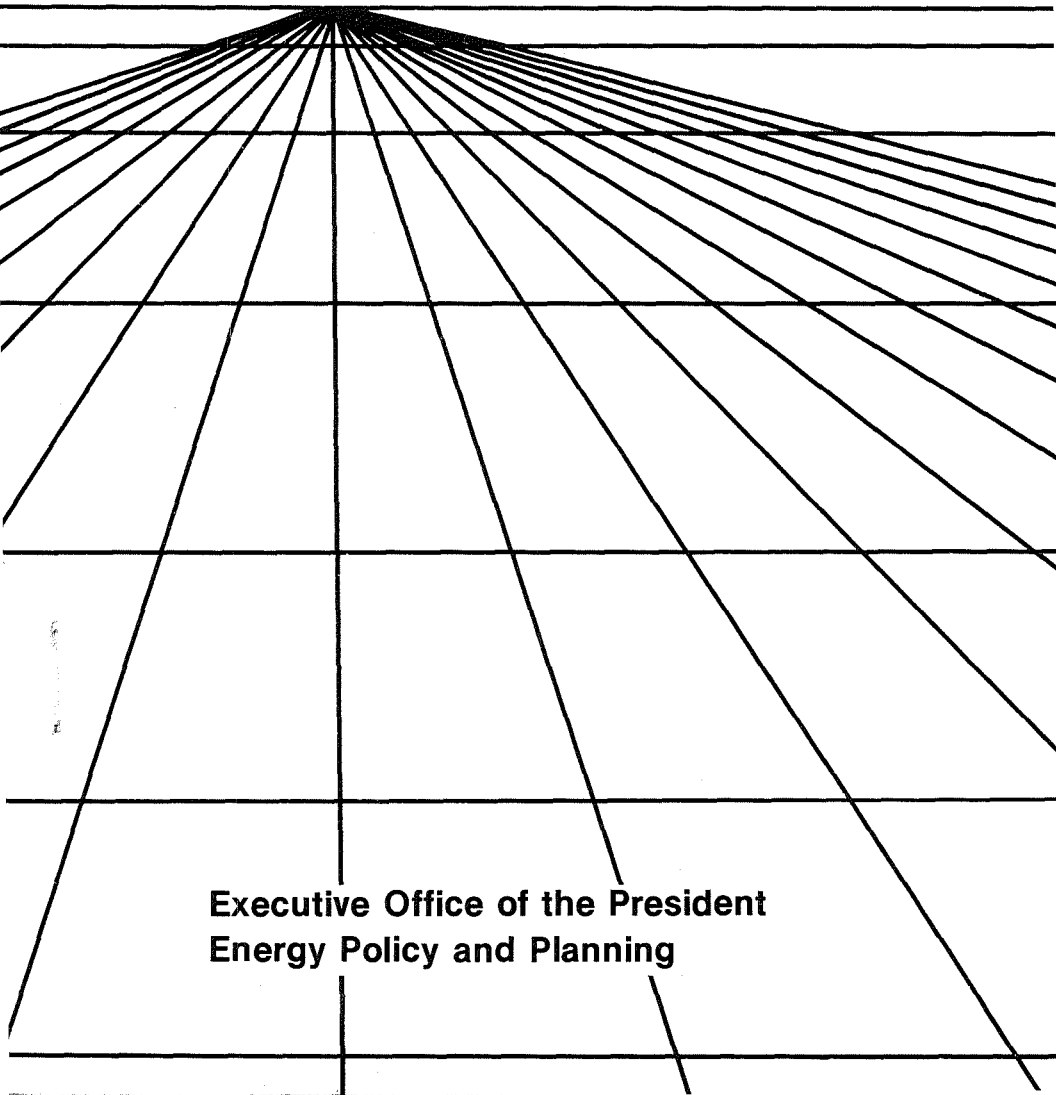

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THE WHITE HOUSE

WASHINGTON

APRIL 29, 1977.

In each period of our history, the nation has responded to challenges which have demanded the best in all of us.

This is one of those times.

Our energy crisis is an invisible crisis, which grows steadily worse—even when it is not in the news. It has taken decades to develop, as our demand for energy has grown much faster than our supply. It will take decades to solve. But we still have time to find answers in a planned, orderly way—if we define the changes we must make and if we begin now.

This report explains why we have to act, and gives you the details of our Plan. The Plan is complicated. I am sure that many people will find some feature of it they will dislike along with features they can support. But it is a carefully balanced Plan, which depends for its effectiveness on all of its major parts.

Above all it is fair. Our guiding principle, as we developed the Plan, was that none of our people should be asked to bear an unfair burden, and none should reap an unfair advantage. There will be sacrifices, but they will be gradual, reasonable—and fair.

The changes the Plan recommends will mean a new direction in American life. In some cases heading in that direction may seem inconvenient. But I have faith that meeting this challenge will make our lives more satisfying.

We can rediscover the ingenuity and the efficiency which have made our nation prosper, rather than deepening our dependence on insecure imports and increasingly expensive conventional energy supplies. We can rediscover small-scale, more creative ways of satisfying our needs. If we are successful, we can protect jobs, the environment, and the basic American standard of living, not only for ourselves but also for our children and grandchildren.

I know that, if we work together as a united people, we will succeed.

Jimmy Carter

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Overview

The diagnosis of the U.S. energy crisis is quite simple: demand for energy is increasing, while supplies of oil and natural gas are diminishing. Unless the U.S. makes a timely adjustment before world oil becomes very scarce and very expensive in the 1980's, the nation's economic security and the American way of life will be gravely endangered. The steps the U.S. must take now are small compared to the drastic measures that will be needed if the U.S. does nothing until it is too late.

How did this crisis come about?

Partly it came about through lack of foresight. Americans have become accustomed to abundant, cheap energy. During the decades of the 1950's and 1960's, the real price of energy in the U.S. fell 28 percent. And from 1950 until the quadrupling of world oil prices in 1973–1974, U.S. consumption of energy increased at an average annual rate of 3.5 percent. As a result of the availability of cheap energy, the U.S. developed a stock of capital goods—such as homes, cars, and factory equipment—that uses energy inefficiently.

The Nature of the Problem

The most critical increase in demand has been for oil, the most versatile and widely used energy resource. To meet that growing demand, the U.S. has turned increasingly to imports. In January and February of 1977, the U.S. imported about 9 million barrels of oil per day, half of total domestic oil consumption. By 1985, U.S. oil consumption could equal 12 to 16 million barrels per day.

U.S. domestic oil production has been declining since 1970. New production from Alaska, the deep Outer Continental Shelf, and new recovery methods should reverse the decline, but will be unable to satisfy the projected growth in U.S. demand. Other major additions to domestic oil supply are unlikely.

The principal oil-exporting countries will not be able to satisfy all the increases in demand expected to occur in the U.S. and other countries throughout the 1980's. In 1976, the 13 OPEC countries exported 29 million barrels of oil per day. If world demand continues to grow at the rates of recent years, by 1985 it could reach or exceed 50 million barrels per day. However, many OPEC countries cannot significantly expand production; and, in some, production will actually decline. Thus, as a practical matter, overall OPEC production could approach the expected level of world demand only if Saudi Arabia greatly increased its oil production. Even if Saudi Arabia did so, the highest

levels of OPEC production probably would be inadequate to meet increasing world demand beyond the late 1980's or early 1990's.

There are physical and economic limits on the world's supply of oil. A widely used geological estimate of total recoverable world oil resources, past and present, is about 2 trillion barrels. More than 360 billion barrels have already been consumed. Current proved crude reserves are 600 billion barrels. World consumption of oil has grown at an average annual rate of 6.6 percent since 1940, and it grew by as much as 8 percent annually during the 1960's.

If it could be assumed that world demand for oil would grow at an annual rate of only 3 percent, and if it were possible (which it is not) that production would keep pace with that rate of growth, the world's presently estimated recoverable oil resources would be exhausted before 2020. At a conjectural growth rate of 5 percent, those resources would be exhausted by 2010. Despite some uncertainty about the exact size of recoverable world oil resources, and about the rate of increase of productive capacity, this fundamental fact is clear: *within about four generations, the bulk of the world's supply of oil, created over hundreds of millions of years, will have been substantially consumed.*

Of course, actual physical exhaustion of oil resources will not occur. Even today, well over half the oil in existing fields is being left in the ground because additional recovery would be too expensive. As production by conventional methods declines and oil becomes more scarce, its price will rise and more expensive recovery methods and novel technologies will be used to produce additional oil. As this process continues, the price of oil will become prohibitive for most energy uses. Eventually the nations of the world will have to seek substitutes for oil as an energy source, and oil will have to be reserved for petrochemical and other uses in which it has maximum value.

The world now consumes about 20 billion barrels of oil per year. To maintain even that rate of consumption and keep reserves intact, *the world would have to discover another Kuwait or Iran roughly every three years, or another Texas or Alaska roughly every six months.* Although some large discoveries will be made, a continuous series of such finds is unlikely. Indeed, recent experience suggests that, compared to world oil consumption, future discoveries will be small or moderate in size, will occur in frontier areas, and will yield oil only at very high cost. Obviously, continued *high rates of growth* of oil consumption simply cannot be sustained.

Natural gas supplies are also limited. In the U.S., natural gas constitutes only 4 percent of conventional energy reserves, but supplies 27 percent of energy consumption. Gas consumption grew about 5.7 percent per year between 1960 and 1970. From 1970 to 1974, however, consumption dropped 1.3 percent. The demand for gas is

considerably higher than the amount that can be supplied. Hence, gas is rationed by prohibitions on hook-ups for new homes in many areas.

Gas is not only in short supply, but its allocation across the country is distorted, and its distribution among end-uses is unsatisfactory. Federal regulation of the wellhead price of natural gas in interstate commerce has discouraged its distribution from gas producing States to other States, and has encouraged consumption of this premium fuel for less essential uses. Industry and utilities currently consume almost 60 percent of U.S. natural gas, despite the fact that other fuels could be used in a majority of cases.

During the 1973–75 period, only 19 percent of new gas reserve additions were made available to the interstate market, and much of that gas was from the Federal domain. Since the price of intrastate gas is not regulated, there are strong economic incentives to sell gas within the producing States. *The existing distinction between intrastate and interstate sales has given intrastate users first claim to natural gas.*

Strategies and Objectives

The U.S. has three overriding energy objectives:

—as an immediate objective that will become even more important in the future, to reduce dependence on foreign oil and vulnerability to supply interruptions;

—in the medium term, to keep U.S. imports sufficiently low to weather the period when world oil production approaches its capacity limitation; and

—in the long term, to have renewable and essentially inexhaustible sources of energy for sustained economic growth.

The U.S. and the world are at the early stage of an energy transition. Previous energy transitions in the U.S. were stimulated by new technologies, such as the development of the railroad and the mass production of automobiles, which fostered the use of coal and oil, respectively. The latest transition springs from the need to adjust to scarcity and higher prices.

To make the new transition, the U.S. should adhere to basic principles that establish a sound context for energy policy and provide its main guidelines. The energy crisis must be addressed comprehensively by the Government and by a public that understands its seriousness and is willing to make necessary sacrifices. Economic growth with high levels of employment and production must be maintained. National policies for the protection of the environment must be continued. Above all, the U.S. must solve its energy problems in a manner that is fair to all regions, sectors and income groups.

The salient features of the National Energy Plan are:

—conservation and fuel efficiency;

—rational pricing and production policies;

—reasonable certainty and stability in Government policies;

—substitution of abundant energy resources for those in short supply; and

—development of nonconventional technologies for the future.

Conservation and fuel efficiency are the cornerstone of the proposed National Energy Plan. Conservation is cheaper than production of new supplies, and is the most effective means for protection of the environment. It can contribute to international stability by moderating the growing pressure on world oil resources. Conservation and improved efficiency can lead to quick results. For example, a significant percentage of poorly insulated homes in the United States could be brought up to strict fuel-efficiency standards in less time than it now takes to design, build, and license one nuclear powerplant.

Although conservation measures are inexpensive and clean compared with energy production and use, they do sometimes involve sacrifice and are not always easy to implement. If automobiles are to be made lighter and less powerful, the American people must accept sacrifices in comfort and horsepower. If industry is required to make energy-saving investments and to pay taxes for the use of scarce resources, there will be some increases in the cost of consumer products. These sacrifices, however, need not result in major changes in the American way of life or in reduced standards of living. Automobile fuel efficiency can be greatly improved through better design and use of materials, as well as by producing lighter and less powerful cars, without inhibiting Americans' ability to travel. With improved energy efficiency, the impact of rising energy prices can be significantly moderated.

Energy conservation, properly implemented, is fully compatible with economic growth, the development of new industries, and the creation of new jobs for American workers. Energy consumption need not be reduced in absolute terms; what is necessary is a slowing down in its rate of growth. By making adjustments in energy consumption now, the U.S. can avoid a possibly severe economic recession in the mid 1980's.

The U.S. has a clear choice. If a conservation program begins now, it can be carried out in a rational and orderly manner over a period of years. It can be moderate in scope, and can apply primarily to capital goods, such as homes and automobiles. If, however, conservation is delayed until world oil production approaches its capacity limitation, it will have to be carried out hastily under emergency conditions.

It will be sudden, and drastic in scope; and because there will not be time to wait for incremental changes in capital stock, conservation measures will have to cut much more deeply into patterns of behavior, disrupt the flow of goods and services, and reduce standards of living.

Pricing policies should encourage proper responses in both the consumption and the production of energy, without creating any windfall profits. *If users pay yesterday's prices for tomorrow's energy, U.S.*

resources will be rapidly exhausted. If producers were to receive tomorrow's prices for yesterday's discoveries, there would be an inequitable transfer of income from the American people to the producers, whose profits would be excessive and would bear little relation to actual economic contribution.

Currently, Federal pricing policy encourages overconsumption of the scarcest fuels by artificially holding down prices. If, for example, the cost of expensive foreign oil is averaged with cheaper domestic oil, consumers overuse oil, and oil imports are subsidized and encouraged. Consumers are thus misled into believing that they can continue to obtain additional quantities of oil at less than its replacement cost.

Artificially low prices for some energy sources also distort interfuel competition. The artificially low price of natural gas, for example, has encouraged its use by industry and electric utilities, which could use coal, and in many areas has made gas unavailable for new households, which could make better use of its premium qualities.

These misguided Government policies must be changed. But neither Government policy nor market incentives can improve on nature and create additional oil or gas in the ground. From a long-term perspective, prices are an important influence on production and use. As long as energy consumers are misled into believing they can obtain energy cheaply, they will consume energy at a rate the U.S. cannot afford to sustain. Their continued overuse will make the nation's inevitable transition more drastic and difficult.

A national energy policy should encourage production. The energy industries need adequate incentives to develop *new* resources and are entitled to sufficient profits for exploration for *new* discoveries. But they should not be allowed to reap large windfall profits as a result of circumstances unrelated to the marketplace or their risk-taking.

The fourfold increase in world oil prices in 1973–74 and the policies of the oil-exporting countries should not be permitted to create unjustified profits for domestic producers at consumer's expense. By raising the world price of oil, the oil-exporting countries have increased the value of American oil in existing wells. That increase in value has not resulted from free market forces or from any risk-taking by U.S. producers. *National energy policy should capture the increase in oil value for the American people.* The distribution of the proceeds of higher prices among domestic producers and consumers must be equitable and economically efficient if the United States is to spread the cost fairly across the population and achieve its energy goals.

The pricing of oil and natural gas should reflect the economic fact that the true value of a depleting resource is the cost of replacing it. An effective pricing system would provide the price incentives that producers of oil and natural gas need by focusing on harder to find new supplies. The system should also moderate the adjustment that households will have to make to rising fuel costs. It should end

the distortions of the intrastate-interstate distinction for new natural gas, which is a national resource. It should also promote conservation by raising the ultimate price of products made by energy-intensive processes.

Reasonable certainty and stability in Government policies are needed to enable consumers and producers of energy to make investment decisions. A comprehensive national energy plan should resolve a wide range of uncertainties that have impeded the orderly development of energy policy and projects. Some uncertainties are inherent in a market economy, and Government should not shelter industry from the normal risks of doing business. But Government should provide business and the public with a clear and consistent statement of its own policies, rules, and intentions so that intelligent private investment decisions can be made.

Resources in plentiful supply should be used more widely as part of a process of moderating use of those in short supply. Although coal comprises 90 percent of United States total fossil fuel reserves, the United States meets only 18 percent of its energy needs from coal. Seventy-five percent of energy needs are met by oil and natural gas although they account for less than 8 percent of U.S. reserves. This imbalance between reserves and consumption should be corrected by shifting industrial and utility consumption from oil and gas to coal and other abundant energy sources.

As industrial firms and utilities reduce their use of oil and gas, they will have to turn to coal and other fuels. The choices now for electric utilities are basically coal and nuclear power. Expanding future use of coal will depend in large part on the introduction of new technologies that permit it to be burned in an environmentally acceptable manner, in both power plants and factories. Efforts should also be made to develop and perfect processes for making gas from coal.

Light-water nuclear reactors, subject to strict regulation, can assist in meeting the United States energy deficit. The 63 nuclear plants operating today provide approximately 10 percent of U.S. electricity, about 3 percent of total energy output. That contribution could be significantly increased. The currently projected growth rate of nuclear energy is substantially below prior expectations due mainly to the recent drop in demand for electricity, labor problems, equipment delays, health and safety problems, lack of a publicly accepted waste disposal program, and concern over nuclear proliferation. The Government should ensure that risks from nuclear power are kept as low as humanly possible, and should also establish the framework for resolving problems and removing unnecessary delays in the nuclear licensing process.

To the extent that electricity is substituted for oil and gas, the total amounts of energy used in the country will be somewhat larger

due to the inherent inefficiency of electricity generation and distribution. But conserving scarce oil and natural gas is far more important than saving coal.

Finally, *the use of nonconventional sources of energy must be vigorously expanded.* Relatively clean and inexhaustible sources of energy offer a hopeful prospect of supplementing conventional energy sources in this century and becoming major sources of energy in the next. Some of these nonconventional technologies permit decentralized production, and thus provide alternatives to large, central systems. Traditional forecasts of energy use assume that nonconventional resources, such as solar and geothermal energy, will play only a minor role in the United States energy future. Unless positive and creative actions are taken by Government and the private sector, these forecasts will become self-fulfilling prophecies. Other technologies that increase the efficiency of energy use should also be encouraged, such as cogeneration, the simultaneous production of industrial process steam and electricity.

A national energy plan cannot anticipate technological miracles. Even so, nonconventional technologies are not mere curiosities. Steady technological progress is likely, breakthroughs are possible, and the estimated potential of nonconventional energy sources can be expected to improve. Some nonconventional technologies are already being used, and with encouragement their use will grow. Because nonconventional energy sources have great promise, the Government should take all reasonable steps to foster and develop them.

The National Energy Plan is based on this conceptual approach. It contains a practical blend of economic incentives and disincentives as well as some regulatory measures. It strives to keep Government intrusion into the lives of American citizens to a minimum. It would return the fiscal surpluses of higher energy taxes to the American people.

Finally, the Plan sets forth goals for 1985 which, although ambitious, can be achieved with the willing cooperation of the American people. These goals are:

—reduce the annual growth of total energy demand to below 2 percent;

—reduce gasoline consumption 10 percent below its current level;

—reduce oil imports from a potential level of 16 million barrels per day to 6 million, roughly one-eighth of total energy consumption;

—establish a Strategic Petroleum Reserve of 1 billion barrels;

—increase coal production by two-thirds, to more than 1 billion tons per year;

—bring 90 percent of existing American homes and all new buildings up to minimum energy efficiency standards; and

—use solar energy in more than 2½ million homes.

The Plan would reverse the recent trend of ever-rising oil imports and ever-increasing American dependence on uncertain foreign sources of supply. It would prepare the United States for the time when the world faces a limitation on oil production capacity and consequent skyrocketing oil prices. It would achieve substantial energy savings through conservation and increased fuel efficiency, with minimal disruption to the economy, and would stimulate the use of coal in a manner consistent with environmental protection.

The United States is at a turning point. It can choose, through piecemeal programs and policies, to continue the current state of drift. That course would require no hard decisions, no immediate sacrifices, and no adjustment to the new energy realities. That course may, for the moment, seem attractive. But, with each passing day, the United States falls farther behind in solving its energy problems. Consequently, its economic and foreign policy position weakens, its options dwindle, and the ultimate transition to scarce oil supplies and much higher oil prices becomes more difficult. If the United States faces up to the energy problem now and adopts the National Energy Plan, it will have the precious opportunity to make effective use of time and resources before world oil production reaches its capacity limitation.

The energy crisis presents a challenge to the American people. If they respond with understanding, maturity, imagination, and their traditional ingenuity, the challenge will be met. Even the "sacrifices" involved in conservation will have their immediate rewards in lower fuel bills and the sense of accomplishment that comes with achieving higher efficiency. By preparing now for the energy situation of the 1980's, the U.S. will not merely avoid a future time of adversity. It will ensure that the coming years will be among the most creative and constructive in American history.

Summary of the National Energy Plan

Conservation

In the transportation sector, the Plan proposes the following major initiatives to reduce demand:

—a graduated excise tax on new automobiles with fuel efficiency below the fleet average levels required under current legislation; the taxes would be returned through rebates on automobiles that meet or do better than the required fleet averages and through rebates on all electric automobiles;

—a standby gasoline tax, to take effect if total national gasoline consumption exceeds stated annual targets; the tax would begin at 5 cents per gallon, and could rise to 50 cents per gallon in 10 years if targets were repeatedly exceeded by large or increasing amounts; the tax would decrease if a target were met; taxes collected would be returned to the public through the income tax system and transfer payment programs; States would be compensated for lost gasoline tax revenues through sources such as the Highway Trust Fund;

—fuel efficiency standards and a graduated excise tax and rebate system for light-duty trucks;

—removal of the Federal excise tax on intercity buses;

—increase in excise tax for general aviation fuel, and elimination of the existing Federal excise tax preference for motorboat fuel;

—improvement in the fuel efficiency of the Federal automobile fleet, and initiation of a vanpooling program for Federal employees.

To reduce waste of energy in existing buildings, the Plan proposes a major program containing the following elements:

—a tax credit of 25 percent of the first $800 and 15 percent of the next $1,400 spent on approved residential conservation measures;

—a requirement that regulated utilities offer their residential customers a "turnkey" insulation service, with payment to be made through monthly bills; other fuel suppliers would be encouraged to offer a similar service;

—facilitating residential conservation loans through opening of a secondary market for such loans;

—increased funding for the current weatherization program for low-income households;

—a rural home conservation loan program;
—a 10 percent tax credit (in addition to the existing investment tax credit) for business investments in approved conservation measures;
—a Federal grant program to assist public and non-profit schools and hospitals to insulate their buildings;
—inclusion of conservation measures for State and local government buildings in the Local Public Works Program.

The development of mandatory energy efficiency standards for new buildings will be accelerated. In addition, the Federal Government will undertake a major program to increase the efficiency of its own buildings.

The Plan proposes the establishment of mandatory minimum energy efficiency standards for major appliances, such as furnaces, air conditioners, water heaters, and refrigerators.

The Plan proposes to remove major institutional barriers to cogeneration, the simultaneous production of process steam and electricity by industrial firms or utilities, and to provide an additional 10 percent tax credit for investment in cogeneration equipment. Encouragement will also be given to district heating, and the Energy Research and Development Administration (ERDA) will undertake a study to determine the feasibility of a district heating demonstration program at its own facilities.

To promote further industrial conservation and improvements in industrial fuel efficiency, an additional 10 percent tax credit for energy-saving investments would be available for certain types of equipment (including equipment for use of solar energy) as well as conservation retrofits of buildings.

The Plan also contains a program for utility reform, with the following elements:

—a phasing out of promotional, declining block, and other electric utility rates that do not reflect cost incidence; declining block rates for natural gas would also be phased out;
—a requirement that electric utilities either offer daily off-peak rates to customers willing to pay metering costs or provide a direct load management system;
—a requirement that electric utilities offer customers interruptible service at reduced rates;
—a prohibition of master metering in most new structures;
—a prohibition of discrimination by electric utilities against solar and other renewable energy sources;
—Federal authority to require additional reforms of gas utility rates;
—Federal Power Commission (FPC) authority to require interconnections and power pooling between utilities even if they are not now subject to FPC jurisdiction, and to require wheeling.

Oil and Natural Gas

Government policy should provide for prices that encourage development of new fields and a more rational pattern of distribution; but it should also prevent windfall profits. It should promote conservation by confronting oil and gas users with more realistic prices, particularly for those sectors of the economy where changes can be made without hardship. To promote these ends, the Plan proposes a new system for pricing oil and natural gas.

The proposal for oil pricing contains the following major elements:

—price controls would be extended;

—newly discovered oil would be allowed to rise over a 3 year period to the 1977 world price, adjusted to keep pace with the domestic price level; thereafter, the price of newly discovered oil would be adjusted for domestic price increases;

—the incentive price for "new oil" would be applicable to oil produced from an onshore well more than 2½ miles from an existing well, or from a well more than 1,000 feet deeper than any existing well within a 2½ mile radius; the incentive price would be applicable to oil from Federal offshore leases issued after April 20, 1977;

—the current $5.25 and $11.28 price ceilings for previously discovered oil would be allowed to rise at the rate of domestic price increases;

—stripper wells and incremental tertiary recovery from old fields would receive the world price;

—all domestic oil would become subject in three stages to a crude oil equalization tax equal to the difference between its controlled domestic price and the world oil price; the tax would increase with the world price, except that authority would exist to discontinue an increase if the world price rose significantly faster than the general level of domestic prices;

—net revenues from the tax would be entirely returned to the economy: residential consumers of fuel oil would receive a dollar-for-dollar rebate, and the remaining funds would be returned to individuals through the income tax system and transfer payment programs;

—once the wellhead tax is fully in effect, the entitlements program would be terminated, along with certain related activities, but would be retained on a standby basis.

The proposal for natural gas pricing contains the following major provisions:

—all new gas sold anywhere in the country from new reservoirs would be subject to a price limitation at the Btu equivalent of the average refiner acquisition cost (before tax) of all domestic crude oil;

—that price limitation would be approximately $1.75 per thousand cubic feet (Mcf) at the beginning of 1978; the interstate-intrastate distinction would disappear for new gas;
—new gas would be defined by the same standards used to define new oil;
—currently flowing natural gas would be guaranteed price certainty at current levels, with adjustments to reflect domestic price increases;
—authority would exist to establish higher incentive pricing levels for specific categories of high-cost gas, for example, from deep drilling, geopressurized zones and tight formations;
—gas made available at the expiration of existing interstate contracts or by production from existing reservoirs in excess of contracted volumes would qualify for a price no higher than the current $1.42 per Mcf ceiling; gas made available under the same circumstances from existing intrastate production would qualify for the same price as new gas;
—the cost of the more expensive new gas would be allocated initially to industrial rather than residential or commercial users;
—Federal jurisdiction would be extended to certain synthetic natural gas facilities;
—taxes would be levied on industrial and utility users of oil and natural gas to encourage conservation and conversion to coal or other energy sources.

The Plan contains the following additional proposals for oil and natural gas:

—to encourage full development of the oil resources of Alaska, Alaskan oil from existing wells would be subject to the $11.28 upper tier wellhead price and would be treated as uncontrolled oil for purposes of the entitlements program; new Alaskan oil finds would be subject to the new oil wellhead price;
—production from Elk Hills Naval Petroleum Reserve would be limited to a ready reserve level at least until the west-to-east transportation systems for moving the surplus Alaskan oil are in place or until California refineries have completed a major retrofit program to enable more Alaskan oil to be used in California;
—the Outer Continental Shelf Lands Act would be amended to require a more flexible leasing program using bidding systems that enhance competition, to assure a fair return to the public, and to assure full development of the OCS resources;
—shale oil will be entitled to the world oil price;
—the guidelines established by the Energy Resources Council in the previous administration would be replaced by a more flexible policy: projects for importation of liquified natural gas

(LNG) should be analyzed on a case-by-case basis with respect to the reliability of the selling country, the degree of American dependence the project would create, the safety conditions associated with any specific installation and all costs involved; imported LNG would not be concentrated in any one region; new LNG tanker docks would be prohibited in densely populated areas;

—Federal programs for development of gas from geopressurized zones and Devonian shale would be expanded;

—the Administration hopes to eliminate gasoline price controls and allocation regulations next fall; to maintain competition among marketers, it supports legislation similar to the pending "dealer day in court" bill;

—as part of the extension of oil and natural gas price controls, the Administration would urge that independent producers receive the same tax treatment of intangible drilling costs as their corporate competitors;

—a Presidential Commission will study and make recommendations concerning the national energy transportation system.

To provide relative invulnerability from another interruption of foreign oil supply, the Strategic Petroleum Reserve will be expanded to 1 billion barrels; efforts will be made to diversify sources of oil imports; contingency plans will be transmitted to the Congress; and development of additional contingency plans will be accelerated.

Coal

Conversion by industry and utilities to coal and other fuels would be encouraged by taxes on the use of oil and natural gas.

The Plan also contains a strong regulatory program that would prohibit all new utility and industrial boilers from burning oil or natural gas, except under extraordinary conditions. Authority would also exist to prohibit the burning of oil or gas in new facilities other than boilers. Existing facilities with coal-burning capability would generally be prohibited from burning oil and gas. Permits would be required for any conversion to oil or gas rather than to coal. By 1990, virtually no utilities would be permitted to burn natural gas.

While promoting greater use of coal, the Administration will seek to achieve continued improvement in environmental quality. A strong, but consistent and certain, environmental policy can provide the confidence industry needs to make investments in energy facilities. The Administration's policy would:

—require installation of the best available control technology in all new coal-fired plants, including those that burn low sulfur coal;

—protect areas where the air is still clean from significant deterioration;
—encourage States to classify lands to protect against significant deterioration within 3 years after enactment of Clean Air Act amendments;
—require Governors to announce intent to change the classification of allowable air quality for a given area within 120 days after an application is made to construct a new source in that area;
—require States to approve or disapprove the application within 1 year thereafter.

Further study is needed of the Environmental Protection Agency's policies allowing offsetting pollution trade-offs for new installations. A committee will study the health effects of increased coal production and use, and the environmental constraints on coal mining and on the construction of new coal-burning facilities. A study will also be made of the long-term effects of carbon dioxide from coal and other hydrocarbons on the atmosphere.

The Administration supports uniform national strip mining legislation.

An expansion is proposed for the Government's coal research and development program. The highest immediate priority is development of more effective and economic methods to meet air pollution control standards. The program will include research on:

—air pollution control systems;
—fluidized bed combustion systems;
—coal cleaning systems;
—solvent refined coal processes;
—low Btu gasification processes;
—advanced high Btu gasification processes;
—synthetic liquids technology;
—coal mining technology.

Nuclear Power

It is the President's policy to defer any U.S. commitment to advanced nuclear technologies that are based on the use of plutonium while the United States seeks a better approach to the next generation of nuclear power than is provided by plutonium recycle and the plutonium breeder. The U.S. will defer indefinitely commercial reprocessing and recycling of plutonium. The President has proposed to reduce the funding for the existing breeder program, and to redirect it toward evaluation of alternative breeders, advanced converter reactors, and other fuel cycles, with emphasis on nonproliferation and safety concerns. He has also called for cancellation of construction of the Clinch River Breeder Reactor Demonstration Project and all component construction, licensing, and commercialization efforts.

To encourage other nations to pause in their development of plutonium-based technology, the United States should seek to restore confidence in its willingness and ability to supply enrichment services. The United States will reopen the order books for U.S. uranium enrichment services, and will expand its enrichment capacity by building an energy-efficient centrifuge plant. The President is also proposing legislation to guarantee the delivery of enrichment services to any country that shares U.S. nonproliferation objectives and accepts conditions consistent with those objectives.

To resolve uncertainties about the extent of domestic uranium resources, ERDA will reorient its National Uranium Resources Evaluation Program to improve uranium resource assessment. The program will also include an assessment of thorium resources.

The United States has the option of relying on light-water reactors to provide nuclear power to meet a share of its energy deficit. To enhance the safe use of light-water reactors:

—the Nuclear Regulatory Commission (NRC) has already increased the required number of guards at nuclear plants and the requirements for the training that guards receive;

—the President is requesting that the NRC expand its audit and inspection staff to increase the number of unannounced inspections and to assign one permanent Federal inspector to each nuclear power plant;

—the President is requesting that the Commission make mandatory the current voluntary reporting of minor mishaps and component failures at operating reactors;

—the President is requesting that the NRC develop firm siting criteria with clear guidelines to prevent siting of nuclear plants in densely populated locations, in valuable natural areas, or in potentially hazardous regions.

The President has directed that a study be made of the entire nuclear licensing process. He has proposed that reasonable and objective criteria be established for licensing and that plants which are based on a standard design not require extensive individual licensing.

To ensure that adequate waste storage facilities are available by 1985, ERDA's waste management program has been expanded to include development of techniques for long-term storage of spent fuel. Also, a task force will review ERDA's waste management program. Moreover, improved methods of storing spent fuel will enable most utilities at least to double their current storage capacity without constructing new facilities.

Hydroelectric Power

The Department of Defense (Corps of Engineers), together with other responsible agencies, will report on the potential for installation

of additional hydroelectric generating capacity at existing dams throughout the country.

Nonconventional Resources

America's hope for long-term economic growth beyond the year 2000 rests in large measure on renewable and essentially inexhaustible sources of energy. The Federal Government should aggressively promote the development of technologies to use these resources.

Solar Energy

Solar hot water and space heating technology is now being used and is ready for widespread commercialization. To stimulate the development of a large solar market, a tax credit is proposed. The credit would start at 40 percent of the first $1,000 and 25 percent of the next $6,400 paid for qualifying solar equipment. The credit would decline in stages to 25 percent of the first $1,000 and 15 percent of the next $6,400. The credit would be supported by a joint Federal-State program of standards development, certification, training, information gathering, and public education. Solar equipment used by business and industry would be eligible for an additional 10 percent investment tax credit for energy conservation measures.

Geothermal Energy

Geothermal energy is a significant potential energy source. The tax deduction for intangible drilling costs now available for oil and gas drilling would be extended to geothermal drilling.

Research, Development and Demonstration

An effective Federal research, development and demonstration program is indispensable for the production of new energy sources. The Federal Government should support many research options in their early stages, but continue support into the later stages only for those that meet technical, economic, national security, health, safety, and environmental criteria. Research and development should be accompanied by preparation for commercialization so that successful projects can rapidly be put to practical use.

Additional research, development and demonstration initiatives are proposed, with emphasis on small, dispersed and environmentally sound energy systems.

An Office of Small-Scale Technologies would be established to fund small, innovative energy research and development projects. The office would enable individual inventors and small businesses to contribute to the national energy research and development effort.

Information

A three-part energy information program is proposed. A Petroleum Production and Reserve Information System would provide the Federal Government with detailed, audited data on petroleum reserve esti-

mates and production levels. A Petroleum Company Financial Data System would require all large companies and a sample of small firms engaged in crude oil or natural gas production to submit detailed financial information to the Federal Government. Data required from integrated companies would permit evaluation of the performance of their various segments by providing vertical accountability. An Emergency Management Information System would provide the Federal and State governments with information needed to respond to energy emergencies.

Competition

Effective competition in the energy industries is a matter of vital concern. The Under Secretary for policy and evaluation in the proposed Department of Energy would be responsible for making certain that policies and programs of the Department promote competition. Although at this time it does not appear necessary to proceed with new legislation for either horizontal or vertical divestiture of the major oil companies, their performance will be monitored. The proposed information program would greatly assist that effort.

A present anomaly in the availability of the tax deduction for intangible drilling costs within the oil industry would be removed as part of the program for extending oil and natural gas price controls.

Emergency Assistance for Low-Income Persons

Existing emergency assistance programs are deficient in assisting low-income persons to meet sharp, temporary increases in energy costs due to shortages or severe winters. A redesigned program will be completed promptly and submitted to the Congress.

Chapter I.–The Origins of the U.S. Energy Problem

Abundant, cheap energy has been a decisive element in the creation of modern America. Since the industrial revolution, fossil energy has increasingly replaced human labor in the workplace, supported a growing population, and led to a spectacular growth in productivity and higher standards of living for Americans. Today, the entire stock of capital goods—from poorly insulated buildings to heavy and powerful automobiles—is tailored to plentiful and cheap energy.

But the days of abundance are now drawing to a close, and American society faces sobering new energy realities. Domestic reserves of oil and natural gas, the nation's predominant energy sources since World War II, have been declining since 1970. Imported oil and other possible substitutes for oil and gas are now expensive. As a result, the available supply of cheap oil and gas is being rapidly exhausted, and consumption of them cannot continue to grow at the pace to which Americans have become accustomed. Fundamental changes in the supply and cost of oil and gas will reshape the United States during the remainder of this century.

Today, America's primary source of energy is oil, which provides nearly half the energy consumed and is used in all sectors of the economy. Oil was developed originally as a source of artificial light and as a lubricant. In the 1870's and 1880's, illumination from new forms of gas manufactured from coal began to appear, and Edison invented the incandescent light. By the outbreak of World War I, industrial and residential heating had become the principal use of oil.

In the early years of this century, the age of the mass-produced automobile—and the age of oil—really began. The number of registered automobiles increased from 8,000 in 1900 to over 1 million in 1913, 10 million in 1922, and 27.5 million in 1940. American oil production rose from 64 million barrels in 1900 to 1.4 billion barrels in 1940. By 1950, oil had replaced coal as the predominant energy source in the United States.

Demand for natural gas followed a similar course. Gas was originally a discarded by-product of oil extraction, but its consumption grew with the development of pipeline systems that could deliver it cheaply to nationwide markets.

Between 1945 and 1960, gas became the predominant fuel for residential heating, and began to replace oil and coal as a boiler fuel for industry and electric utilities. Its cleanness and extremely low

price induced both industrial and residential users to switch from coal and become heavily dependent on natural gas. Today, natural gas meets about one-fourth of U.S. energy needs.

During the period from 1950 to 1970, the real cost of energy in the United States decreased 28 percent. Much of the decrease resulted from declining real prices for oil imports, which grew from 900,000 barrels per day in 1950 to 3.4 million barrels per day in 1970. The expansion of imports was made possible by new production from large reservoirs of oil overseas, and by the development of an efficient, economic international oil transportation system.

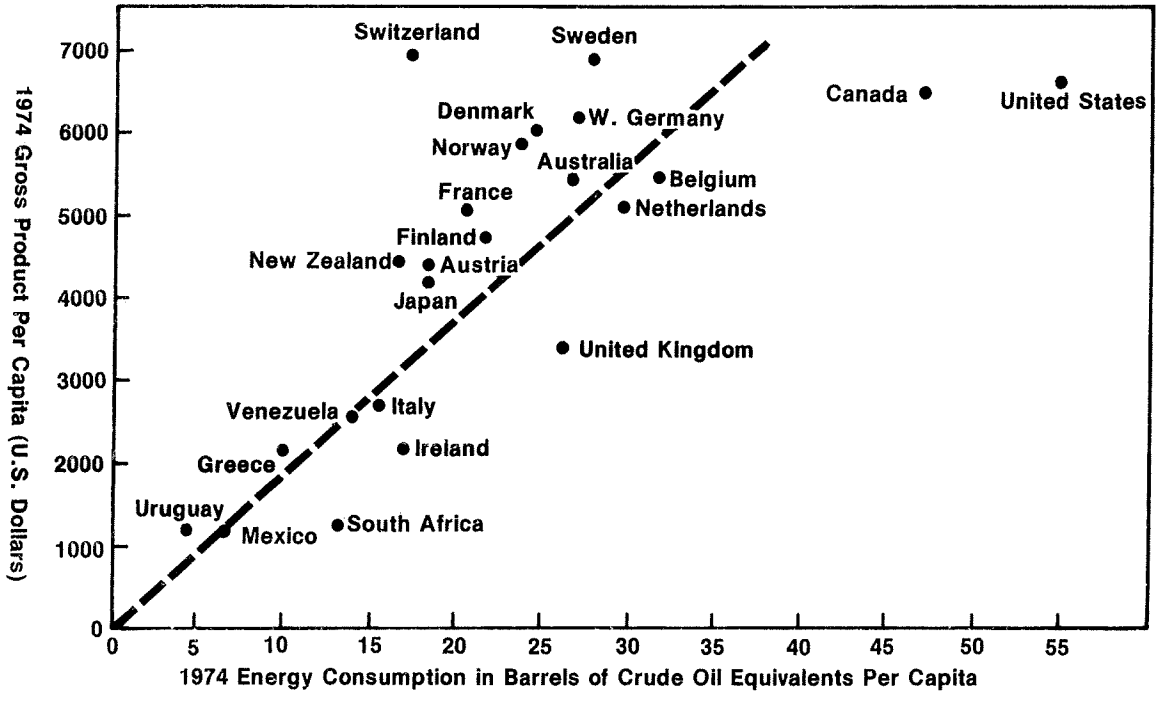
During the two decades of falling real energy prices, America's gross national product rose an unprecedented 102 percent or 3.6 percent per year, and domestic energy consumption grew at an average annual rate of 3.5 percent, for a total increase of 98 percent. The effects of increased affluence and energy demand were felt throughout society, as Americans in homes, farms, factories, and offices turned to energy-consuming machines and appliances for liberation from daily drudgery.

Buildings generally were constructed with little or no insulation or regard for energy-saving design. Air-conditioners became commonplace. Automobile weight and horsepower increased. Cheap automobile transportation helped to shape major metropolitan areas with widely distributed suburban development and inadequate mass transportation. Petroleum-based plastics and textiles replaced many natural fibers, wood, and other materials. Wider use of electricity resulted in generally less efficient use of oil, gas, and coal because three units of primary energy are consumed in the generation and transmission of every unit of electrical energy. During the entire postwar period—until the quadrupling of world oil prices in 1973–74—almost all economic and technological developments were premised on cheap energy, while the costs of other factors of production increased.

Today, America consumes far more energy than any other nation. With less than 6 percent of the world's population, the United States consumes more than 30 percent of the world's energy. As Figure I–1 shows, the United States uses more energy per dollar of gross national product than any other industrialized nation. America consumes twice as much energy per capita as West Germany, which has a similar standard of living.

America's rapidly growing demand for energy has not resulted entirely from broad economic and social developments. With some exceptions, such as the restrictions on oil imports during the period when foreign oil was cheap, Government policies have generally stimulated energy demand. Tax benefits to producers and regulation of prices to consumers have kept the price of energy below its true replacement cost, and thereby promoted consumption and waste.

Energy Consumption Per Unit of GNP



Source of Data: U.N. Statistical Yearbook, 1975

Figure I–1

Large-volume consumers of electricity and natural gas have been given discounts. Government policy has subsidized and protected energy-inefficient truck and air transportation. The interstate highway system has encouraged automobile use. Local highways have drawn people, businesses, and industry out of central cities into suburbia. Thus, the American people have been led to believe that the oil and gas they consume will remain cheap, when in fact new additions to oil and gas supply already are expensive and inevitably will become more so.

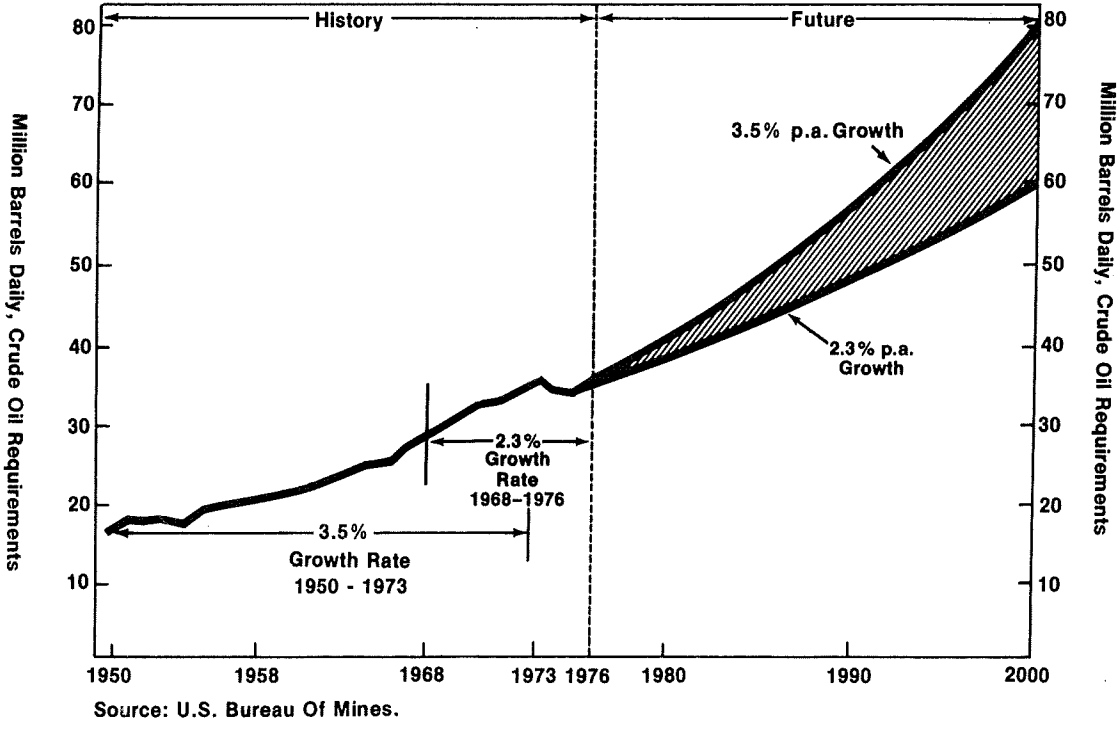
Compound growth of demand for energy can produce striking results within a surprisingly short time. If demand for energy increases at the long-term annual average of 3 percent, it doubles in 24 years. Compound growth at an annual average of 4.3 percent, the rate prevailing from 1963 to 1973, would double energy consumption in 16 years. At 7 percent, the rate at which electricity consumption grew during the 1960's, energy consumption would double in 10 years. The difference between a U.S. growth rate of 3.5 percent (the 1950–73 average) and a growth rate of 2.3 percent (the 1968–76 average) would result in the consumption of 20 million additional barrels of oil equivalent per day in the year 2000.[1] (See Figure I–2.) That would be an increment of more than one-half of total 1976 daily energy consumption.

The domestic sources of energy which have largely satisfied growing U.S. demand since World War II are declining. U.S. oil production has been falling since 1970. Alaskan oil will boost U.S. production for a few years; but then, without significant new discoveries, production will decline or remain static. World production of oil is likely to approach its capacity limitation by the mid-1980's, so the United States cannot look to an expanding supply of imported oil as it has in the past. U.S. natural gas production has been declining since 1973. In sum, the supplies of oil and natural gas now available to the United States cannot possibly serve to sustain continued growth of demand at rates like those of recent years.

America is now at an historic turning point as the postwar era of oil and gas comes to a close. America has made two major energy transitions in the past, but in very different circumstances (see Figure I–3). After the Civil War, wood, waterwheels, and windmills largely gave way to coal. Although these resources were abundant, technological progress made it feasible and more economical to use coal in railroad transportation, for industrial process heat, and for home heating. Coal supplied more than half of U.S. energy needs from about 1885 to about 1940. During the 1950's, the transition from coal to oil and

[1] Throughout this report, quantities of energy are expressed in terms of barrels of oil (petroleum product) per day. One million barrels of oil per day equals 1.96 trillion cubic feet of natural gas per year, or 88 million tons of coal per year.

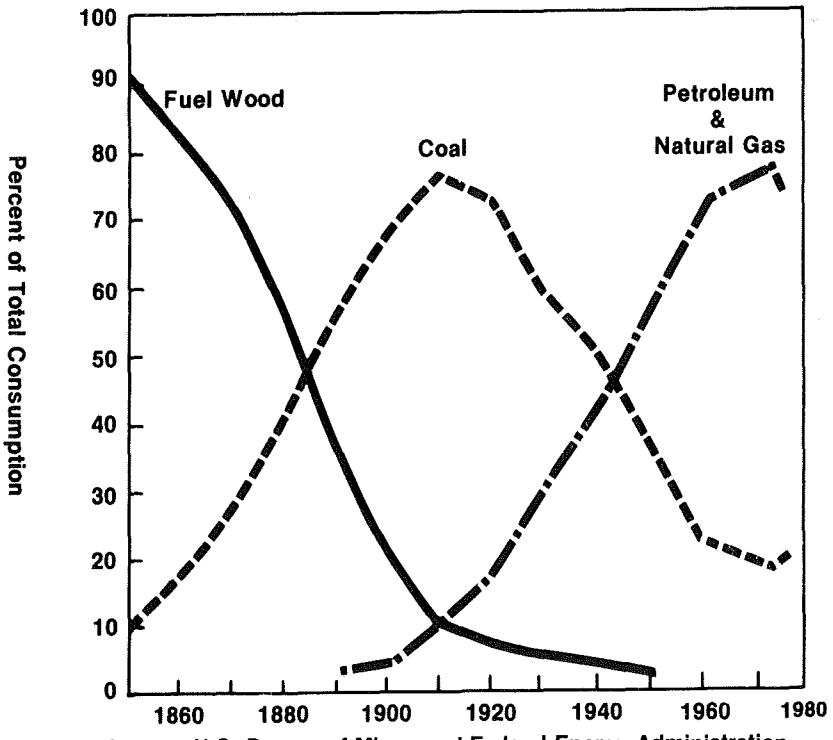
A Lower Growth Rate Can Make A Large Difference In Energy Requirements



Source: U.S. Bureau Of Mines.

Figure I–2

The United States Has Shifted to Different Fuel Use Patterns



Source: U.S. Bureau of Mines and Federal Energy Administration.

Figure I–3

natural gas was completed, and they became America's predominant energy sources. This second transition, from one abundant fuel to two others, also resulted from technological progress, as well as the lower cost, cleanness, and ease of handling of oil and natural gas. The transition did not result from any shortage of coal, which even today is a vast resource.

The energy crisis that now faces America results from the divergence between its historically increasing energy demand and its decreasing supplies of oil and natural gas. To meet this crisis, America must make a new kind of energy transition—from a period of abundant, cheap oil and gas to a period when these resources will be in short supply.

Historically, the United States has depended on technological progress to solve many of its problems. There is hope that technological developments will provide long-term solutions to the energy problem. But, in the energy field, technologies develop slowly. Someday, the U.S. probably will be able to rely on such abundant resources as solar energy, geothermal energy, and, perhaps, fusion; but, even under the most optimistic estimates, those resources will not become major suppliers of energy until after the year 2000. America landed a man on the moon in a decade, but finding substitutes for oil and natural gas is a far more difficult and time-consuming job that must be accomplished within economic, social, health and environmental constraints.

The coming energy transition can be made in three stages. In the short term, from now until 1985, the United States can reduce its rate of growth of demand for energy generally and for oil in particular, reallocate natural gas to high priority uses, increase the use of abundant conventional energy sources, and build up the Strategic Petroleum Reserve to protect against another interruption of foreign oil supply. During this period, the U.S. stock of capital goods can be adjusted to the new realities of scarcity. By the mid-1980's, when world oil production is likely to approach its capacity limitation, the United States could be in a position to reduce its demand for foreign oil. Beyond 2000, the United States will need new energy sources to maintain economic growth and a high standard of living.

If America takes action now, it can accomplish the transition in an orderly way. With sufficient time, the U.S. can modify its capital stock to make it more efficient. However, if action is delayed, the transition will have to be made abruptly with measures, such as rationing, that operate directly on behavior and at the expense of the immediate flow of goods and services.

Chapter II.–The Continuing Crisis

Another sudden quadrupling of the world price of oil, like that in 1973–74, is improbable. Although the danger of another interruption of oil imports is real, there does not appear to be any immediate prospect of one. Another winter as cold as the last does not seem likely.

In the absence of energy traumas, it is easy to forget. But the real energy crisis does not lie in intermittent supply interruptions or shortages during abnormally cold winters. These are simply dramatic symptoms of the underlying conditions of energy demand and supply that are worsening slowly, but inexorably, day by day.

This invisible crisis arises from the pressure of growing demand on finite resources of oil and natural gas. Over time, economic growth and increases in population add large increments to an already large base of consumption. However, the resources from which the demand must be satisfied are limited.

In the short run, the growing gap between consumption and domestic supply will have to be filled by increasing oil imports unless effective actions are taken to reduce demand and increase domestic supply. Import dependence produces economic and political vulnerability. The energy demand of other nations is also growing, and world oil production is likely to approach its capacity limitation in the near future. Thus, even if the United States were willing to accept the consequences of increasing dependence on imports, in the future the world's oil supply will no longer be able to satisfy growing American demand.

In the long term, research and development will provide supply options not available now. Until then, the basic task for the American people is to adjust energy consumption patterns to reduce pressure on domestic oil and gas resources and reduce oil imports. Thereby, the U.S. would be prepared for the transition to a different energy economy at the beginning of the next century.

U.S. ENERGY DEMAND

Econometric projections of supply and demand are made by Government and industry to analyze the impacts of different actions and policies. These projections are based on mathematical simulation of past behavior. As such, they fail to take into account the changing na-

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ture of public attitudes and tastes, institutional constraints, and many other factors. A mathematical model was used in the development of the National Energy Plan to provide one type of estimate of what would happen with and without the Plan. However, due to the inherent limitations of all models, care has been taken to set forth the uncertainties surrounding particular projections, and judgment has been exercised in order to provide the most reliable picture of America's energy future, both with and without the Plan.

The President's economic goals imply a 46 percent increase in gross national product (GNP) by 1985. Although there is no fixed relationship between energy and GNP, this growth does imply a substantial increase in energy consumption unless effective conservation measures are taken.

The model projects that, with a high rate of economic growth and no new conservation initiatives, total U.S. energy demand would grow between 1976 and 1985 at an average annual rate of 3 percent. Consumption would rise from the equivalent of 37 million barrels of oil per day in 1976 to more than 48 million by 1985, a 31 percent increase. Under favorable assumptions and with no new initiatives, domestic energy supply is projected to increase from the equivalent of 30 million barrels of oil per day in 1976 to 37 million in 1985. Thus, the overall gap between demand and domestic production would grow from 7 million barrels of oil equivalent per day to about 12 million.[1]

These projections could be unduly optimistic: they could understate demand and overstate domestic supply. If Americans disregard the energy crisis, demand could easily increase at a rate higher than projected; and experience suggests that domestic supply could easily be below the projected level.

Energy consumption is projected to grow at different rates in the three sectors of the economy from 1976 to 1985. The industrial sector's consumption of energy, 37 percent of the total in 1976, is projected to increase the most, by more than 5 percent per year. Residential and commercial demand, also 37 percent in 1976, is projected to increase at an average annual rate of about 2 percent. Transportation demand, 26 percent in 1976, is projected to increase at an average annual rate of 1 percent, assuming successful implementation of the present fuel efficiency standards and driver response to higher gasoline prices.

These projected growth rates are substantially different from those of the recent past. From 1950 to 1973, when energy consumption increased at an average annual rate of 3.5 percent, industrial use rose at a rate of only 3.0 percent; residential and commercial use grew at a rate of 4.3 percent; and use in the transportation sector grew

[1] The numbers do not add up due to rounding.

at a rate of 3.4 percent. Since the 1973–74 embargo, energy use by industry has actually decreased, and energy use in the residential and commercial sector and the transportation sector has increased only slightly.

In addition to considering total demand and the demand of individual sectors, it is important to recognize that the various energy sources have different qualities and ranges of use and are more valuable in some uses than in others. Oil is heavily used by all three sectors, but is needed most for the transportation sector, where no substitute is currently available. Although natural gas is heavily used by industry, it is the premium fuel for residential and commercial use because it is an efficient, clean, and convenient source of heat. Coal is used principally by electric utilities and industry, and nuclear energy is suitable only for electricity generation. (Figure II–1 shows the fuels used by each sector.)

Substantial opportunities exist for reducing demand in all sectors. In the transportation sector, large savings can be achieved by improving the efficiency of automobiles and trucks. Sizable savings are also attainable in the industrial sector through more efficient processes and other energy-saving measures. With better insulation of homes and more efficient appliances, significant savings can be made in the residential sector.

OIL

Oil is the nation's major energy source, but neither domestic supplies nor imports from the rest of the world will be able to satisfy indefinitely continued high rates of growth.

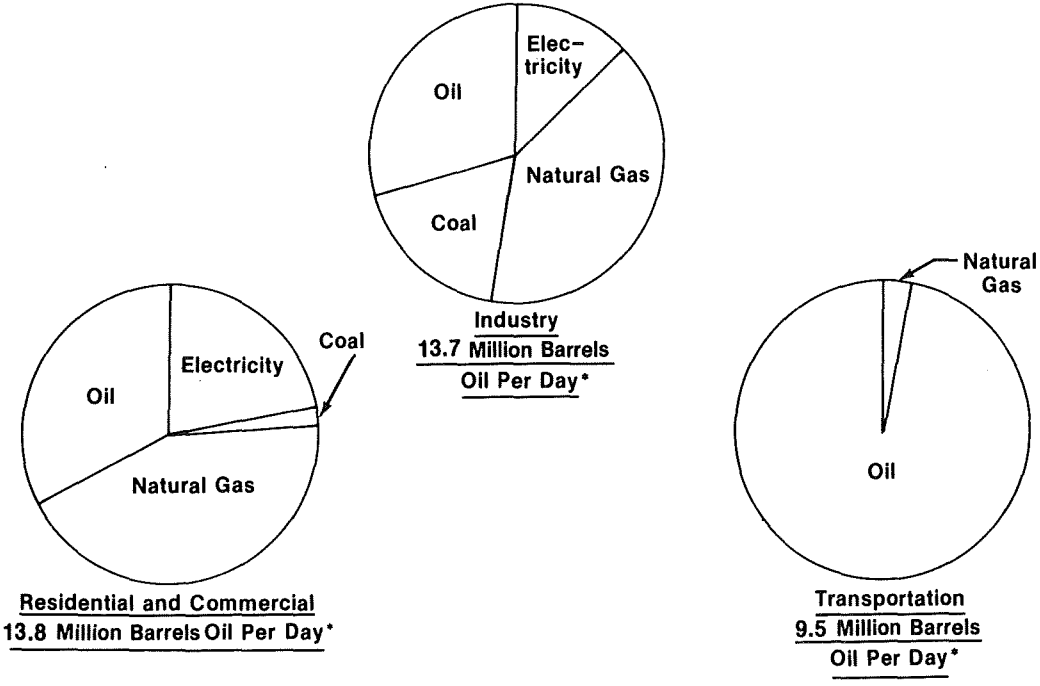
Since World War II, U.S. oil consumption grew at an average annual rate of 4.4 percent until 1973. From 1969 to 1973, utilities and industrial users of coal responded to increased environmental concerns by converting to oil and natural gas. OPEC's fourfold increase in oil prices in 1973–74 created an immediate incentive for conservation. Consumption fell during the 1973–75 recession, but has now resumed its upward trend, and grew 6.7 percent in 1976.

Without further action, U.S. demand for oil will continue to increase in the future (see Figure II–2). Even taking into account various constraints, the mathematical model projects that demand will rise from 17.4 million barrels per day in 1976 to 22.8 million in 1985, a 3 percent annual increase. Without constraints, U.S. oil demand probably would grow at the postwar rate of 4 percent per year, and reach 25 million barrels per day by 1985.

Domestic oil supply cannot possibly meet that growing demand. Domestic oil reserves constitute only 3.7 percent of U.S. conventional energy reserves, but provided 27 percent of U.S. energy consumption in 1976. Current domestic production is 10 million barrels per day.[2]

[2] Including natural gas liquids (NGL's) and refinery gains.

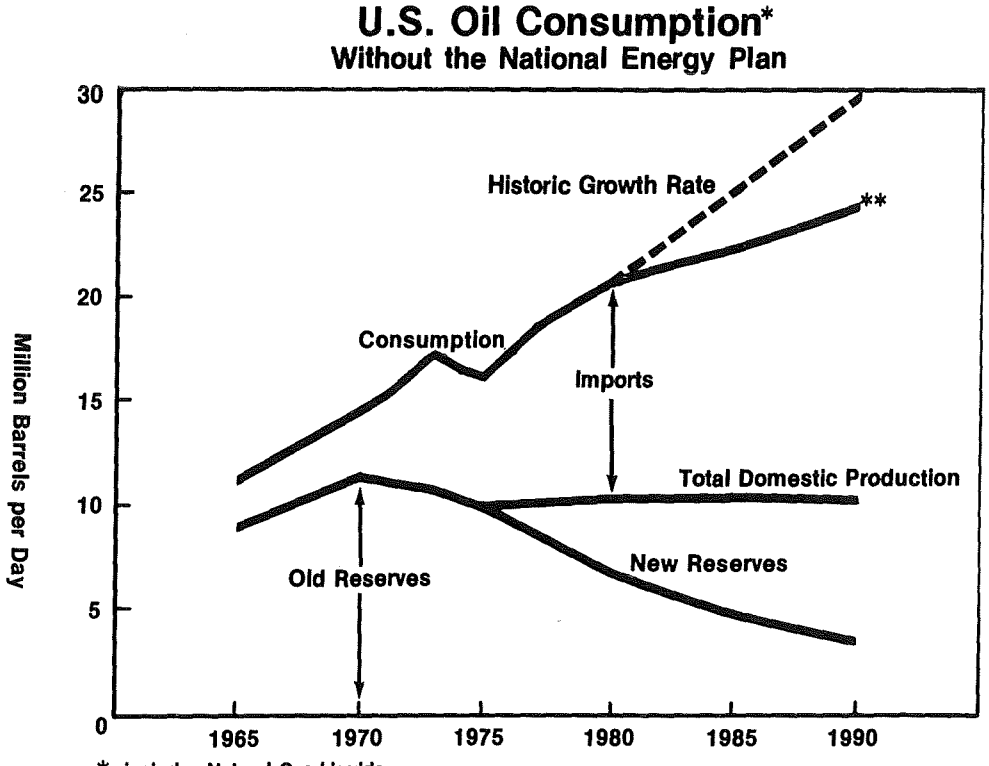
U.S. Energy Consumption By Sector, 1976



*Oil Equivalent
(Electricity Losses Allocated)

Source: Federal Energy Administration.

Figure II-1



* Includes Natural Gas Liquids

**assumes implementation of mandatory fuel efficiency standards and reductions induced by higher gasoline prices

Source: U.S. Bureau of Mines and Federal Energy Administration.

Figure II-2

With rising prices, the model projects total U.S. production of around 11 million barrels per day in 1985,[3] assuming a new contribution of about 3 million barrels per day from Alaskan oil, Outer Continental Shelf development, and tertiary recovery. Nevertheless, these new sources will be far from sufficient to satisfy the projected growth in U.S. demand.

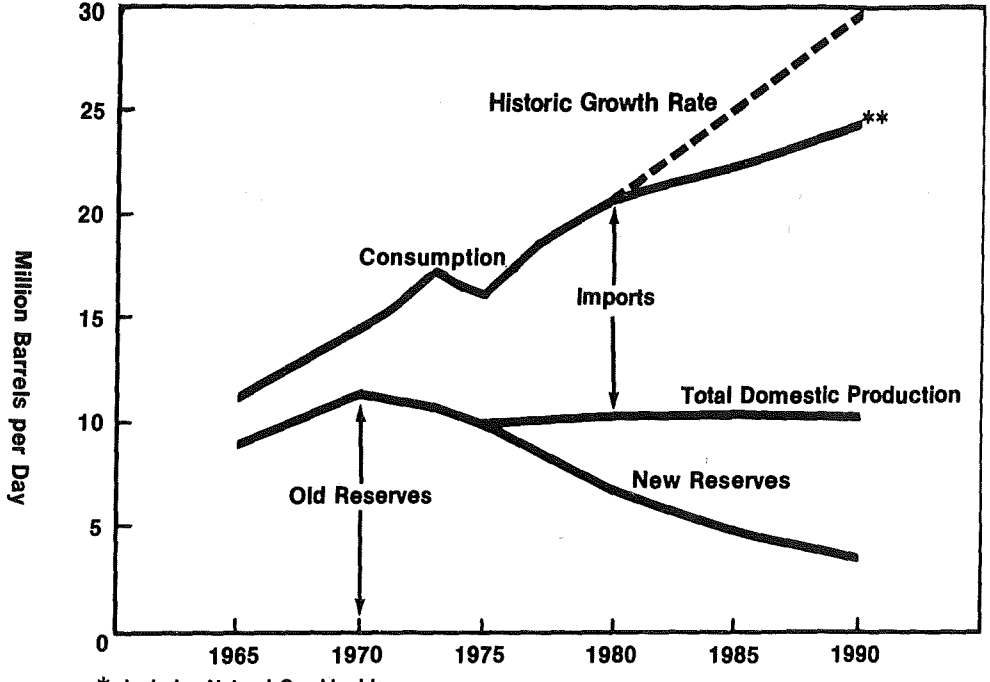
Other major additions to domestic oil supply are unlikely. For more than 17 years, domestic oil discoveries have been outpaced by domestic consumption, except for the discovery of oil on the North Slope of Alaska. In 1940, U.S. proved reserves were sufficient for 14 years of consumption. Today, U.S. proved reserves amount to less than 10 years of production at the current level, which is only 5 years of current total domestic oil consumption. In the face of falling domestic oil reserves and production, oil companies increasingly engage in high-risk, high-cost development in such frontier areas as Alaska and the deep Outer Continental Shelf.

As a result of these postwar trends in demand and domestic supply, the United States has increasingly turned to imported oil. In 1947, the United States became a net importer of oil, but domestic excess production capacity exceeded the level of imports. By the mid-1960's, the United States had become dependent on imports: domestic excess capacity could no longer match the level of imports. Imports rose from 21 percent of U.S. oil consumption in 1965 to 37 percent in 1974. In 1976, imports averaged 7.3 million barrels per day, or 42 percent of U.S. oil consumption. In February of 1977, oil imports jumped to 9.6 million barrels per day. Increasing consumption of imported oil has led to deepening dependence on the world oil market and growing vulnerability to a supply interruption.

A major increase in imports will occur by 1985 unless demand is curbed. If demand for oil were to grow freely, it could reach 25 million barrels per day in 1985. Domestic oil production could well be only about 9 million barrels per day, 2 million below the model's projection. Oil imports would then be 16 million barrels per day. If current measures to increase fuel efficiency in automobiles are successful and if higher gasoline prices reduce driving, it is likely that demand for oil would be closer to 23 million barrels per day, and imports closer to 14 million. If, by 1985, demand were in fact 23 million barrels per day and domestic oil production were to increase by 1 million barrels per day, to 11 million, oil imports would then be 12 million barrels per day. Although estimates vary widely, the most reasonable range of estimates of 1985 oil imports is 12 to 16 million barrels per day.

Even apart from considerations of vulnerability, the United States cannot rely indefinitely on growing oil imports to meet its domestic deficit. In coming years, several factors will limit the availability of world oil for U.S. consumption. Ultimately, there are physical and

U.S. Oil Consumption*
Without the National Energy Plan



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economic limits on world oil resources. The approach to these limits will be hastened by increasing demand in other countries. During the 1980's, the oil-exporting countries will approach their capacity limitation.

The availability and cost of oil imports to the United States will be influenced by the rate of growth in demand for oil throughout the world. As the economies of other industrialized countries grow, their demand for world oil will increase. It is probable that, during the 1980's, demand for oil will outpace production in the Soviet Union and Eastern Europe, and their excess demand will aggravate the growing pressure on world oil supply. As developing countries make economic progress, they, too, will need additional oil. Iran, Venezuela, Nigeria, and other oil-exporting countries may well experience economic growth that will create substantial domestic demand for oil and cause them to limit exports, even if they maintain or increase production.

The oil-exporting countries probably will not be able to satisfy the increases in demand now projected to occur in the 1980's. In 1976, the 13 OPEC countries exported 29 million barrels of oil per day. If world demand continues to grow at the rates of recent years, by 1985 it could reach or exceed 50 million barrels per day. The United States alone, the most profligate of the world's energy users, would require a substantial part of that total. However, many OPEC countries cannot significantly increase production. In some, production will actually decline. Thus, as a practical matter, overall OPEC production could approach the expected level of world demand only if Saudi Arabia greatly increased its production. Even if Saudi Arabia did so, the highest levels of OPEC production probably would be inadequate to meet increasing world demand beyond the late 1980's or early 1990's.

Finally, there are physical and economic limits on the world's supply of oil. There is considerable uncertainty and debate about the size of the world's oil resources. A widely used geological estimate of total recoverable world oil resources, past and present, is about 2 trillion barrels. More than 360 billion barrels have already been consumed. Current proved crude reserves are 600 billion barrels. World demand for oil has grown at an average annual rate of 6.6 percent since 1940. It grew by as much as 8 percent annually during the 1960's. If it could be assumed that world demand for oil would grow at an annual rate of only 3 percent, and if it were possible (which it is not) that production would keep pace with that rate of growth, the world's estimated recoverable oil resources would be exhausted by 2020. At a conjectural growth rate of 5 percent, those resources would be exhausted by 2010.

In reality, world production would not continue to grow until the last drop was recovered. Rather, the growth of world consumption

would be stopped by limitations on productive capacity. Despite the uncertainty about the exact size of recoverable world oil resources and about the rate of increase in productive capacity, this fundamental fact is clear: within about four generations, the bulk of the world's supply of oil, created over hundreds of millions of years, will have been substantially consumed.

Of course, actual physical exhaustion of oil resources will not occur. Even today, well over half the oil in existing wells is left in the ground because additional recovery would be too expensive. As production by conventional methods declines and oil becomes more scarce, its price will rise and more expensive recovery methods and novel technologies will be used to produce additional oil. As this process continues, the price of oil will become prohibitive for most energy uses. Eventually, the nations of the world will have to seek substitutes for oil for most energy uses, and oil will have to be reserved for petrochemical and other uses in which it has maximum value.

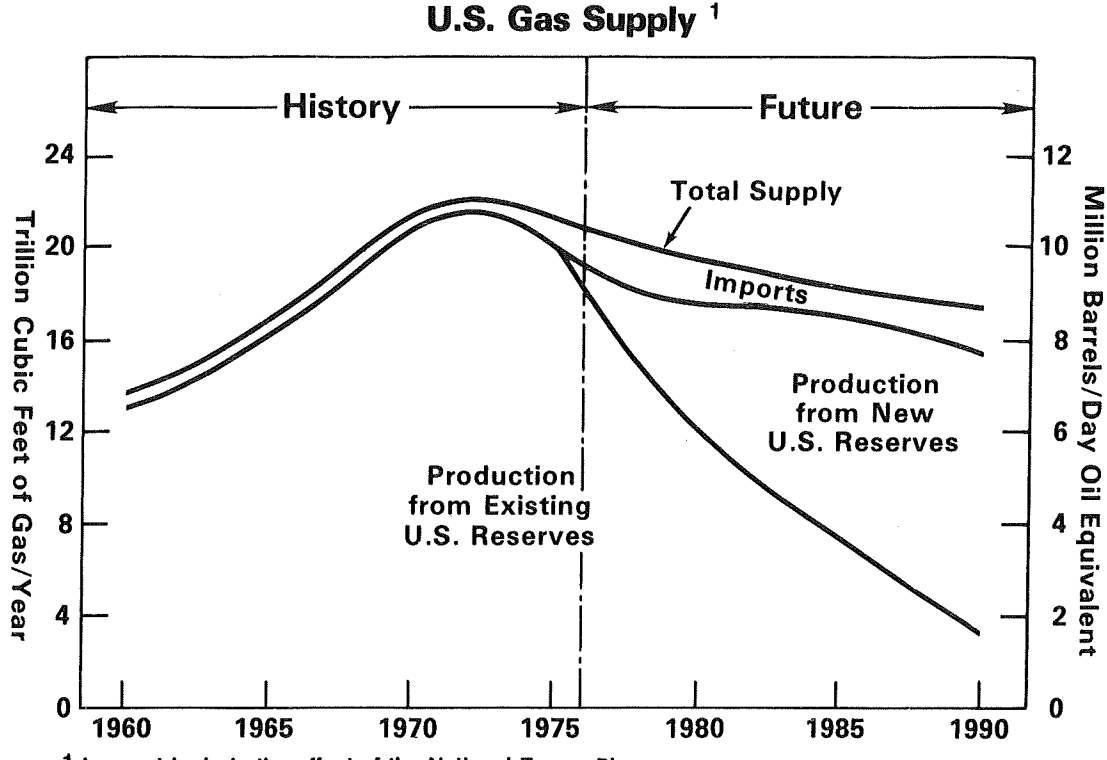
The world now consumes over 20 billion barrels of oil per year. To maintain *even that rate of consumption* and keep reserves intact, the world would have to discover another Kuwait or Iran roughly every 3 years, or another Texas or Alaska roughly every 6 months. Although some large discoveries will be made, the likelihood of a continuous flow of large discoveries is small. Indeed, recent experience suggests that, from the perspective of world oil consumption, future discoveries will be small or moderate in size, will occur in frontier areas, and will yield oil only at very high cost. Obviously, continued high rates of *growth* of oil consumption simply cannot be sustained.

NATURAL GAS

The opportunities for supplementing domestic production of natural gas with imports are small. It is far more expensive to transport gas overseas than oil. The presently available supplements to domestic natural gas are limited amounts of Canadian gas, imported liquefied natural gas (LNG), and synthetic natural gas (SNG). The availability of Canadian gas is becoming increasingly uncertain, and LNG and SNG are very expensive. Therefore, the growing imbalance between America's domestic natural gas resources and its annual consumption is of particular concern. (see Figure II–3.)

Natural gas constitutes only 4 percent of domestic conventional energy reserves. In 1973 it furnished 30 percent of U.S. energy consumption, the equivalent of about 11.2 million barrels of oil per day.[4] By 1976, its share had dropped to 27 percent, equivalent to 10 million barrels per day.

[4] Excluding natural gas liquids.



1does not include the effect of the National Energy Plan

Source: Federal Energy Administration.

Figure II-3

Gas consumption grew by about 5.7 percent per year between 1960 and 1970. From 1970 to 1974, however, consumption declined by 1.3 percent, mainly because declining production caused prohibitions against the use of gas in new homes and buildings, and because industrial and electric utility users of interstate natural gas could not obtain adequate long-term commitments for new supplies.

Domestic production of gas, having peaked at 22.2 trillion cubic feet in 1973, has been declining. Last year, only 19.0 trillion cubic feet were produced.

Between 1976 and 1985, total U.S. production of natural gas is projected by the model to decrease from the equivalent of 9.5 million barrels of oil per day to 8.2 million barrels. Consumption, however, is projected to be the equivalent of 9.4 million barrels of oil per day. Consumption would increase to a much greater extent if supply were not limited. The difference between the estimated consumption and the estimated domestic production would be made up by imports, amounting to the equivalent of 1.2 million barrels of oil per day.

Federal regulation of the wellhead price of natural gas in interstate commerce has encouraged consumption of this premium fuel for nonessential uses and has discouraged its distribution from gas producing States to other States. Recent contract prices for new gas in the intrastate market range from $1.60 per Mcf to $2.25, while the highest price ever allowed for long-term interstate gas purchases is $1.45.

Last year, natural gas in the interstate market sold at wellhead rates that were 25 percent of the Btu equivalent price [5] of imported crude oil. At that price, natural gas was highly attractive to industry and utilities, and they used the equivalent of about 6 million barrels of oil per day, while new households had to turn to electricity.

Since Federal regulation covers only the interstate market, new onshore gas production has gone primarily to the unregulated intrastate market, where it has received higher prices. From 1973 to 1975, only 19 percent of new reserve additions were committed to the interstate market, and much of that gas was from the Federal domain. The existing distinction between intrastate and interstate sales has given intrastate users first claim on new natural gas.

By 1985, gas from existing reservoirs will be able to satisfy only 55 percent of natural gas demand. It is doubtful that even substantial price increases could do much more than arrest the decline in gas production.

The gap between demand and production in the lower 48 States will have to be filled from new sources, such as Alaskan gas; the Outer Continental Shelf; deeper, tighter onshore formations; the geopressurized zones along the Gulf Coast; synthetic natural gas; and im-

[5] The Btu equivalent is the price paid for quantities of various energy sources that have the same heat value.

ported liquefied natural gas. In the short term, the new sources of natural gas will not be able to reverse the downward trend in total U.S. production. Supplies for the residential and commercial sector will have to be obtained by diverting gas from electric utilities. However, from the mid-1980's onward, the prospects for gas supply could improve if significant discoveries are made on the Outer Continental Shelf, and if technological advances make possible the exploitation of the deeper, tighter onshore formations, Devonian shale, and geopressurized zones.

IMPLICATIONS FOR THE UNITED STATES

The United States would be profoundly affected by a continuation of current trends of oil and gas demand and supply. To sustain continuation of the rate of growth of demand, the U.S. would be forced to expand domestic production greatly or to increase its already high level of imports, or pursue a combination of both. These courses of action would present serious problems in the short run. But short-term impacts would be eclipsed by even greater problems if U.S. petroleum demand is still growing at the time OPEC production levels off.

Supply disruptions this winter caused short-term unemployment for more than 1 million workers nationally. They have also encouraged firms to consider moving plants, and jobs, to the Sun Belt to assure stable supplies of energy. But these near-term effects are minor compared to the loss of millions of jobs should future energy prices increase dramatically as a result of a continuing upward trend of demand combined with static or declining production.

The United States could face repeated jolts as energy supplies become increasingly unreliable and actual shortages occur more frequently. Regional disruptions could result from unusual weather, failure to bring electricity generating capacity on line, and many other factors. In some cases, the American people could experience mere inconvenience; in others, real suffering, as economic activity ground to a halt. It is difficult to predict which region would encounter problems and when, but future supply disruptions would be very likely.

Some industries, such as the recreation industry, are particularly dependent on a continuing supply of energy. Short-term limitations on energy use are disruptive to these industries. If action is taken now to curb demand, they will continue to flourish. If action is not taken, their very survival may come into question in the future.

A crash program to meet growing demand through increased domestic production would have very serious adverse consequences. Oil, the most critical energy resource, would be drained rapidly, and there-

fore the nation would not have adequate protection against future shortfalls in energy supply. It would be unwise to solve a problem of short-term vulnerability arising from dependence on oil imports by creating a problem of long-term vulnerability arising from depletion of America's resources.

A production effort intended to eliminate oil and gas imports would also harm the environment. The Outer Continental Shelf, Alaska, oil shale, and synthetic fuels would have to be developed as rapidly as possible. Even more coal-fired and nuclear plants would be needed. Major energy production facilities would have to be developed without adequate attention to adverse impacts on public health, society and the environment.

The capital investment required to meet a domestic production level of 48 million barrels of oil equivalent per day by 1985 would exceed $550 billion, about 37 percent of total U.S. expenditures for all plant and equipment throughout the economy. In recent years, energy production has already been drawing a disproportionate share of capital. From 1973 through 1975, the United States invested $112 billion in plant and equipment to produce energy, about 35 percent of all such expenditures throughout the economy. Previously, the share of investment going to energy production had ranged between 25 and 30 percent.

Finally, an all-out production effort would raise questions of regional equity and balance. Actual and potential producing States would be pressed to deliver increasing quantities of energy at the expense of their environment and, in some areas, a distinctive way of life. Nonproducing States would be pressed to carry out increasingly drastic conservation programs.

If the United States pursued the course of accepting ever increasing imports, it would face a set of difficult problems. In the past, the United States has enjoyed flexibility in formulating and executing its foreign policy. If, however, the United States continues to increase its dependence on oil imports, its position as a world leader will be weakened. The current vulnerability to supply interruptions affects the whole structure of international relations. Although greater cooperation among the industrialized nations is needed to deal with the energy crisis, the crisis itself raises the specter of future competition among political allies for diminishing oil supplies. Because the United States is the country most wasteful of energy, and because it has been increasing its demand for world oil, the United States has not been able to provide leadership to restrain the growth of world demand.

Reliance on oil imports beyond the short term would also make the U.S. economy even more vulnerable to sudden large oil price increases.

Price vulnerability is as harmful to long-term economic and political interests as supply vulnerability. A precipitous increase in energy prices would place significant inflationary pressures on the economy.

The high level of oil imports has already increased the U.S. merchandise trade deficit from $2.0 billion in 1971 to $14.8 billion in 1976. In 1971, oil imports cost $3.7 billion; in 1976, they cost $36.4 billion.

The foregoing discussion addressed the most likely developments in U.S. energy demand and supply. The actual situation could be either better or worse. If growth in demand is reduced and significant new discoveries of oil are made, the leveling off and decline of world production would be deferred for a time.

However, one need not engage in fantasy to contemplate a far worse case. Under a set of unfavorable circumstances, U.S. payments for imported oil theoretically could run as high as $175 billion in 1985. Foreign oil producers might reduce exports to the United States or the world generally for their own economic or political reasons. Some producer nations might choose to conserve their remaining reserves rather than supply world demand. Moreover, a disruption of oil exports from the Persian Gulf would be a disaster for all oil-importing countries, including the United States.

The consequences would be grave if the United States were unable to purchase all the oil it needs. The United States would most likely experience a dramatic interruption of economic activity akin to a depression, and real income would plummet. Rationing and other Government controls would be necessary, leading to an unprecedented Government intrusion into the lives of American citizens.

In developing public policy toward the energy crisis, all three possibilities—the most likely case, the optimistic case, and the pessimistic case—should be considered. It would be foolhardy to base public policy on the most optimistic possibility. Even if the future should prove to be brighter than now appears likely, steps taken to curb demand and increase use of abundant resources would still have been justified to meet the immediate need to reduce vulnerability. In formulating public policy toward energy, the prudent course is to act on the basis of the most likely assumptions about the future, and to bear in mind that the pessimistic set of assumptions is a real possibility.

IMPLICATIONS FOR THE INTERNATIONAL COMMUNITY

Although the United States faces very serious problems, they are far less severe than those faced by most other nations. The 1973–74 embargo and fourfold increase in oil prices have already demonstrated the industrialized countries' vulnerability to arbitrary supply and

price manipulation. The industrialized nations continue to suffer from supply and price vulnerability, large and increasing balance of payment deficits, and resulting constraints on economic growth.

The dramatic 1973–74 OPEC price increases contributed significantly to the worst global recession since the Great Depression. Unemployment, for example, increased 4 percentage points in the U.S. In 1973, the OECD countries and the OPEC countries each had a small surplus in current account balances with the rest of the world, but in 1974 that situation was radically altered. The OECD countries experienced a $33 billion deficit on current account, while the OPEC surpluses increased to $70 billion. Since 1973, the oil-importing countries have paid over $300 billion in oil imports bills to the 13 OPEC countries. Today, each 10 percent price increase adds an additional $14 billion to the growing OPEC balances.

The massive oil price increases since 1973 have most adversely affected those developing countries that lack domestic oil supplies. Their expenditures for oil rose from about $4 billion in 1973 to $12 billion last year. The indirect cost to their economies was even more pronounced. The recession and inflation in the industrialized countries slackened their demand for the developing countries' exports, and raised the prices of the developing countries' imports. From 1973 to 1975 the foreign debt of these developing countries rose from $67 to $117 billion.

The developing nations cannot significantly reduce their energy consumption since they are not large energy users. As increasing amounts of scarce foreign exchange are expended for energy imports, other development needs suffer. Many developing countries have reached or even surpassed the limits of their creditworthiness.

The quadrupling of oil prices introduced a massive structural distortion into the international payments mechanism. That distortion has not abated. Debt service amounted to 15 percent of the world's export receipts in 1976. As a result, many countries are finding it more difficult to obtain additional loans from the commercial capital markets. The balances held by OPEC countries have been invested in the industrialized countries, largely in short-term securities, although a shift to longer-term investments is occurring. Most of these funds are invested in the United States and Europe, with only limited amounts flowing to the weaker developed and developing countries. Ironically, it is these very countries that suffer most from the energy crisis and have the greatest need for a compensating flow of capital.

The oil-exporting countries and the oil-importing countries share a number of long-term interests. Both need a growing global economy and a liberal trading system to ensure the availability of future markets for their products. All nations, including the oil exporters, will

someday have to meet their energy needs from resources other than oil and gas. Hence, all nations are part of the coming energy transition, even though they will be affected very differently.

* * *

The prognosis for the United States and the world is serious if current growth in demand for oil continues. In the short term, American vulnerability to a supply interruption would increase. By the mid-1980's, the United States could be vying for scarce oil against its allies and other consuming nations, including the Soviet Union. Then, prices could increase dramatically as a result of tremendous pressure on world oil supply.

During the last years of the 20th century, the United States will have to reduce significantly its reliance on oil, and make greater use of abundant energy sources. For the long term, the United States and other nations will need to develop renewable and essentially inexhaustible sources of energy. If steps are not taken now to prepare for this transition, the United States and the world will face serious economic and political problems.

Chapter III.–Principles and Strategy of the National Energy Plan

Broad public understanding of the gravity of the energy problem, a commitment to action, and a willingness to endure some sacrifice are all indispensable to the success of a national energy plan. In the present circumstances, an energy plan that demanded nothing from the American people would be no energy plan at all, but merely a prescription for chaos at a later date.

Changes in energy demand and supply have long leadtimes, and, therefore, the coming energy transition cannot be made overnight. For the transition to be made without serious economic and social disruptions, it will have to take place over a period of years. If the United States is to be prepared for the time when world oil production approaches its capacity limitation and then begins to level off, it must take action now.

The ultimate question is whether this society is willing to exercise the internal discipline to select and pursue a coherent set of policies well in advance of a threatened disaster. Western democracies have demonstrated such discipline in the past in reacting to immediate, palpable threats to survival, as in time of war. But they have had less success in harnessing their human and material resources to deal with less visible and immediate threats to their political and economic systems. When dangers appear incrementally and the day of reckoning seems far in the future, democratic political leaders have been reluctant to take decisive and perhaps unpopular action. But such action will be required to meet the energy crisis. If the nation continues to drift, it will do so in an increasingly perilous sea.

PRINCIPLES

The principles set forth in this chapter provide a framework not only for present policies, but also for development of future policies. Planning is necessarily an ongoing process. The National Energy Plan will have to be adjusted continually as new experience and knowledge are gained, as government programs take effect, as new technologies develop, and as the world's political and economic circumstances change.

The following 10 principles divide into two groups. The first five establish the context in which energy policy must be formulated. The

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remaining five are fundamental to the proposed comprehensive National Energy Plan.

The first principle is that the energy problem can be effectively addressed only by a Government that accepts responsibility for dealing with it comprehensively, and by a public that understands its seriousness and is ready to make necessary sacrifices. The declining availability of oil and natural gas will affect virtually all energy prices and consumption patterns in the United States, for the various energy supplies are all part of an integrated energy market. Therefore, in this democratic society, a solution can be found only in comprehensive Government policy-making informed by public comment and supported by public understanding and action.

The Federal Government can pass laws and encourage action. State and local governments can play active roles. But this society can function at its best only when citizens voluntarily work together toward a commonly accepted goal. Washington can and must lead, but the nation's real energy policy will be made in every city, town and village in the country.

The second principle is that healthy economic growth must continue. It is an axiom of public policy that full employment be promoted. The energy problem can be solved without turning off or slowing down America's economic progress. In developing energy policy, measures should be designed to minimize adverse economic and fiscal consequences by returning to the economy funds collected to carry out energy policy. National energy policy can move toward economic rationality while protecting jobs, avoiding rampant inflation, and maintaining economic growth. Conservation initiatives, for example, not only contribute to productivity, but also create a large number of new jobs. Indeed, in the long run, the nation can continue to enjoy economic health only if it solves its energy problems.

The third principle is that national policies for the protection of the environment must be maintained. Energy policy should sustain and improve the quality of life of the American people. It would be ironic if, in moving toward that objective, the nation unnecessarily degraded the quality of the environment and made this country and the planet a less healthful place in which to live.

Virtually every available source of energy has its disadvantages. Storage and combustion of hydrocarbons can pollute the air. Oil imports and drilling on the Outer Continental Shelf present a risk of spills. Strip mining of coal scars the landscape, and deep mining causes deaths through accidents and black lung disease; coal combustion also presents risks to health; liquefied natural gas poses safety problems, as do light-water nuclear reactors. In energy planning, it is necessary to recognize hazards and risks and to reduce them to relatively low levels.

In the long run, there is no insurmountable conflict between the twin objectives of meeting energy needs and protecting the quality of the environment. The energy crisis and environmental pollution both arose from wasteful use of resources and economic and social policies based on the assumption of unlimited and cheap resources. The solutions to many energy and environmental problems follow a parallel course of improving efficiency and harnessing waste for productive purposes.

The fourth principle is that the United States must reduce its vulnerability to potentially devastating supply interruptions. Although conserving energy in general is an important goal, conserving oil has an even higher priority. Continued high vulnerabilty to interruptions of foreign oil supply is unacceptable.

Considerations of national security, as well as the problem of funding ever-increasing balance of payments deficits, suggest rejection of any "solution" to the energy problem through unrestrained growth of oil imports. Continued growth of imports would erode the nation's economic security, promote dissension with allies, and jeopardize America's world leadership. Moreover, the time is approaching when world oil production will no longer be able to supply the United States with increasing levels of imports.

The solution to the problem of vulnerability does not lie in a crash program of production to achieve energy independence. There is no justification for massive, reckless development of all U.S. energy resources, depletion of critical domestic oil and gas reserves, pollution of the environment, draconian conservation measures, and rejection of the substantial economic benefits of oil imports, all in the name of energy independence.

An appropriate and far more sensible goal is relative invulnerability. The United States should be prepared to import foreign oil for a number of years because it is an available source of supply that does not deplete domestic resources. Through effective conservation and increased use of abundant domestic resources such as coal, oil imports can be reduced to a manageable level. A large Strategic Petroleum Reserve, diversification of foreign sources of oil, and contingency plans should help to deter interruptions of foreign oil supply and protect the economy should an interruption occur.

The fifth principle is that the United States must solve its energy problems in a manner that is equitable to all regions, sectors, and income groups. No segment of the population should bear an unfair share of the total burden, and none should reap undue benefits from the nation's energy problems. In particular, the elderly, the poor, and those on fixed incomes should be protected from disproportionately adverse effects on their income. Energy is as necessary to life as food and shelter.

The energy industries need adequate incentives to develop new resources and are entitled to sufficient profits to encourage exploration and development of new finds. But they should not be allowed to reap large windfall profits as a result of circumstances not associated with either the marketplace or their risk-taking. The fourfold increase in world oil prices in 1973–74 and the policies of the oil-exporting countries should not be permitted to create unjustified profits for domestic producers at consumers' expense. By raising the world price of oil, the oil-exporting countries have increased the value of American oil in existing wells. National energy policy should capture that increase in value for the American people. However, where incentives are legitimately needed to stimulate new production, energy policy should allow adequate returns to producers. The distribution of the proceeds of higher prices among domestic producers and consumers must be equitable and economically efficient if the nation is to spread the costs fairly across the population and meet its energy goals.

Some regions of the country, particularly the Gulf Coast States and Appalachia, are large energy producers. Other regions, such as the Rocky Mountain and Great Plains States, have large energy resources which have not yet been extensively developed. And still other regions, such as New England and California, import most of their energy from other regions and other nations. The Plan must assure that policies are equitable across the country, and that the special needs of each region are met. Prices for energy should be reasonably uniform to prevent economic dislocations and unjustified variations in consumer costs.

The environmental quality of producing States and States with untapped resources should be protected by strict standards effectively enforced. Producing States should be fairly compensated, and consuming States should be assured a fair share of energy supplies at reasonable prices.

The Federal Government can enact national policies to further these goals, and can recognize that the States also have important responsibilities for the formulation and execution of energy policy. But States within the various regions must also accept their share of the responsibility for national equity if the U.S. is to avoid "energy Balkanization." It would be desirable for States to develop energy policies that complement the Plan while meeting local and regional needs.

The sixth principle, and the cornerstone of National Energy Policy, is that the growth of energy demand must be restrained through conservation and improved energy efficiency. Conservation and improvement in energy efficiency is the most practical course of action for the United States and for the nations of the world. Conservation is cheaper than production of new energy supplies, and is the most effective means for protection of the environment.

Conservation and improved efficiency can lead to quick results. A significant percentage of poorly insulated homes in the United States could be brought up to strict fuel efficiency standards in less time than it now takes to design, license, and build one nuclear powerplant.

Although conservation measures are inexpensive and clean compared with energy production, they do involve sacrifice and are sometimes difficult to implement. If automobiles are to be made lighter and less powerful, the American people must accept some sacrifice in comfort and horsepower. If industry is required to make energy-saving investments and to pay taxes on the use of scarce fuels, there will be some increases in the cost of consumer products. These sacrifices, however, need not result in major changes in the American way of life or in a reduced standard of living. Automobile fuel efficiency can be greatly improved through better design of cars, and thus gasoline consumption could be significantly reduced without inhibiting Americans' ability to travel. With improved energy efficiency, the impact of rising energy prices can be significantly moderated. Energy conservation, properly implemented, is fully compatible with economic growth, the development of new industries, and the creation of new jobs for American workers. Energy consumption need not be reduced in absolute terms; what is necessary is a slowing down in its rate of growth.

If a conservation program is instituted now, it can be carried out in a rational and orderly manner over a period of several years. It can be moderate in scope, and can apply primarily to capital goods, such as homes, automobiles, factories, equipment, and appliances. If, however, conservation is delayed until world oil production approaches its capacity limitation, it will have to be carried out hastily under emergency conditions. It will then be drastic; and, because there will not be time to wait for incremental changes in capital stock, conservation measures will have to cut much more deeply into patterns of behavior, disrupt the flow of goods and services, and reduce standards of living.

Finally, conservation in America can contribute to international stability by moderating the growing pressure on world oil resources. Indeed, reduction of America's demand for world oil would be a form of assistance to the developing countries.

The seventh principle underlying the National Energy Plan is that energy prices should generally reflect the true replacement cost of energy. Energy prices should move toward a level that reflects the true value of energy in order for market signals to work in harmony with conservation policy. When the cost of expensive foreign oil is averaged with cheaper domestic oil, consumers overuse oil. Government policy that promotes overuse by artificially holding down prices

misleads consumers into believing that they can continue to obtain additional quantities of oil at less than its replacement cost.

Artificially low prices for particular energy sources also distort interfuel competition. The artificially low price of natural gas, for example, has encouraged its use by industry and electric utilities, which could use coal, and has made gas unavailable for new households, which could make better use of its premium qualities.

Neither Government policy nor market incentives can create additional oil or gas in the ground. But from a long-term perspective, prices are an important influence on production and use. As long as energy consumers are enticed into believing that they can continue to pay yesterday's prices for tomorrow's energy, they will continue to use more energy than the nation can really afford, U.S. resources will be rapidly exhausted, and continued overuse will make the inevitable transition more sudden and difficult.

Although producers need incentives for exploration and new development, pricing policies should not give them windfall profits unrelated to their economic contribution. If producers were to receive tomorrow's prices for yesterday's discoveries, there would be an inequitable transfer of income from the American people to the oil and gas producers, and producers' profits would be excessive.

The eighth principle is that both energy producers and consumers are entitled to reasonable certainty as to Government policy. An inadequately organized Federal Government, conflicting signals from different Federal agencies, and unwieldy and confusing regulatory procedures have resulted in major bottlenecks in the development of energy resources. The Plan should resolve a wide range of uncertainties that have impeded the orderly development of energy policy and projects. Some uncertainties are inherent in a market economy, and Government cannot and should not shelter industry from the normal risks of doing business. But Government can and should provide business and the public with a clear and consistent statement of its own policies, rules, and intentions, so that intelligent private investment decisions can be made. In order to be able to provide certainty and consistency in energy policy-making, the Federal energy agencies should be organized into a Department of Energy.

The ninth principle is that resources in plentiful supply must be used more widely, and the nation must begin the process of moderating its use of those in short supply. Although coal comprises 90 percent of domestic fossil fuel reserves, the United States meets only 18 percent of its energy needs from coal. Seventy-five percent of energy needs are met by oil and natural gas although they account for less than 8 percent of U.S. reserves. This imbalance between reserves and consumption should be corrected by shifting from oil and gas to coal and other domestic energy sources.

If the United States is to preserve its scarce reserves of oil and gas and still reduce the growth of imports, policies must be forged to reduce consumption of oil and gas, particularly by automobiles, industry, and electric utilities. As industry reduces its use of oil and gas, it will have to turn to coal and other fuels. The choices for electric utilities for the foreseeable future will be coal and nuclear power.

Expanding future use of coal will depend in large part on the introduction of new technologies that permit it to be burned in an environmentally acceptable manner, in both power plants and factories, for electricity, for process steam, and for heat. Efforts must also be made to perfect processes for low Btu gasification of coal and to develop new technologies for advanced high Btu gasification.

Light-water nuclear reactors, subject to strict regulation, can assist in meeting the nation's total net energy deficit. The 63 nuclear plants operating today provide approximately 10 percent of U.S. electricity, about 3 percent of total energy consumed. That contribution could be significantly increased. The currently projected growth rate of nuclear energy is substantially below prior expectations due mainly to the recent drop in demand for electricity, labor problems, equipment delays, health and safety problems, lack of a publicly accepted waste disposal program, and concern over nuclear proliferation. The Government should ensure that risks from nuclear power are kept as low as possible, and should also resolve problems and unnecessary delays in the nuclear licensing process.

To the extent that electricity from coal is substituted for oil and gas, the total amounts of energy used in the country will be somewhat larger due to the inherent inefficiency of electricity generation and distribution. But conserving scarce oil and natural gas is more important than saving coal.

The tenth principle is that the use of nonconventional sources of energy must be vigorously expanded. Relatively clean and inexhaustible sources of energy are a hopeful prospect, as supplements to conventional energy resources in this century, and as major sources of energy in the next. Many of these sources permit decentralized production, and thus provide alternatives to large, central systems. Traditional forecasts of energy use assume that nonconventional resources, such as solar and geothermal energy, will play only a minor role in the energy future. Unless positive and creative actions are taken by Government and the private sector, these forecasts will become self-fulfilling prophecies. Other technologies that increase efficiency of energy use, such as cogeneration of industrial process steam and electricity, should also be encouraged.

The Plan should not be premised on technological miracles. But nonconventional technologies are not mere curiosities. Steady technological progress is likely, breakthroughs are possible, and the

estimated potential of nonconventional energy sources can be expected to improve. Many nonconventional technologies are already being used, and with encouragement their use will grow. Because nonconventional energy sources have great promise, the Government should take all reasonable steps to foster and develop them.

THE BROAD PERSPECTIVE

The U.S. has three overriding energy objectives. As an immediate objective, which will become even more important in the future, the U.S. must reduce its dependence on foreign oil to limit its vulnerability to supply interruptions. In the medium term, the U.S. must weather the stringency in world oil supply that will be caused by limitations on productive capacities. In the long term, the U.S. must have renewable and essentially inexhaustible sources of energy for sustained economic growth. The strategy of the Plan contains three major components to achieve these objectives.

First, by carrying out an effective conservation program in all sectors of energy use, through reform of utility rate structures, and by making energy prices reflect true replacement costs, the nation should reduce the annual rate of growth of demand to less than 2 percent. That reduction would help achieve both the immediate and the medium-term goals. It would reduce vulnerability and prepare the nation's stock of capital goods for the time when world oil production will approach capacity limitations.

Second, industries and utilities using oil and natural gas should convert to coal and other abundant fuels. Substitution of other fuels for oil and gas would reduce imports and make gas more widely available for household use. An effective conversion program would thus contribute to meeting both the immediate and the medium-term goals.

Third, the nation should pursue a vigorous research and development program to provide renewable and other resources to meet U.S. energy needs in the next century. The Federal Government should support a variety of energy alternatives in their early stages, and continue support through the development and demonstration stage for technologies that are technically, economically, and environmentally most promising.

The Plan seeks to achieve the overriding objectives by other means as well. To reduce vulnerability, the Strategic Petroleum Reserve should be expanded, foreign sources of oil should be diversified, and contingency plans should be put in place. To help weather the approaching capacity limitations on world oil production, incentives should be provided to encourage new production in Alaska, on the Outer Continental Shelf, and from advanced recovery techniques. Potential new sources of gas hold great promise and should be developed.

Conversion from oil and gas to coal should be facilitated by development of more environmentally acceptable methods for using coal.

The 10 principles of the National Energy Plan provide a realistic framework for these actions. By pursuing conservation, bringing energy prices into line with replacement costs, and expanding the use of coal, the U.S. can reduce oil imports to an acceptable level and prepare for the coming stringency in oil supplies. Backed by a large Strategic Petroleum Reserve, a more diversified set of foreign oil suppliers, and contingency plans, the United States can reduce its vulnerability to supply interruptions to an acceptable level. Measures can be designed to assure that American workers, the poor, and the elderly do not suffer as a result of rising prices. Economic growth can be promoted and inflationary pressures kept within bounds. Regional and environmental imbalances can be recognized and corrected with maximum equity. And nonconventional sources of energy can be promoted to meet long-term needs.

The United States is at a turning point. It can choose, through piecemeal programs and policies, to continue the current state of drift. That course would require no hard decisions, no immediate sacrifices, and no adjustment to the new energy realities. That course may, for the moment, seem attractive. But, with each passing day, the nation falls farther behind in solving its energy problems. Consequently, its economic and foreign policy position weakens, its options dwindle, and the ultimate transition to stringency in oil supplies and higher oil prices becomes more difficult.

An alternative to continued drift is the comprehensive National Energy Plan, set forth in the next five chapters. Chapter IV describes the Plan's conservation and fuel efficiency program. Chapter V contains proposals for the pricing of oil and natural gas and for resolving other issues affecting those resources. Chapter VI presents the Plan's program for conversion to coal and other fuels, and its programs for nuclear and hydroelectric power. Chapter VII presents initiatives for the development of nonconventional resources and sets forth the Administration's policy toward energy research and development. Chapter VIII addresses the role of government and the public in formulating and carrying out energy policy. It discusses, in particular, the establishment of national energy goals, the creation of the Department of Energy, the development of a national energy information system, competition within the energy industries, the role of the States, assistance to people with low incomes, and public participation. Finally, Chapter IX discusses the impacts of the Plan.

CHAPTER IV–THE NATIONAL ENERGY PLAN: CONSERVATION AND ENERGY EFFICIENCY

The cornerstone of the National Energy Plan is conservation, the cleanest and cheapest source of new energy supply. Wasted energy—in cars, homes, commercial buildings and factories—is greater than the total amount of oil imports. By reducing the need for additional oil imports, conservation and improved efficiency in the use of energy can contribute to national security and international stability. By reducing the need for additional domestic energy production, conservation can contribute to environmental protection and to an adequate supply of capital for balanced economic growth.

America needs to embrace the conservation ethic. The attitudes and habits developed during the era of abundant, cheap energy are no longer appropriate in an era of declining supplies of America's predominant energy sources. Conservation offers vast opportunities for American creativity and know-how. The challenge of saving energy should galvanize the ingenuity and talents of the American people. As individual Americans find new ways to save energy in their daily lives, they will reduce their own energy bills and contribute to the future well-being of the country.

In buying durable goods, in deciding how to travel to work or how to spend leisure time, and in making countless other decisions, Americans will have to be conscious of the rising price of energy, and will have to emulate the shrewdness and practicality of earlier generations. For example, when buying a home, a car, or an appliance, consumers ought to consider not only an item's initial cost, but also its annual operating cost—including its energy consumption. In many cases, an item that is initially more expensive will actually prove to be cheaper over a period of years.

If vigorous conservation measures are not undertaken and present trends continue, energy demand is projected to increase by more than 30 percent between now and 1985. Americans can eliminate energy waste through effective conservation and improved energy efficiency in transportation, buildings, and industry.

TRANSPORTATION

Transportation consumes 26 percent of U.S. energy, and about half of that is used by automobiles. About 5 million barrels of oil per day

are consumed by automobiles. Domestically manufactured automobiles use considerably more gasoline than imported cars. (See Figure IV–1.) More efficient, lighter, and less powerful cars would save a substantial amount of gasoline. Carpooling could also save significant quantities of gasoline. If 4 commuting cars out of 10 carried 1 additional passenger, 2.5 percent of total oil consumption, about 400,000 barrels per day, could be saved. No serious energy policy can ignore these opportunities for large savings.

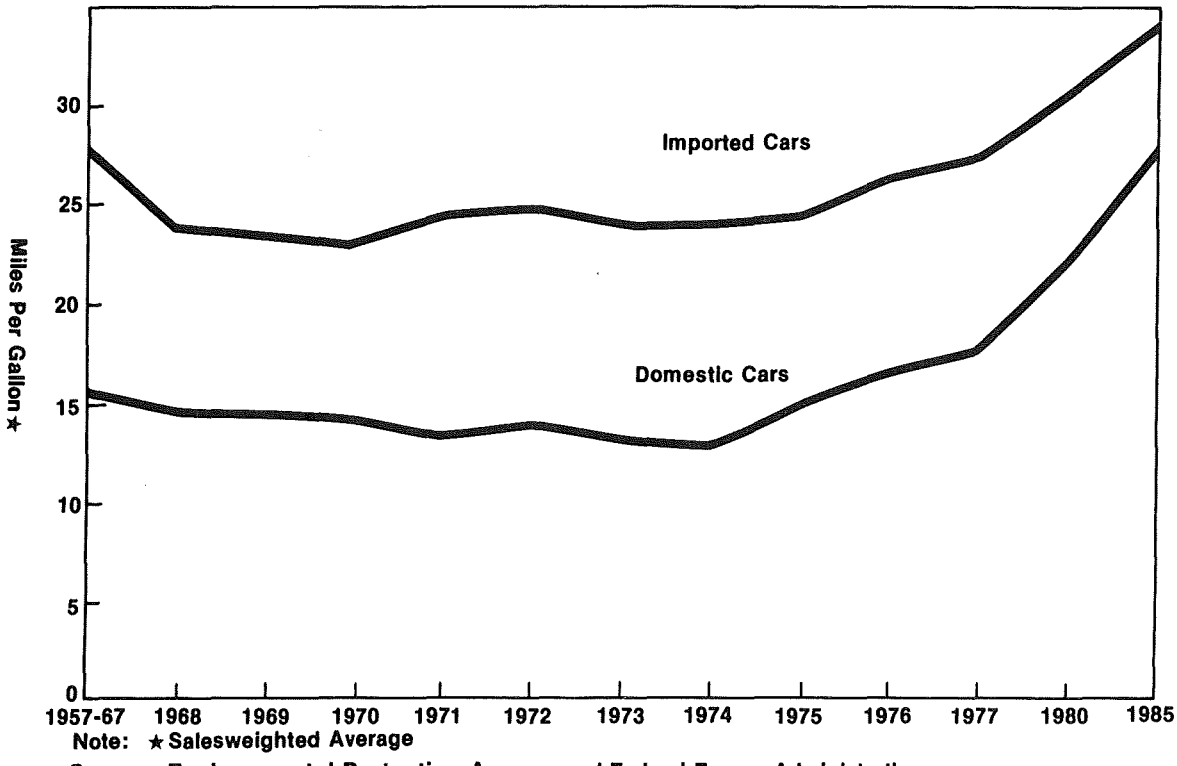
Overseas, there is no greater symbol of American energy waste than the heavy, powerful, accessory-laden American automobile. An average new car in Europe weighs about 1,900 pounds; in the United States, about 3,300. From the perspective of energy efficiency, a major problem with American cars is their weight and power, not necessarily their interior size. With better design and other improvements, family size cars could be considerably more fuel efficient.

In late 1975, the Congress enacted legislation requiring that the average mileage of new cars be 20 miles per gallon by 1980, and 27.5 miles per gallon by 1985, compared to 14 miles per gallon actually achieved in 1974. However, many consumers still appear to prefer heavier cars with high acceleration and low fuel efficiency. It is questionable whether the penalties for noncompliance by manufacturers are strong enough to assure that the current statutory standards will be met. The present legislation is, therefore, insufficient to ensure the kind of reductions that are needed in the transportation sector. Reduction in gasoline consumption is necessary. Accordingly, the Plan proposes a national goal to reduce gasoline consumption 10 percent by 1985.

To help achieve that goal, a graduated excise tax would be imposed on new automobiles with fuel efficiency below the fleet average levels required under current legislation. Graduated rebates would be given for new cars with mileage better than the standard. The tax schedule would be fixed by statute, and taxes would rise from 1978 to 1985 and remain constant thereafter. The rebate schedule would be set by the Internal Revenue Service so that total estimated rebate payments would be equal to estimated tax receipts, with no gain or loss to the Treasury. The rebate schedule would be fixed in advance so that manufacturers and consumers would know the exact amount of tax or rebate for every car. Rebates would be available for cars purchased after May 1, 1977. These rebates would be paid from taxes collected on 1978 fuel inefficient vehicles.

Examples for the model year 1985 illustrate the operation of the tax-rebate system. In that year the statutory standard will be 27.5 miles per gallon. A car with at least 20.5 miles per gallon but less than 21.5 would bear a tax of $610; and a car with less than 12.5 miles per

Fuel Economy For New Automobiles



Note: ★ Salesweighted Average

Source: Environmental Protection Agency and Federal Energy Administration.

Figure IV-1

gallon would bear a tax of $2,488, the maximum under the proposed system. In the same year, a car with 30.5 miles per gallon would earn a rebate of $176; a car with 34.5 miles per gallon would earn a rebate of $362; and a car with 38.5 miles per gallon or above would earn a rebate of $493. The statutory maximum would be $500. Actual rebates might differ from these estimates, depending on the estimate that will be made in 1984 of the composition of new car sales during the 1985 model year, and the tax receipts that would result from that composition.

Cars manufactured in the United States or Canada would be eligible for rebates; for cars manufactured in other countries, rebates would be provided only after agreements were reached with individual countries. The President's Special Representative for Trade Negotiations will work with other nations to develop equitable rebate agreements.

Electric vehicles would be eligible for the maximum rebate. These vehicles consume no gasoline and are a clean method of transportation for intra-urban use. Electric delivery trucks have long been used in Europe.

The Administration intends to continue the progress that has been made to date on automobile fuel efficiency. The Secretary of Transportation will begin the analytic work necessary to examine how his authority should be used to raise mileage standards above 27.5 miles per gallon beyond 1985.

The tax on fuel inefficient new cars will not reach old cars, and it will not directly influence the number of miles driven. A further measure is necessary to help meet the goal of a 10 percent reduction in gasoline consumption by 1985. Accordingly, a program is proposed to establish annual targets for gasoline consumption, backed by a standby tax on gasoline.

A gasoline tax is a highly effective measure for conservation because it affects all cars and all drivers. However, in order to provide maximum scope for citizen action, the tax would not be imposed as long as Americans achieved specified annual gasoline consumption targets. The proposal would challenge the American people to reduce gasoline consumption through use of more efficient cars, increased use of car pools and van pools, compliance with the 55-miles-per-hour speed limit, more efficient driving, regular maintenance, and reduced use of cars. If the American people join together to meet this challenge, the standby tax will never take effect.

The targets established in the standby tax program would permit limited annual increases in gasoline consumption from 7.35 million barrels per day in 1978 to 7.45 million in 1980. From 1980 to 1987, when fuel-efficient cars will become a sizable share of the total automobile fleet, the program would require annual reductions in gasoline consumption. The target in 1985 would be 6.60 million barrels per day.

Under the program, no tax could go into effect until 1979. In 1979 or any subsequent year, the tax would go into effect if gasoline consumption in the preceding year exceeded the target by at least 1 percent. The amount of the tax would equal 5 cents for each percent that gasoline consumption exceeded the target in the preceding year. The tax could be reduced by 5 cents a year based on the formula in the legislation. The tax could not increase or decrease more than 5 cents per year and it could never exceed 50 cents.[1]

Funds collected from the standby gasoline tax would be rebated progressively to the public. For each five cents of tax imposed, nearly $6 billion in revenue would be generated. These revenues would be rebated on a per capita basis in the amount of $25 to each person per year or a payment of $100 for a family of four. If a tax of twenty-five cents were to be imposed, each citizen would be eligible for a payment of $125, or $500 for a family of four.

Passenger automobiles are not the only wasteful vehicles. Under the Energy Policy and Conservation Act, the Secretary of Transportation plans to promulgate by next July efficiency standards for light-duty trucks weighing 6,000 pounds or less. Once those standards are in effect, these vehicles will become subject to a tax-rebate system similar to that for automobiles. The President has directed the Secretary to commence a proceeding to cover trucks weighing over 6,000 pounds.

Legislation is requested to remove the 10 percent excise tax on intercity buses. Buses, like railroads, are fuel-efficient forms of transportation that deserve encouragement.

The existing Federal gasoline tax on aviation fuel would be raised to 11 cents per gallon except for use by commercial airlines and in farming. The current rebate of half of the Federal excise tax on fuel used by motorboats would be eliminated. Revenues from the elimination of that rebate would go to the Land and Water Conservation Fund.

The Federal Government itself must set an example in reducing gasoline consumption. The President is issuing an Executive Order requiring that the Federal fleet of new cars meet an average mileage standard that will rise from 2 miles per gallon above the average fuel economy standard applicable in 1978 to 4 miles per gallon above in

[1] The tax would increase if an annual target is exceeded and would decrease if an annual target is met. For example, if standby tax legislation is enacted in 1977, the first target would be for 1978. If the target is exceeded by 0.5 percent in 1978, no tax would go into effect for 1979, because the tax is triggered only by an excess of at least 1 percent. If the 1979 target is exceeded by 10 percent, a 5-cents-per-gallon tax would go into effect for 1980; regardless of the amount of excess, no increase in the tax can be more than 5 cents for any year. If the 1980 target is exceeded by 1 percent, the 5-cents-per-gallon tax would remain in effect without any increase because the tax can reach 10 cents per gallon only if the excess in the previous year was at least 2 percent. If the 1981 target is exceeded by 2 percent, the tax would increase to 10 cents per gallon for 1982. If in 1982 consumption is 25 percent below the target, the tax for 1983 would decrease from 10 cents per gallon to 5 cents per gallon. No decrease in the tax can be more than 5 cents per gallon for any year.

1980 and thereafter. This initiative not only will save gasoline, but also will provide incentives for the development of more fuel-efficient vehicles.

The Federal Government will also initiate a major van pooling demonstration program in areas not served by mass transit. About 6,000 vans will be purchased by the Federal Government and made available to Federal employees. All costs of the program will be repaid to the Federal Government by the riders.

If it should appear that the goal of a 10 percent reduction in gasoline consumption by 1985 is not being achieved, additional measures, including a tax on commuter parking and minimum automobile mileage standards, would have to be considered.

Beyond this Federal program, States and localities can promote gasoline conservation through local initiatives. Observance of the national 55-miles-per-hour speed limit should be vigorously enforced by States and municipalities. The Secretary of Transportation has authority to withhold Highway Trust Fund revenues from States not enforcing the 55-miles-per-hour speed limit. If the widespread noncompliance and lack of enforcement continue, the Secretary may find it necessary to exercise that authority.

Inspection and maintenance programs to determine compliance with the Clean Air Act can also provide gasoline savings. In areas where air quality indicates a need for inspection and maintenance, gasoline savings of 2 percent can be achieved.

Reduction in gasoline consumption will entail a loss of revenues to the States from their taxes on gasoline, which are used to operate and maintain highways. A way needs to be found to ease this additional burden on State treasuries. The Administration will develop a program to compensate them for this loss though sources such as the Highway Trust Fund.

In the long run, mass transit by bus and rail must play a significant role in reducing energy consumption in the transportation sector. Reliable, inexpensive mass transit is needed to serve existing, spread out metropolitan areas. New development patterns based on public transportation can bring homes and offices, churches and schools, shops and other community buildings together, and at the same time conserve energy. The nation must begin to explore a system of incentives for more efficient transportation just as it is creating disincentives for inefficient transportation.

BUILDINGS

Currently, there are approximately 74 million residential units in the United States, and 1.5 million nonresidential buildings with some 29 billion square feet of floor space. Almost 20 percent of U.S. energy

is used to heat and cool buildings. Some of these buildings needlessly waste as much as half of that energy. The hermetically-sealed glass and steel skyscraper is the analogue of the gas-guzzling automobile. The energy inefficiency of American buildings is a direct result of the cheap energy era in which most of these structures were built.

The potential savings from improving the energy efficiency of the nation's stock of buildings are enormous. Installation of ceiling and roof insulation, weatherstripping of doors and windows, caulking of cracks, installation of clock thermostats, and simple furnace modifications could result in substantial energy savings.

The Plan includes a national program designed to bring 90 percent of all residences and many public and other buildings up to minimum Federal standards by 1985. The program contains the following elements:

First, homeowners would be entitled to a tax credit of 25 percent of the first $800 and 15 percent of the next $1,400 spent on approved conservation measures. The credits would be available for measures undertaken between April 20, 1977, and December 31, 1984. A list of eligible measures will be included in proposed legislation.

Second, State public utility commissions would be required to direct their regulated utilities to offer their residential customers a "turnkey" conservation service, financed by loans repaid through monthly bills. Utilities would also inform customers of other available conservation programs, and advise them how to obtain financing, materials, and labor to carry out conservation measures themselves. Other fuel suppliers will be encouraged to offer similar programs, with the help of State energy offices.

Third, the Federal Government will remove the barriers to opening a secondary market for residential energy conservation loans through the Federal Home Loan Mortgage Corporation and the Federal National Mortgage Association. This action should help to ensure that capital is available to homeowners at reasonable interest rates for residential energy conservation through private lending institutions.

Fourth, increased funds would be available to aid people with low incomes to weatherize their homes. Under this proposal, $130 million would be provided in fiscal 1978, $200 million in 1979, and $200 million in fiscal year 1980. The Secretary of Labor has been directed to take all appropriate steps to ensure that recipients of funds under the Comprehensive Employment Training Act (CETA) will supply labor for the weatherization effort. The CETA program's employment levels, as proposed by the Administration, would meet the labor requirements of the low-income weatherization program.

Fifth, the Department of Agriculture has begun a rural home conservation program in cooperation with rural electric cooperatives with loans provided through the Farmers Home Administration.

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Sixth, businesses would be entitled to a 10 percent tax credit for investments in approved conservation measures, in addition to the existing investment tax credits. A list of approved measures would be included in the legislation. The credit would be available to owners of apartment buildings, and tenants should benefit from the impact of reduced energy costs on rents.

Seventh, a Federal grant program would assist public and nonprofit institutions such as schools and hospitals in conservation. The program would be funded at the rate of $300 million per year for 3 years.

Eighth, the Local Public Works Program, under which the Federal Government provides funds for public works projects for State and local government units, will include repair of State and local government buildings. The Department of Commerce, which administers the program, will strongly encourage State and local governments to include in their proposals actions that will contribute to energy conservation.

Except for participation by electric and gas utilities, the proposed national program is a voluntary one. It does not initially include any intervention by the Federal Government into the homes of individual Americans. The American people already have ample incentives for improving the energy efficiency of their homes. Home heating and cooling bills have risen dramatically in recent years, and the prices for all fuels used in home heating and cooling will rise even more in the future. The program provides the means for carrying out conservation measures: tax credits, federally encouraged loans, and the assistance of utilities. If, however, the present reliance on voluntary measures is insufficient to achieve widespread residential energy conservation, then mandatory measures will be considered, such as a requirement that homes be insulated before they are sold.

New buildings should also be energy efficient. The President is directing the Department of Housing and Urban Development to advance by 1 year, from 1981 to 1980, the effective date of the mandatory standards required by the Energy Policy and Conservation Act. Funds will be made available to States to help them in this effort.

The President is issuing an Executive Order to upgrade the efficiency of Federal buildings. He is directing all Federal agencies to adopt procedures which aim at reducing energy use per square foot by 1985 by 20 percent from 1975 energy consumption levels for existing Federal buildings and by 45 percent for new Federal buildings. Investments which are not cost-effective would not be funded under the program. The Director of the Office of Management and Budget and the Administrator of the Federal Energy Administration will implement this program.

Finally, the Administration will request appropriations of up to $100 million over the next 3 years to add solar hot water and space heating to suitable Federal buildings to reduce consumption of conventional fuels and demonstrate the feasibility of widespread solar energy use.

APPLIANCES

Major home appliances such as furnaces, air-conditioners, water heaters, and refrigerators account for 20 percent of the nation's energy consumption.[2] Most of these appliances could achieve significant reductions in energy use with relatively small increases in cost. Current legislation relies mainly on voluntary efforts to meet industry-wide average targets, and permits the establishment of mandatory standards only after long delays. New legislation is proposed to streamline the regulatory process. The present voluntary program will be replaced by mandatory minimum standards on certain major home appliances as soon as possible. The National Bureau of Standards will continue to develop procedures to test the energy efficiency of appliances. The Federal Energy Administration will continue to promulgate test procedures. The Federal Trade Commission will establish labeling requirements.

FUEL EFFICIENCY IN INDUSTRY

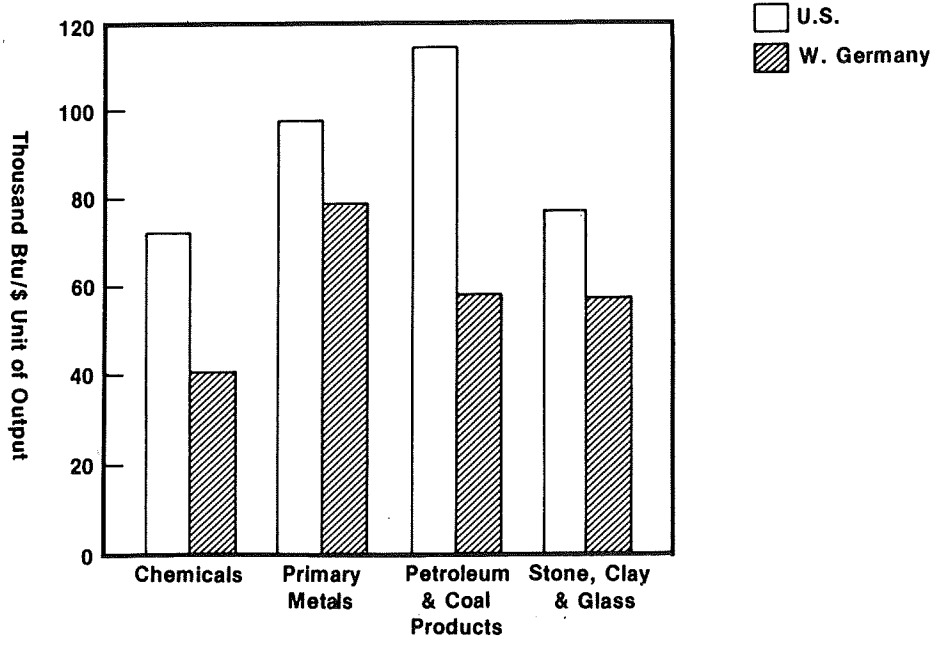
Industry accounts for 37 percent of the nation's energy consumption. Since the 1973–74 oil supply interruption, industry has done better than other sectors in conserving energy, but still has a large potential for further savings. For example, various U.S. industries are substantially less fuel efficient than their West German counterparts. (See Figure IV–2.) Industrial firms have an incentive to make energy-saving investments that are cost-effective from their own perspective. The price industry pays for much of the energy it consumes is not the marginal cost of energy, but rather a "rolled in" average cost, and often industrial firms receive volume discounts. In many cases, energy costs are small relative to the first costs of energy-saving investments. Therefore, energy-saving investments frequently have a lower value to industry than to society.

The oil and gas pricing program, described in Chapter V, and the taxes on industrial and utility use of oil and gas, described in Chapter VI, would provide substantial improvement in overall industrial energy efficiency.

To achieve greater savings within the industrial sector, an additional 10 percent investment tax credit would generally be available

[2] This figure includes the heating and cooling of buildings.

U.S. Industry Energy Efficiency Compared to West Germany, for Major Energy-Intensive Industries



Source: Comparison of Energy Consumption Between W. Germany & the U.S., Stanford Research Inst., June 1975.

Figure IV-2

for investments in energy-saving equipment, including solar energy systems. A list of types of eligible investments would be included in the legislation. The Secretary of the Treasury would have authority to add items to the list and to delete items that do not effectively conserve energy after consultation with the Administrator of the Federal Energy Administration.

COGENERATION AND DISTRICT HEATING

About three-quarters of the energy used by industry actually performs useful work; the rest is waste heat. In addition, two-thirds of the energy used in electricity generation and distribution is wasted. In 1975, waste heat from these sources was equivalent to over 7 million barrels of oil per day.

One way to use this waste heat is through cogeneration, the simultaneous production of process steam and electricity. Cogeneration provided 15 percent of U.S. energy as recently as 1950, but now contributes only 4 percent.

Although cogeneration is economical today and will become increasingly attractive as energy prices rise, a variety of institutional barriers impede its development. A program is proposed to remove these barriers by assuring that industrial firms generating electricity receive fair rates from utilities for both the surplus power they would sell and for the backup power they would buy. Industries using cogeneration to produce electricity could be exempted from State and Federal public utility regulation, and would be entitled to use public utility transmission facilities to sell surplus power and buy backup power. An additional tax credit of 10 percent above the existing investment tax credit would be provided for industrial and utility cogeneraton equipment. Finally, industrial firms and utilities which invest in cogeneration equipment could be exempted from the requirement to convert from oil and gas in cases where an exemption is necessary for cogeneration. Cogeneration would reduce the capital requirements of electric utilities.

Another productive use of waste heat which should be fully explored is district heating. State public utility commissions should give close attention to this option in their processing of applications for new utility generating capacity.

The Government proposes to demonstrate a commitment to district heating by funding in fiscal 1978 a program to make use of the large quantities of waste heat generated by facilities of the Energy Research and Development Administration. ERDA would recover the waste heat for use on site and would also pipe steam and hot water to nearby households, industry, and agriculture. After a study of the feasibility of this concept, actual implementation of the program could occur at ERDA's facilities at Oak Ridge, Tennessee; Paducah, Kentucky; Portsmouth, Ohio; and Savannah River, South Carolina.

The Plan seeks to achieve the large savings available from productive use of waste heat through positive incentives. Careful review will be made of progress in the use of waste heat. If industry and utilities do not respond adequately, consideration will be given to a tax on waste heat or other direct measures to reduce this loss of energy.

UTILITY REFORM

Conventional utility pricing policies discourage conservation. The smallest users commonly pay the highest unit price due to practices such as declining block rates. Rates often do not reflect the costs imposed on society by the actions of utility consumers. The result is waste and inequity.

Electrical energy is difficult and expensive to store, so a utility's need for plant and equipment is determined by its peak demand. If electricity consumption during peak periods were reduced, fewer costly new additions to utility capacity would be needed. Equally important, since peaking units commonly burn oil and gas, a reduction in peak demand would save these scarce fuels.

Accordingly, comprehensive utility reform legislation is proposed. State public utility commissions would require their regulated utilities to reform rate structures in the interest of conservation and equity. Such reform would be a prerequisite to future rate increases. The program includes the following elements:

—Electric utilities would be required to phase out promotional, declining block, and other rates that do not reflect costs; gas utilities would also be required to phase out declining block rates.

—Electric utilities would be required to offer either daily off-peak rates to each customer who is willing to pay metering costs, or provide a direct load management system. Off-peak rates would provide a strong incentive for customers, particularly industrial customers, to shift energy use from peak to off-peak periods. Similarly, homeowners would have an incentive to wash dishes and clothes at night when rates were lower, or to install equipment that stores energy during off-peak hours for use during peak hours.

—Electric utilities would be required to offer lower rates to customers who are willing to have their power interrupted at times of highest peak demand.

—Master metering—the use of a single meter for multi-unit buildings or complexes—would generally be prohibited in new structures. Individual metering induces energy conservation, in some cases as much as 30 percent.

—Electric utilities would be prohibited from discriminating against solar and other renewable energy sources.

—the Federal Government would be authorized to adopt, and require implementation of, similar policies applicable to gas utilities.

Utility interconnections and power pools make possible economies of scale, reduction of aggregate capacity requirements, and sharing of power during emergencies. Expansion of interconnections and achievement of maximum efficiency from pools are primarily the responsibility of the utility sector, which has been active in this area.

The Federal Government will follow closely the further progress of the utility sector. A proposed amendment to the Federal Power Act would remove a major gap in the authority of the Federal Power Commission by authorizing it to require interconnections between utilities even if they are not presently under FPC jurisdiction. The FPC would also be authorized to require wheeling the transmission of power between two noncontiguous utilities across another utility's system.

SAVINGS FROM CONSERVATION

Many conservation measures can be implemented with relatively little cost. Conservation involves sacrifice mainly where a cherished prerogative is given up. Many American drivers have come to enjoy instant acceleration, but as oil becomes increasingly scarce, the highly powered automobile will become increasingly anachronistic. Some moderate sacrifice today will help avoid major jolts and far more painful sacrifices in the future.

There are many ways that individual Americans can save energy beyond those specific measures included in the National Energy Plan. Individuals can keep their homes at 78° F. during the summer and at 65° F. during the winter. They can walk or ride bicycles or join carpools, instead of driving alone. They can combine several shopping trips into one. And, they can maintain their energy-using equipment—furnace, car, appliances—in good operating condition, so as to reduce energy waste.

The value of the proposed conservation program can be illustrated by comparing the cost of savings from conservation with the cost of oil imports. Conservation reduces the need for imported oil costing about $13.50 per barrel through investment in insulation, lighter automobiles, clock thermostats, and other capital equipment. The costs of the capital equipment can be expressed in terms of the cost of each barrel of oil equivalent which the equipment saves. The resulting costs vary. For example, the effective cost of a barrel of oil equivalent saved under some of the Plan's proposed conservation measures are: less than $2 for cogeneration; $3.50 for mandatory standards for new commercial construction; and about $7.50 for tax credits for commercial and industrial investments in energy-saving retrofits or mandatory standards for new residential construction. In short, conservation pays.

Chapter V.–The National Energy Plan: Oil and Natural Gas

Oil and natural gas are currently the nation's primary energy sources. They provide three-quarters of U.S. energy consumption, but constitute less than 8 percent of domestic reserves. National policy toward oil and gas has been erratic, complex, and ineffective. Continuing uncertainties, particularly as to price, have retarded both production and conservation investment. The United States needs a clearly defined oil and gas policy that provides both producer incentives and consumer protection.

THE CONTEXT OF OIL AND NATURAL GAS PRICING

Both oil and natural gas are now priced domestically below their marginal replacement costs, and as a result they are overused. By holding down the price of domestic oil and "rolling in" the higher price of foreign oil, the United States has actually subsidized oil imports. The entitlements program, designed to equalize the cost of foreign and domestic oil to U.S. refiners, has become an administrative nightmare. Current mandatory oil price controls are scheduled to expire in 1979; and there is great uncertainty as to what system of controls, if any, will exist in the future.

As a result of present price controls on natural gas, discount rates offered by gas utilities, and environmental concerns, large quantities of natural gas are burned by industry and utilities. Consequently, it has become unavailable for use in new homes in many areas of the country. The movement of natural gas from producing to nonproducing States has been discouraged; and serious regional shortages, like the one this past winter, could occur in the future.

The time has come to recognize that, regardless of Government policy, the production of oil and natural gas will cost more in the future than it has in the past. Newly discovered fields are more expensive to develop than existing fields, and additional recovery from existing fields by nonconventional means is more expensive than recovery by conventional means.

It is also time to face up to the realities of the price of foreign oil. It has sometimes been argued that the oil-producing countries should not determine the price of oil in the United States. But, despite all the rhetoric and protestations to the contrary, the fact is that as long as a large percentage of U.S. oil consumption is imported, the world

price of oil will continue to be the real cost to the U.S. economy of every extra barrel consumed.

In 1973–74, the oil-producing countries raised the world oil price fourfold. Deregulation of oil and gas prices would make U.S. producers the beneficiaries of those arbitrary price rises, and yield windfall profits from the increased value of oil and gas in existing fields. The producers have no equitable claim to that enhanced value because it is unrelated to their activities or economic contributions.

Government policy must now address the fundamental economic facts of oil and natural gas supply, and the deficiencies and uncertainties of the current system of price controls. It should provide for prices that encourage development of new wells through a more effective distribution of production incentives, but should also prevent windfall profits. It should protect consumers from profiteering, but should also promote conservation by confronting them with the real cost of oil and gas in the energy marketplace.

To achieve these purposes, a new system for pricing oil and natural gas is required. The Administration is proposing a system under which price controls would be made more consistent with national energy policies. Producers would be given adequate price incentives for development of new fields. A crude oil equalization tax would bring the cost of domestic oil up to the world price. It would raise the price of oil to its true replacement cost, and thereby encourage conservation. The proceeds of the tax, which represent the enhancement of value of domestic oil caused by OPEC price increases, would be distributed to the American people on an equitable basis.

Price controls on natural gas would be reformed as a first step toward market pricing through a formula that relates the price of gas to the price of oil.

OIL PRICING

Under the Energy Policy and Conservation Act (EPCA) passed in December of 1975, producers generally are subject to a price ceiling of either $11.28 per barrel for new oil, or $5.25 per barrel for old oil. These pricing regulations encourage additional production from existing fields. However, oil from higher cost new field development is denied the full incentive of the $13.50 world price.

The President's position has been that price controls on oil should be retained as long as world oil prices remain subject to arbitrary control, and domestic supplies are insufficient to meet domestic needs. Therefore, the Plan calls for creation of a new long-range pricing system.

The price of newly discovered oil would be allowed to rise over a 3 year period to the current 1977 world oil price, adjusted to keep pace with the domestic price level. Thereafter, the price of newly discovered oil would be adjusted for subsequent inflation. This measure

would establish a domestic incentive price for frontier oil, separate from post-1977 OPEC world prices.

The incentive price would be limited to new discoveries by a definition of "new oil" applicable to oil produced from any well more than 2½ miles from a currently existing onshore well. A well more than 1,000 feet deeper than any existing well within a 2½-mile radius would also qualify for the new oil price. Offshore, only oil discovered on new Federal leases granted on or after April 20, 1977, or old leases which had been abandoned and are subjected to re-leasing by the Government would qualify for this new price.

This price should provide all the incentives needed for the development of new oil production in the United States. It would yield one of the highest production incentives available to producers anywhere in the world. It is more, for example, than the level of producer revenues in the North Sea, where exploration takes place in extremely deep water and thirty-foot waves are commonplace.

There is little or no basis for the assertion that the only reasonable price for all domestic production is the world oil price. In addition to enjoying under this program one of the highest incentives for new oil production available to any producers in the world, the domestic oil industry would find it difficult in the short-run to utilize additional incentives due to physical limitations on the availability of drilling rigs and related equipment. It would make little sense to provide incentives that could not be fully used. This pricing approach would provide the incentives in the future that would produce more energy, rather than increasingly expensive energy.

The increase in producer revenues from new discoveries of oil would provide an incentive for new production, while ensuring that there would be no windfall profits on conventional production from existing wells. Total deregulation would result in a massive transfer of income from the American public to the oil and gas producers, amounting to $14 to $15 billion, nearly 1 percent of the U.S. gross national product.

The $5.25 and $11.28 price ceilings for previously discovered oil would be allowed to rise at the rate of inflation. Where it could be shown on a case-by-case cost basis that the $5.25 ceiling makes production from a marginal well uneconomic, that well would be eligible for the $11.28 price ceiling.

Stripper wells and new tertiary recovery from old fields would receive the world oil price.

In order to ensure that market decisions by consumers are based on the real value of oil, all domestic oil would become subject at the wellhead in three stages over a 3 year period to a crude oil equalization tax equal to the difference between its controlled price and the world price. The first increment of the tax would be applied on January 1, 1978, with two subsequent increments on January 1, 1979 and January 1, 1980. Once the full tax was in place, it would increase in accordance

with the world price of oil. However, authority would exist to prevent increases in the tax if the world price increased significantly faster than the level of domestic prices.

To protect consumers, net revenues from the equalization tax would be returned to them in the form of a per capita energy credit against other taxes or in the longer run as part of general tax reform. These "energy payments" would result in lower withholding from weekly paychecks to make it unnecessary to wait a full year for the benefit of the energy credit. The poor who do not pay taxes would also be entitled to their per capita share of these tax revenues. Most would receive their payment through existing income maintenance programs. The remainder would collect their energy payment by applying to one of the existing State agencies through which Federal funds are now distributed. It would be up to each State to designate which agency, or group of agencies, would have the responsibility for distributing energy payments. If the funds from the equalization tax were distributed on this basis in 1980, when the tax is fully in effect, a family of four would receive $188 in energy payments. Home heating oil users would receive an additional share of the equalization tax as a dollar-for-dollar reduction in price when they buy fuel oil.

The oil tax would establish a more realistic energy pricing system, with no net gain to the Treasury, and no net loss to consumers as a group. Once the tax is fully in effect, all domestic oil would have the same price (after tax), and the entitlements program would be terminated, and certain related regulatory activities could be phased out. The entitlements program would be retained in a standby status.

NATURAL GAS PRICING

The Natural Gas Act never contemplated the dramatic increase in demand for natural gas which has resulted from the sudden quadrupling of the world price of oil in 1973–74 and from growing environmental concern in recent years. As a result of regulation under that Act, natural gas is now substantially underpriced, and there is excess demand. Existing supplies are being wasted on nonessential industrial and utility uses. A pricing policy which evolved at a time when gas was a surplus by-product of oil production is no longer sensible in a world where gas is a premium fuel in short supply.

Natural gas price regulation based on historic costs was workable when there were abundant supplies of natural gas. Similarly, the distinction between the unregulated intrastate and regulated interstate markets made little practical difference as long as gas was a cheap, surplus fuel. Producer claims that historic cost-based regulation is no longer appropriate for a premium fuel in short supply are fundamentally correct. But for precisely the same reason, the intrastate-interstate distinction has also become unworkable, indeed intolerable, as the limited amount of new gas increasingly flows to the unregulated intra-

state market at the expense of interstate consumers. The shift in the natural gas market from surpluses to shortages requires the abandonment of historic cost-based regulation and of the artificial distinction between interstate and intrastate markets.

Therefore, a new commodity value pricing approach is proposed that applies to all new gas wherever it is used. It recognizes that prices should reflect the costs and the degree of risk associated with finding replacement supplies. This approach also recognizes the need to provide a sufficient incentive for the development of future supplies with substantially higher long-range development costs. By helping bring natural gas supply and demand back into balance, this pricing proposal would be a first step toward deregulation. If the natural gas market could be brought into better balance by the mid-1980's, it might be possible and desirable to move further toward establishing full market pricing.

Under this proposal, all new gas sold anywhere in the country from new reservoirs would be subject to a price limitation at the Btu equivalent of the average refiner acquisition price (without tax) of all domestic crude oil. That price would be approximately $1.75 per thousand cubic feet (Mcf) at the beginning of 1978. New gas entitled to this incentive price would be limited to truly new discoveries. Gas from onshore wells more than 2½ miles from an existing well, or 1,000 feet deeper than any existing well within a 2½-mile radius, would qualify for the new gas price. Offshore, only gas produced from wells on new Federal leases granted on or after April 20, 1977, or old leases which had been abandoned and are subject to re-leasing by the Government would qualify for this new price.

The country would also move toward a single national market for gas, like that now existing for oil. For new production the interstate-intrastate distinction would be eliminated, together with the resulting distorting effect on both production and distribution. Currently flowing natural gas would be guaranteed price certainty at levels currently set by the Federal Power Commission, with adjustments in accordance with changes in the GNP deflator. The Government would have authority to establish higher incentive pricing levels for specific categories of high-cost gas, such as gas from deep drilling, geopressurized zones, and tight formations.

The Federal Power Commission would be given new, more flexible standards for determining the price of natural gas made available at the expiration of existing interstate contracts or by production from existing reservoirs in excess of contracted volumes, but in no case would such gas qualify for a price in excess of the $1.42 per Mcf ceiling (plus inflation). Gas made available under the same circumstances from existing intrastate production would qualify for the same price as new supplies of gas, that is, a price no greater than the domestic oil Btu equivalent. Existing intrastate contracts would not be affected. Because

States already regulate intrastate pipelines, Federal jurisdiction would not be extended to them except for purposes of allocation during national supply emergencies. This new gas pricing system would increase the supply of gas in the interstate market without precipitously drawing gas away from the intrastate market.

Federal pricing policy would also discourage use of gas by industry and utilities. The wellhead cost of the more expensive new supplies would all be allocated initially to industrial users, not to residential and commercial users, because the latter have far less capacity than industrial consumers to convert to other fuels.

In addition to these wellhead pricing changes, taxes would be levied on the use of oil and gas by industry and utilities, in order to encourage conservation and conversion to coal and other fuels. High volume industrial and utility users of natural gas, except for fertilizer manufacturers and certain agricultural users, would be subject to a use tax. The tax would increase the price of gas to industrial and utility users by about one-third above the Btu equivalent price of world oil over the next 5 years. Utility and industrial users of oil would also be subject to a phased-in conservation and conversion tax ranging from 90 cents to $3.00 per barrel. These measures are discussed in more detail in Chapter VI.

Federal Power Commission jurisdiction would be extended to certain synthetic natural gas facilities. However, the higher price of synthetic natural gas would not be rolled in with the price of natural gas, but rather would be allocated to industrial customers.

It will be at least 3 years before these proposals can significantly improve the natural gas supply situation. Until then, the U.S. will remain vulnerable to natural gas supply emergencies during the coldest months of the year. Because it was needed to keep American homes warm this past winter, the current emergency gas allocation authority would be extended for another 3 years. The need for that authority will be reviewed as the natural gas market comes into better balance.

This pricing approach acknowledges that the true economic value of a depleting resource is its replacement cost. The proposed pricing system would provide the price incentives natural gas producers need and protect homeowners from natural gas prices in excess of levels needed to maintain production.

For both oil and gas, this approach establishes an integrated pricing system that places the incentives on harder to find, new supplies, while ending the distortions of the interstate-intrastate distinction for new natural gas. It provides no reward to any firms that may have withheld natural gas last winter. Under the Plan, there would be about as much gas, oil, and conservation as would result under total deregu-

lation. But, in addition, windfall profits would be prevented, realistic market prices for energy would be established, and part of the higher retail price of oil would be distributed to the American people.

ALASKAN OIL

By the end of 1977, the Alaska pipeline terminal in Valdez, Alaska, should be receiving approximately 1.2 million barrels of oil per day. The current capacity for absorbing additional crude oil on the West Coast is no more than 600,000 to 800,000 barrels per day, leaving another 400,000 to 600,000 barrels of Alaskan oil as surplus.

Active Federal and State involvement will be necessary to assure expedited construction of the best project or combination of projects for receiving Alaskan oil on the West Coast and moving it in an environmentally sound way to inland markets where it is needed. A Federal project coordinator has been designated to coordinate Federal involvement and to work with States in ensuring timely and thorough review of all proposals in order to expedite projects. The Administration will consult with the Canadian Government to encourage timely Canadian consideration of projects that could be constructed in that country.

As the United States reviews its options for transporting Alaskan oil, it is important that the needs of midcontinent and northern tier refiners be taken into account along with those of refiners on the West Coast. The establishment of a long-term transportation system for supplementing supplies in these regions is a matter of high priority. An assessment will also be made of all options that would enable the U.S. to benefit from Alaskan oil in the short term until permanent transportation systems are in place. The options include transshipment of surplus crude to Gulf Coast markets as well as exchanges with other nations.

The 500,000 barrels per day of imports now expected to arrive on the West Coast could also be phased out by a refinery retrofit program that, over the course of the next several years, would enable more high-sulfur Alaskan oil to be refined in California.

In order to reduce the West Coast oil surplus, legislation will also be sought to provide authority to limit production from the Elk Hills Naval Petroleum Reserve to a ready reserve level. This action could reduce the West Coast surplus until the west-to-east transportation systems for moving the West Coast crude surplus are in place or California refiners have completed a major retrofit program. In the meantime, studies will be undertaken to determine the feasibility of producing and selling natural gas from Elk Hills to supply California markets.

Without a comprehensive oil pricing approach, inclusion of Alaskan North Slope oil production in the domestic composite price would

introduce a degree of unnecessary uncertainty into domestic crude oil pricing. Because the large volume of new Alaskan oil would initially be moving into the composite average at a wellhead price considerably below the current average, its inclusion could allow price increases in other tiers in the short term. Under the Plan's proposed regulations, this problem would be eliminated. The $5.25, $11.28, and new oil pricing tiers would be guaranteed increases consistent with inflation. Alaskan oil from already developed fields would be subject to an $11.28 wellhead ceiling price, would be exempt from the equalization tax, and would be treated like uncontrolled oil for purposes of the entitlements program until that program is terminated. New Alaskan discoveries would be subject to the new oil wellhead price.

This program grants maximum and certain wellhead price incentives for Alaskan oil production.

OUTER CONTINENTAL SHELF

Oil and gas under Federal ownership on the Outer Continental Shelf (OCS) are important national assets. It is essential that they be developed in an orderly manner, consistent with national energy and environmental policies. The Congress is now considering amendments to the OCS Lands Act, which would provide additional authorities to ensure that OCS development proceeds with full consideration of environmental effects and in consultation with States and communities. These amendments would require a flexible leasing program, using bidding systems that will enhance competition, ensure a fair return to the public, and promote full resource recovery. The Administration strongly supports passage of this legislation.

The President has also directed the Secretary of the Interior to undertake a review of OCS leasing procedures. This review will establish a sound basis for the leasing program and assure adequate production from the OCS, consistent with sound environmental safeguards.

SHALE OIL

Billions of barrels of oil may some day be recovered from shale deposits in Western States if environmental and economic problems can be overcome. Several private firms have announced that they believe they can solve these problems, and that they are prepared to proceed with shale oil development. These commercial ventures should provide valuable information about the viability of a shale oil industry.

Due to the high risks and costs involved in shale oil development, the Government should establish a pricing policy that provides adequate incentives to producers. Accordingly, shale oil will be entitled to the world price of oil.

LIQUIFIED NATURAL GAS

The Energy Resources Council in the previous administration proposed guidelines to limit imports of liquefied natural gas to 2 trillion cubic feet per year. Of that, no more than 1 trillion cubic feet could be imported from any one country. Applications for LNG contracts now pending before the Federal Power Commission already approach the 2-trillion-cubic-feet limitation, with over 1.2 trillion cubic feet proposed to come from Algeria.

Due to its extremely high costs and safety problems, LNG is not a long-term secure substitute for domestic natural gas. It can, however, be an important supply option through the mid-1980's and beyond, until additional gas supplies may become available.

The previous Energy Resources Council guidelines are being replaced with a more flexible policy that sets no upper limit on LNG imports. Under the new policy, the Federal Government would review each application to import LNG so as to provide for its availability at a reasonable price without undue risks of dependence on foreign supplies. This assessment would take into account the reliability of the selling country, the degree of American dependence such sales would create, the safety conditions associated with any specific installation, and all costs involved. This action could add as much as 500 billion to 1 trillion cubic feet annually to U.S. gas supply through the 1980's, without making an open-ended commitment for large volumes of this expensive resource.

The new policy further provides for distribution of imports throughout the nation, so that no region would be seriously affected by a supply interruption. It also provides for the development of contingency plans for use in the event of a supply interruption. In cases where the proposed supplier retains a unilateral right to cut off supply, consideration should be given to conditioning FPC certification on recognition of a reciprocal right to cancel on the part of the U.S. purchaser.

Finally, strict siting criteria would foreclose the construction of other LNG docks in densely populated areas.

SYNTHETIC NATURAL GAS

The nation's current policy toward synthetic natural gas (SNG) made from petroleum feedstocks is not satisfactory. Existing regulations favor the allocation of naphtha and other potential SNG feedstocks to the petrochemical industry, and effectively preclude their use by gas utilities. This policy has discouraged the construction of new SNG plants. Yet, the 13 SNG plants that were operating this winter provided the additional margin of natural gas supply that kept

several areas of the country from shutting off residential users during the coldest months.

Therefore, a Federal task force will be created to work with the gas utilities to identify those areas of the country where a limited number of additional SNG plants should be built to help meet the critical peakload needs for gas over the next 5 to 7 years. Federal Energy Administration regulations will be revised to provide a priority for SNG feedstocks to those plants approved by the task force. This regulatory change will give pipeline companies and utilities the reasonable certainty they need to make investments for this short-term source of gas supply.

SNG plants could contribute almost 1 trillion cubic feet of gas annually in the 1980's.

NEW SOURCES OF NATURAL GAS

Additional funding in fiscal year 1978 is proposed to encourage private efforts to tap the potential of two resources that may produce considerable quantities of natural gas in the near and mid-term.

To evaluate the technology and economic viability of Eastern Devonian shale deposits, a number of wells will be drilled and advanced recovery will be tested. In addition, the institutional and regulatory arrangements needed to assure effective use of this resource will be studied.

ERDA will assess the dissolved gas potential in the geopressurized zones along the coast of the Gulf of Mexico. The proposed research program is designed to provide a reliable assessment of this resource and to help resolve corrosion and other problems associated with it. The significant environmental and institutional barriers to extensive development of the geopressurized resource will also be examined.

New gas from these sources could materially alter the outlook for U.S. gas supply. Successful development of these resources could provide enough additional gas to assure supplies for residential and commercial use for years to come.

STUDY OF THE NATIONAL ENERGY TRANSPORTATION SYSTEM

During the era of cheap energy, the United States developed a national energy transportation system principally for moving oil and natural gas from the South and the Texas Panhandle to the North and Northeast. With growing prospects for increased supplies of oil and gas from the Outer Continental Shelf, as well as the anticipated increases in coal production, the nation urgently needs to reassess its energy transportation system. It is clear that the energy transportation routes built in the first half of this century will have to be supplemented

by new routes capable of moving the projected mix of energy supplies in 1985 to market. Therefore, the President will create a commission to study the nation's energy transportation needs and to make recommendations to him by the end of this year. One purpose of the study will be to develop means to encourage use of energy supplies nearest to consuming markets, such as eastern coal, in order to reduce the need for long-distance transport.

GASOLINE DECONTROL

Gasoline allocation and price controls are another major area of unsettled oil policy. Gasoline prices have never reached their allowable controlled ceilings, and marketers have contended for some time that deregulation of gasoline would increase competition by allowing them to shop among suppliers. There is little question that gasoline allocation and price controls have distorted what at times has been a competitive market.

In order to assure the maintenance of such competition in the gasoline marketplace, the Administration will support legislation similar in concept to the pending "dealer day in court" bill that would protect service station dealers from arbitrary cancellation of their leases by major oil suppliers. In addition, the Administration currently hopes to eliminate gasoline price controls and allocation regulations at the end of the peak driving season this coming fall. Gasoline prices and market competition will be closely monitored between now and then to assure this policy is appropriate. If gasoline were to be decontrolled, controls could be reimposed if prices rose above a predetermined level. This standby authority would permit the elimination of controls while protecting consumers.

OIL IMPORTS

In February and March of this year, United States imports reached a level of about 9 million barrels of oil per day. The measures proposed in the Plan would reduce total oil demand by 4.5 million barrels per day, resulting in oil imports in 1985 averaging about 7 million barrels per day, 2 million below the levels of February and March of this year. Even with a reduction of oil imports to under 6 million barrels per day, the United States would have to take additional steps to reduce its vulnerability to supply interruptions.

As explained in Chapter III, the sensible policy goal for oil imports is relative invulnerability, not independence. The United States continues to import foreign oil because, even at the high prices set by the oil-exporting countries, it is cheaper than domestic sources of synthetic oil. To eliminate imports would be to sacrifice an economic

benefit of major proportions. Imports also reduce the depletion of America's own critical oil reserves. Moreover, by substituting for domestic production, and by obviating the need for immediate massive development of all energy sources simultaneously, imports help maintain the quality of the environment. The United States has no reason to pay the very high cost of trying to achieve energy independence. Even if the U.S. itself were independent, its allies could not be, and the U.S. would have to assist them in the event of an international oil shortage.

The key to a tolerable level of oil imports lies in reducing vulnerability by means of an adequate strategic oil reserve, diversification of foreign sources of supply, and contingency plans. The reserve must be large enough to impose substantial revenue losses on countries imposing an embargo, and to enable the United States to deal with the consequences of any supply interruption. The ability to ride out a supply interruption may reduce the likelihood that any nation or combination of nations would impose one. The availability of the Strategic Petroleum Reserve would help offset the adverse economic effects of a supply interruption.

Accordingly, the U.S. plans to expand the Strategic Petroleum Reserve from the currently projected 500 million barrels to the 1 billion barrel level. Assuming that vigorous conservation measures, including rationing, would be undertaken during a supply interruption, and assuming further that a number of OPEC and non-OPEC nations would not participate in the supply interruption, the reserve is designed to supply somewhat more than 3 million barrels per day. Under these assumptions, a 1 billion barrel reserve would last at least 10 months. This reserve is the best kind of insurance the United States could buy, since it is unlikely that the price of oil will fall in the foreseeable future.

An effective policy to reduce vulnerability to supply interruptions also requires diversification of the sources of oil imports. Some developing countries with major petroleum reserves find it difficult to deal directly with multinational oil companies. Yet such countries need capital and sophisticated technology of the kind U.S. firms could supply, as well as the revenues that resource development would bring. The United States recognizes that government-to-government negotiations may be helpful in dealing with the wide variety of potential obstacles that currently prevent these nations from making a significant contribution to world oil supplies.

Finally, the United States must put in place effective contingency plans. The Administration is transmitting to the Congress a standby rationing plan and demand restraint plans to be available in the event of a national emergency resulting from a supply interruption. The impacts on particular industries and sectors of society would be

substantial. But the contingency plans would be implemented only under conditions of extreme national emergency, when substantial sacrifices in the national interest would be justified. In addition, the Administration is accelerating the preparation of additional contingency plans. These plans would reach all sectors of American life: industry, commerce, transportation, residences, and the public sector. Should a national energy emergency occur and the plans have to be invoked, the burdens would be shared widely and fairly among all Americans.

Chapter VI.–The National Energy Plan: Coal, Nuclear, and Hydroelectric Power

Even with vigorous conservation, America's demand for energy will continue to grow. The United States will need increased domestic energy production if it is to avoid shortages and unacceptable levels of imports. The U.S. eventually will make extensive use of solar and other nonconventional energy sources. During the remainder of this century, however, it will have to rely for the bulk of its energy supply on the conventional sources now at hand: oil, natural gas, coal, nuclear, and hydroelectric power. Federal policy should stimulate the expanded use of coal, supplemented by nuclear power and renewable resources, to fill the growing gap created by rising energy demand and relatively stable production of oil and gas.

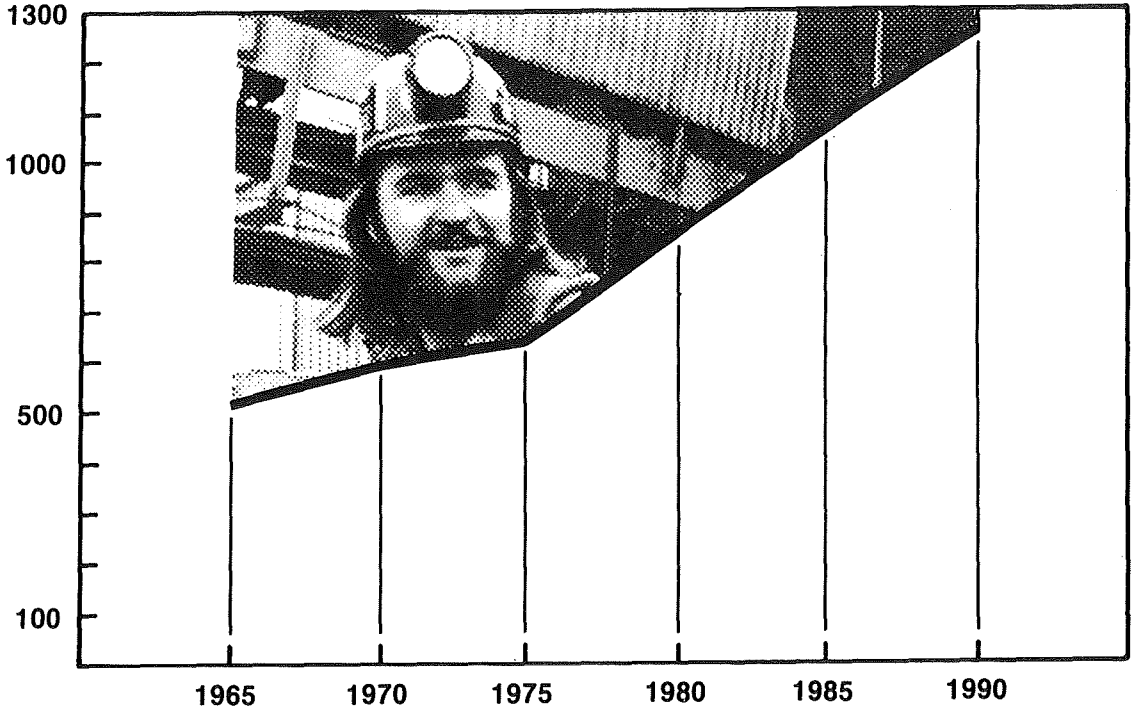
COAL

Conversion to Coal and Alternative Fuels

Industry and utilities consumed 4.8 million barrels of oil per day and 5.9 million barrels of oil equivalent per day in the form of natural gas in 1976. Oil and natural gas are scarce, and generally they are needed more by other sectors of the economy. Industry and electric utilities can convert to other energy sources more readily than can other users; therefore, a large-scale conversion by industry and utilities from oil and gas to more abundant resources is needed.

Coal constitutes 90 percent of U.S. conventional energy reserves, but currently supplies only 18 percent of energy consumption. It is generally acknowledged that the coal industry can expand production significantly, and currently has a small amount of excess capacity. (See Figure VI–1.) Full utilization of America's coal resources has been hindered principally by constraints on demand, rather than by lack of supply.

U.S. Coal Supply



Source: U.S. Bureau of Mines and Federal Energy Administration.

Figure VI–1

Questions have been raised about the adequacy of the nation's transportation system to deliver increased quantities of coal. With the exception of a few areas, it appears that railroads could transport the additional coal. The coal transportation situation will be considered as part of the study of the national energy transportation system. In addition, the Federal Government will monitor coal transportation carefully; and if problems should appear, it will take appropriate action.

Coal development and production is most economical when it is near major markets. Although coal production will expand in many areas, there should be large production increases in the highly populated Eastern and Mid-West regions, where coal use in industry and utilities could grow considerably in the future. The required use of best available control technology for new powerplants should stimulate even greater use of high sulfur Mid-Western and Eastern coals.

Expansion of U.S. coal production and use is essential if the nation is to maintain economic growth, reduce oil imports, and have adequate supplies of natural gas for residential use. Accordingly, to stimulate an increase in demand for coal and other alternatives to gas and oil, the Plan proposes a coal conversion program consisting of tax and regulatory measures.

The tax measures are designed to raise the cost of gas and oil to industrial and utility users, and to provide positive incentives for conversion to other sources of energy. A tax would be levied on industrial and utility use of natural gas and petroleum products. Beginning in 1979, high volume industrial users of natural gas (except fertilizer manufacturers and certain agricultural users) would be affected. They would be taxed an amount equal to the difference between their average cost of natural gas and a price target keyed to distillate oil (without the proposed tax on utility and industrial use of petroleum products). The price of distillate is one third higher than the world price of crude oil. The target level for the first year's tax in 1979 in constant dollars would be $1.05 below the Btu equivalent price of distillate. The target price would rise to the distillate prices in 1985 and beyond.

Thus, in 1979, an industrial user who paid $1.65 per Mcf for gas would pay a tax of $0.30 per Mcf to bring the total cost of gas up to the target level of $1.95 per Mcf, assuming the Btu equivalent price of distillate would be $3.00. By 1985, the target level would rise to approximately $3.30 per Mcf, the projected Btu equivalent price for distillate, resulting in an average tax of $1.10 per Mcf based on a projected actual gas cost of $2.20 per Mcf. Utility users of natural gas would be similarly taxed starting in 1983, at an amount that would bring their cost of gas to a level of $0.50 per Mcf below the Btu equivalent price of distillate. The tax would rise so that by 1988 their cost of gas would

equal the cost of the Btu equivalent amount of distillate. The later starting date for the tax on utility use of natural gas reflects the longer lead time required by utilities to convert to coal.

Industrial and utility users of petroleum products would be taxed at a flat rate since, unlike natural gas prices, petroleum prices are relatively uniform nationwide. Beginning in 1979, industrial use would be taxed $0.90 per barrel; the tax would rise to $3.00 per barrel by 1985. A tax on utility use of petroleum products would begin in 1983 at $1.50 per barrel and remain at that level thereafter.

Industry would generally be eligible, at its election, for either an additional 10 percent investment tax credit for conversion expenditures or a rebate of any natural gas or petroleum taxes paid, up to the amount of any expenditures incurred for conversion to coal or other fuels. With tax liability delayed until 1979 for industry and 1983 for utilities, prudent investors undertaking an aggressive conversion program should be able to accumulate enough conversion credits to eliminate, or minimize, the actual amounts of tax paid. Only those industrial firms and utilities which lagged behind in conversion would pay substantial taxes.

The Plan also proposes a revised and simplified regulatory program for oil and natural gas conversions. Industry and utilities would be prohibited from burning natural gas and petroleum products in new boilers, with limited environmental and economic exceptions. Industrial firms also could be prohibited from burning gas or petroleum in new major fuel-burning installations other than boilers, by regulations applicable to categories of installations, or on a case-by-case basis. Such orders would be subject to the same limited environmental and economic exceptions.

Existing facilities with coal-burning capability could be prohibited from burning gas or oil, where the burning of substitute fuels would be economically feasible and environmentally acceptable. Facilities burning coal would be required to obtain a permit in order to shift to petroleum or natural gas. Utilities burning gas would require a permit to shift to petroleum instead of coal. By 1990, virtually no utility would be permitted to burn natural gas.

Any industrial firm or utility prohibited from using natural gas would be allowed to sell its contract to purchase gas at a price that would compensate it fully for shifting to petroleum on an interim basis or to coal on a longer term basis.

These regulatory proposals closely resemble a bill sponsored by Senators Jackson, Humphrey, and Randolph. The Administration looks forward to working closely with the Congress to develop an effective fuel conversion program.

Environmental Policy

Attainment and maintenance of the environmental goals set out in the Clean Air Act, the Federal Water Pollution Control Act, and the National Environmental Policy Act are high national priorities. The Administration intends to achieve its energy goals without endangering the public health or degrading the environment.

The Administration has indicated its position regarding a series of amendments to the Clean Air Act. Utilities and industrial facilities will be asked to convert to coal without sacrifice of air quality standards. It is recognized that, in areas with serious air pollution problems, it may be necessary to continue burning oil in order to protect public health. The Administration is conducting a research and development program that will produce new technologies that allow the clean burning of coal more efficiently.

A strong but consistent and certain environmental policy can provide the stability needed to encourage investment in new energy facilities. The Administration has taken a position that all new facilities, including those that burn low sulfur coal, should be required to use the best available control technology.

The Administration has also supported an amendment to the Clean Air Act which would prevent significant deterioration of air quality in areas where air is now cleaner than required by air quality standards. It is committed to protecting national parks and other pristine Federal lands. In order to provide a necessary measure of certainty for the development of new energy facilities, the Administration has recommended adoption of a provision which would encourage States to classify their lands into the various categories within 3 years for protection against significant deterioration. After these initial designations are made, a new energy facility would be subject to those classifications and requirements in effect at the time of application, unless the Governor of the State served notice of an intent to change the classification within 120 days. If a classification is to be changed, the State would be required to complete the redesignation within 1 year. By reducing the amount of time during which the ground rules for locating energy facilities can change, Government would enable energy planning to proceed in a more orderly and expeditious way.

The Environmental Protection Agency will review its current policies allowing offsetting pollution tradeoffs for new installations locating in areas which violate the primary ambient air quality standards. Although the current policy may prove to be the most reasonable strategy for permitting new growth while maintaining progress toward attainment of air quality goals, alternatives should also be

explored. The Administration has recommended that no new legislative requirements be adopted in this area until the review is completed. In the interim, the existing EPA policy will be retained.

Some uncertainty will continue over the environmental impacts of an increasing number of coal-burning plants, even those equipped with the best available control technology. Accordingly, the President will appoint a special committee to study the health effects of increased coal production and use, and the environmental constraints on coal mining and on the construction of new coal-burning facilities. The committee will report to the President by next October. In addition, nearly $3 million is being requested to study the long-term effects on the atmosphere of carbon dioxide from coal and other hydrocarbons.

The Administration has recognized the need to protect land and water quality against unwarranted damage resulting from inadequate reclamation of strip mined areas. It continues to support uniform national strip mine legislation that would fully protect the nation's land while permitting the production of coal that is needed to meet national energy objectives.

Coal Research

Coal will meet the greatest portion of increased U.S. energy needs. A comprehensive coal research and development program is a high priority. The program should focus on meeting environmental requirements more effectively and economically, and should seek to expand the substitution of coal for natural gas and petroleum products.

In the short term, most coal will continue to be burned directly. Hence, the highest immediate priority is the development of more effective, economical methods to meet air pollution control standards. Some flue-gas desulfurization (FGD) systems, or "scrubbers," are already in commercial use. Work will continue on overcoming generic operating problems encountered by these systems. A number of new systems are under development, and the Government will undertake a 6 month review to determine whether the new technologies offer sufficient environmental, cost and reliability advantages to justify accelerating the RD & D program. Research into fluidized-bed combustion systems for the direct burning of coal in an environmentally superior manner is being expanded.

In addition, increased research will be devoted to developing means to control the fine particulate and sulfur oxide emissions associated with coal burning. In many situations, front-end coal cleaning by grinding and washing can reduce the free sulfur and ash content and thereby reduce the cost of meeting environmental stand-

ards. Accordingly, the Government will expand its current research and demonstration program for coal cleaning to determine what additional efforts are needed to meet sulfur oxide and particulate standards more economically.

Solvent refined coal processes use chemical means to remove even more of the sulfur content. The Government will initiate the design of a commercial-size demonstration solvent refined coal plant in fiscal 1978. If, as expected, pilot plant technical and economic feasibility is demonstrated, construction of a commercial-size plant will proceed.

Pursuant to the Administration's February budget revisions, the Government is proceeding with demonstration projects to develop on a commercial scale techniques for deriving low Btu gas from coal. For example, a large gasification project at a Minnesota ore plant and another at a Pennsylvania zinc smelter have been selected for Government and industry cost-sharing demonstrations. Low Btu gasification processes produce a coal-derived industrial quality fuel that avoids the need for back-end sulfur oxide and particulate control. That fuel could be a major aid in meeting coal conversion objectives.

In the long run, high Btu synthetic gas produced from coal may provide a substitute for declining natural gas supplies. The Administration will pursue an active RD&D program for high Btu coal gasification using advanced technologies. The program will be conducted with the urgency required to ensure that the new technology will be ready when needed.

The basic Federal role in this process is research, development and demonstration of new technologies. In general, the Government seeks to avoid subsidization of existing technologies, although circumstances may sometimes merit an exception to that policy.

The technology for producing synthetic crude oil is not as well developed as synthetic gas technologies. An active RD&D program, including pilot plant demonstrations, will be pursued. The Federal Government currently is providing some of the funding for a 600-ton per day, coal-to-oil pilot facility in Kentucky.

Funding authority for the overall coal program would amount to $527 million in fiscal 1978, and would continue at substantial levels. The success of this program in developing and commercializing new coal technologies will reduce the pressure on dwindling oil and gas supplies. The new coal technologies are critical to the National Energy Plan, both as an immediate aid in converting from scarce to abundant resources and as a future source of synthetic oil and gas.

NUCLEAR POWER

Many countries view nuclear power as their only real alternative to dependence on costly and uncertain oil and gas imports. The United States is in a better position, primarily because of its vast coal re-

sources. Coal does, however, have economic, environmental, and health and safety limitations; and, therefore, the United States also must continue to count on nuclear power to meet a share of its energy deficit.

Light-water reactors provide a proven technology to produce needed electrical power. However, more advanced forms of nuclear power may entail significant risk, and must therefore be developed cautiously. The United States has been concentrating on the development of a breeder reactor that uses plutonium, a by-product of uranium in nuclear reactors. In addition, the United States has been developing reprocessing technology to recover the uranium and plutonium in the spent fuel from light-water reactors. Access to plutonium, or even the capacity to recover or isolate it, can lead to the risk of diversion of material that could be used for nuclear explosive devices. The United States should develop advanced nuclear technologies that minimize the risk of nuclear proliferation, but with the knowledge that no advanced nuclear technology is entirely free from proliferation risks.

It is the President's policy to defer any U.S. commitment to advanced nuclear technologies that are based on the use of plutonium, while the United States seeks a better approach to the next generation of nuclear power than is provided by plutonium recycle and the plutonium breeder. At the same time, because there is no practicable alternative, the United States will need to use more light-water reactors to help meet its energy needs. The Government will give increased attention to light-water reactor safety, licensing, and waste management so that nuclear power can be used to help meet the U.S. energy deficit with increased safety.

Proliferation is a world-wide problem. The President announced on April 7, 1977 that the United States will make a concerted effort in association with other countries to find better solutions to this problem. For its part, the United States has adopted two policies. First, it will refrain from proceeding with nuclear technologies that present a high risk of proliferation. To this end, the United States will defer indefinitely commercial reprocessing and recycling of plutonium, as well as the commercial introduction of the plutonium breeder. Second, the President is proposing to reduce the funding for the existing breeder program and to redirect it toward evaluation of alternative breeders, advanced converter reactors, and other fuel cycles, with emphasis on nonproliferation and safety concerns. He also is proposing to cancel construction of the Clinch River Breeder Reactor Demonstration Project and all component construction, licensing, and commercialization efforts. The design work would be completed, and a base level program would be maintained, including the Fast Flux Test Facility. These actions would not seriously affect long-term

energy supplies in the United States. There is, of course, some price to be paid in redirecting this program, but that price is clearly outweighed by the dangers of proceeding.

The United States hopes that these actions will encourage other nations to pause in their development of plutonium-based technology and to examine alternative methods of meeting their future energy needs.

The United States recognizes that for this pause to be feasible, other nations must have assured supplies of slightly enriched uranium required for light-water reactors. The United States must restore confidence in its willingness and ability to supply enrichment services. The Administration, therefore, is prepared, in cooperation with the Congress, to take three steps that will substantially improve confidence in the U.S. position:

— reopen the order books for U.S. uranium enrichment services;
— adopt legislation to guarantee the delivery of enrichment services to any country that shares U.S. nonproliferation objectives and accepts conditions consistent with those objectives;
— expand U.S. enrichment capacity.

Current U.S. enrichment capacity consists of three gaseous diffusion plants which use a technology first developed more than 30 years ago. The time has come to move to the new gaseous centrifuge technology, which consumes less than 10 percent as much electrical power as a diffusion plant of equivalent capacity. In addition, a centrifuge plant has the potential for producing enriched uranium at lower cost. Therefore, the next U.S. enrichment plant, for which funds are already in the proposed fiscal 1978 budget, will be a centrifuge plant.

Light-water reactors require a supply of natural uranium. Current estimates of U.S. uranium resources range between 1.8 and 3.7 million tons. The uncertainties about the extent of domestic uranium resources should be resolved. The Energy Research and Development Administration will reorient its National Uranium Resources Evaluation Program to improve uranium resources assessment. The program will also include thorium, which may be used to breed fuel in some of the advanced nuclear technologies. This program will be a cooperative effort with industry, the States and the U.S. Geological Survey.

Today, 63 nuclear power plants provide about 10 percent of the U.S. supply of electricity. By 1985, an additional 75 nuclear plants already planned or in construction could be in operation, and nuclear power could provide as much as 20 percent of electricity supply.

Thus, the United States has the option of relying on light-water reactors to provide nuclear power to offset a share of the nation's energy deficit without undue risk of proliferation. However, as with

any energy technology, there are risks in the operation of light-water reactors. Although the safety record of light-water reactors has been good, several additional actions can be taken to improve safety.

To protect against possible diversion of nuclear material and against sabotage, the Nuclear Regulatory Commission has already increased the required number of guards at plants and the requirements for the training that guards receive. To improve the overall safety of light-water reactors, the President is requesting that the Commission expand its audit and inspection staff to increase the number of unannounced inspections and to assign one permanent Federal inspector to each nuclear power plant. The President is also requesting that the Commission make mandatory the current voluntary reporting of minor mishaps and component failures at operating reactors, in order to develop the reliable data base needed to improve reactor design and operating practice.

In addition, the President is requesting that the Commission develop firm siting criteria with clear guidelines to prevent siting of future nuclear plants in densely populated locations, in valuable natural areas, or in potentially hazardous locations. Proper siting will substantially reduce the risks of a nuclear accident and the consequences should one occur.

Reform of the nuclear licensing process is clearly needed. The present process is unsatisfactory to all participants: industry, intervenors, and the Federal Government. The President has directed that a study be made of the entire nuclear licensing process. He has proposed that reasonable and objective criteria be established for licensing and that plants that are based on a standard design not require extensive individual licensing.

In addition to licensing problems, construction delays have also contributed to the long lead-times needed to build U.S. nuclear plants. A national industry-labor agreement could lead to a substantial reduction in construction time and increase the willingness of utilities to invest in nuclear power plants.

Finally, the waste generated by nuclear power must be managed so as to protect current and future generations. Improved methods of storing spent fuel will enable most utilities at least to double their current storage capacity without constructing new facilities. Two actions have been taken to ensure that long-term waste storage facilities are available by 1985. The Energy Research and Development Administration's waste management program has been expanded to include development of techniques for long-term storage of spent fuel. Prototype technologies, complete designs, and initial environmental criteria for waste repositories will be developed by 1978. Licensing of the first

repository should be completed by 1981. There will be an opportunity for thorough public review at each of these stages. A task force under the direction of the Assistant to the President for energy will review the entire ERDA waste management program.

HYDROELECTRIC POWER

New or additional hydroelectric generating capacity at existing dams could be installed at less than the cost of equivalent new coal or nuclear capacity. Many of these sites are small, but could generate 3 to 5 megawatts, and are located near major demand centers currently dependent on imported fuel oil. Installation of additional generating capacity at existing sites could conceivably add as much as 14,000 megawatts to the nation's generating potential.

The Department of Defense (Corps of Engineers) and other responsible agencies, have, therefore, been directed to report to the Assistant to the President for energy on the potential for additional hydropower installations at existing dam sites throughout the country.

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Chapter VII.—The National Energy Plan: Nonconventional Sources and Energy Research

America's hope for energy to sustain economic growth beyond the year 2000 rests in large measure on the development of renewable and essentially inexhaustible sources of energy. Many diverse solar, geothermal, biomass and other technologies are in various stages of development. Some technologies, such as solar hot water and space heating, can make contributions now. Others, such as the solar electric technologies and some forms of geothermal energy, have great promise for the future. Fusion still requires significant scientific progress before its feasibility can be demonstrated. The Government should aggressively promote the development of nonconventional resources despite the fact that they face many uncertainties. The danger of too much initial skepticism is that it may become a self-fulfilling prophecy.

SOLAR ENERGY

Solar hot water and space heating technology is now being used, and is ready for more widespread commercialization. A temporary Federal program of financial incentives and public education is needed to stimulate the development of a larger solar market. As manufacturers, installers, and consumers become more familiar with solar energy equipment, and as economies of scale are achieved, prices should be reduced. Therefore, a tax credit supported by a Federally funded public education program is proposed. The credit would start at 40 percent of the first $1,000 and 25 percent of the next $6,400 (for a maximum of $2,000) paid for installation of qualifying solar equipment. The credit would decline in stages to 25 percent of the first $1,000 and 15 percent of the next $6,400. The credit would be available for expenditures between April 20, 1977, and December 31, 1984. The public education initiative would consist of a joint Federal-State program of standards development, certification, training, and information gathering and dissemination.

This initiative should help launch the solar heating industry. The industry would be further aided by the inclusion of investments in solar equipment among the approved conservation measures eligible for the proposed 10 percent tax credit for energy-saving investments by business. This investment tax credit should encourage the use of

solar energy for industrial and agricultural process heat and for commercial operations. Solar energy is likely to be particularly attractive for use in crop drying and other agricultural applications.

The results of the solar demonstration programs being carried out by the Energy Research and Development Administration and the Department of Housing and Urban Development and the equipment performance standards being developed by HUD should help provide a basis for warranties, insurance, and mortgage valuations. Moreover, the Federal Government will demonstrate its confidence in solar technology by undertaking a 3 year program of up to $100 million for installation of solar equipment in Federal buildings.

The States should also support widespread use of solar energy. A number of them have already amended their property tax laws to exempt solar installations from assessments. It is desirable that the other States do so as well. The States are also encouraged to enact legislation to protect access to the sun and to promote consumer education in the solar field. Under the proposed utility reform program, State public utility commissions would develop guidelines to prevent utilities from discriminating against users of solar energy.

Energy from the sun can also be used without any equipment at all. Through building orientation and design, choice of materials, location of trees and hedges, and other means, "passive" solar systems can be used to obtain heat from the sun when it is needed and to reject it when it is not. More widespread use of passive solar systems would help to reduce fuel bills and conserve conventional fuels.

Solar energy can also be used to generate electricity. The solar electric technologies are in varying stages of development. Photovoltaic systems, using cells developed in the space program, are economic today for certain small, decentralized applications. These systems have a potential for dramatic price reductions that would make them economical for a broader range of applications. Increased funding is proposed to accelerate the development of economic photovoltaic systems. Longer term development is proceeding on central station solar electric power systems. Collection of solar energy by space satellites has been proposed, and the concept deserves further study.

Various technologies make indirect use of solar energy, in the form of wind, agricultural and forestry residues ("biomass"), and ocean thermal energy (the heat captured by the ocean surface). Wind and biomass can make significant regional contributions in the medium term. Wind systems can supply energy to small utilities, hydroelectric systems, and dispersed users of power. Agricultural and forestry residues already are used as fuel, and that use can be increased by improved collection methods and by energy farms, in

which crops are grown specifically for use as energy. In addition, biomass can be used to produce liquid and gaseous fuels for a variety of uses.

The Plan's fuel conversion program would be an incentive for use of biomass, as well as coal. Industry and utilities would have strong reasons to shift away from oil and gas to other energy sources. Tax credits would be provided for investments in facilities to use nonconventional energy sources, as well as to use coal. The environmental problems associated with coal combustion should lead businessmen to take a close look at the advantages of using nonconventional energy sources.

Finally, the Plan's research and development program includes increased funding for biomass, small wind systems, solar cooling, and other solar technologies.

MUNICIPAL SOLID WASTE

Municipal solid waste is a valuable energy resource. Its use for energy production also helps to solve environmental problems and reduce municipal disposal costs. Energy can be obtained from municipal solid waste both through direct combustion and through systems for converting wastes into liquid, gaseous, and solid fuels ("refuse-derived fuels").

Greater use of energy recovery systems has been hindered by the availability of cheap, open dumps and by technological and institutional difficulties. However, some plants burning solid waste or producing fuel from it already operate successfully, and present barriers to more widespread use should be overcome with coordinated action by Federal, State and local governments and private firms.

The Plan's fuel conversion program would provide incentives for use of municipal solid waste and refuse-derived fuel as energy sources. Through implementation of the Resource Conservation and Recovery Act of 1976, the Federal Government will continue to help States and local governments to overcome the present barriers to more widespread use of municipal solid waste.

GEOTHERMAL ENERGY

Geothermal energy, the natural heat in the Earth's crust, has a large potential for direct thermal use and for electricity generation, particularly in the Western States. It occurs in many forms, only one of which is currently used to a significant extent. Dry geothermal steam from The Geysers in California provides more than 500 MW_e for northern California.

Hydrothermal (liquid-dominated) sites are found throughout the West, some at high temperatures adequate for electricity generation,

and others at lower temperatures suitable for heating of buildings. At present, several hundred buildings use geothermal heat. With expected technological progress, hydrothermal sources should begin to make a significant contribution in the 1980's.

Geopressurized resources, located along the Gulf Coast, contain potentially significant amounts of hot water and dissolved methane, which may become accessible in the 1980's. Hot dry rock may become a significant source of energy in the 1990's.

To stimulate the development of geothermal resources, legislation is proposed to extend to geothermal drilling the tax deduction for intangible drilling costs that is now available for oil and gas drilling. The purpose of this proposal is to bring about equality of treatment among activities which compete for capital. The issues concerning the overall allowance of deductions for intangible drilling costs will be reviewed as part of the President's tax reform program.

The Plan's research and development program provides additional funding to evaluate the geopressurized and liquid-dominated hydrothermal resources and to promote the use of geothermal energy in nonelectric applications.

Finally, the Department of the Interior, the Department of Agriculture, and the States will be encouraged to streamline their leasing and environmental review procedures to remove unnecessary barriers to development of geothermal resources.

FUSION

Research in controlled thermonuclear reactions ("fusion") has been a major element in energy research and development programs. However, despite many years of active research, scientific feasibility has yet to be demonstrated, though steady progress has been made in satisfying each of the individual criteria for achievement of breakeven power (the production of more power than is consumed).

Current research on magnetic confinement systems seeks to demonstrate the simultaneous attainment of temperature, density, and confinement time necessary for breakeven. Inertial confinement (laser or beam) systems, a newer technology, may lag behind magnetic systems in achieving breakeven power. Once a demonstration of breakeven is made, extensive engineering efforts would be required to design a commercial system.

However, even without achievement of breakeven power, either fusion system may be able to produce usable energy as part of a hybrid fusion-fission cycle. The fusion process produces neutrons which might breed fuel for light-water nuclear reactors more easily than it produces electricity.

The revised budget submitted by the Administration last February provides for continued work on fusion on an orderly basis.

RESEARCH, DEVELOPMENT, AND DEMONSTRATION

An effective Federal research, development, and demonstration (RD&D) program is indispensable for the production of new energy sources. Research is not an end in itself. The purpose of RD&D is to produce technologies for practical use. The final stage of a successful RD&D program is commercialization, the movement of a functioning technology into the marketplace.

The groundwork for eventual commercialization should generally be laid during the RD&D stage. Before embarking on costly research projects, the Government should have the best possible information on prospects for economic success and institutional acceptance. As scientific and technical advances are made, economic and institutional barriers to commercialization should also be addressed, so that if technical success is achieved in the RD&D program, commercialization can take place rapidly.

However, Government support of scientific research and engineering development does not constitute a commitment to subsequent demonstrations of technologies that do not meet technical, economic, national security, health, safety, and environmental criteria. The Government should support multiple parallel technological options in their early stages, but it should not drift unwittingly into a long-term guarantee of support for all options initially pursued. Only those technologies that satisfy criteria for practical success should be supported into the demonstration stage. Recognition that early Government support should not be regarded as a blank check for the future should benefit the entire RD&D program.

Commercialization activities, and in particular commercial demonstration projects, also must not become a hidden subsidy of technically feasible but economically uncompetitive technologies. Where subsidies are justified, they should be awarded in an open process that is responsive to national priorities.

A balanced RD&D program should have near-term as well as long-term benefits, should promote conservation and nonconventional resources as well as conventional resources, should support small-scale as well as large-scale projects, and should enlist the talents of individual inventors and small business as well as major corporations. In its revisions of the fiscal year 1978 budget, the Administration began the process of reorienting RD&D priorities to meet the country's real needs. The Administration proposed additional funding for the following items:

—programs to develop improved methods of energy conservation;
—solar heating and cooling demonstrations, mainly in residential buildings;
—application of solar energy in agricultural and industrial processes, including more than 60 agricultural projects in more than 30 States;
—development of improved ways to use agricultural and forestry residues, water-based energy crops, and animal wastes; and
—development and demonstration of the use of solar and wind energy to operate irrigation pumps and for other rural applications.

In accordance with the priorities set forth in the National Energy Plan, additional funds will be provided for research and development projects for conservation and small-scale energy systems. A new Office of Small-Scale Technologies is also proposed, in order to tap more fully the potential of individual inventors and small business firms.

Additional conservation projects are proposed. The Energy Research and Development Administration will conduct a feasibility study of waste heat recovery and district heating at several of its own facilities. To conserve natural gas, the Government will also fund programs for additional work on gas-fired heat pumps and small fuel cells for residential and commercial heating and cooling.

Other programs may add significantly to the nation's near-term natural gas supply. The Government will provide additional funding to accelerate the investigation of methane recovery from the geopressurized zones along the Gulf Coast and gas from Eastern Devonian shale.

The Government will add several initiatives to its research program to support the Plan's emphasis on increased use of coal, as described in Chapter VI.

The Government will provide increased funding for solar cooling and allied solar technology and for small wind energy conversion systems. It will also support a project to demonstrate the use of wood-derived biomass as a substitute for fuel oil. These projects could yield significant regional benefits.

New initiatives are proposed for geothermal energy. Additional funding will be provided to identify new liquid-dominated hydrothermal fields which could be tapped for direct thermal use. The Government will also support field experiments of direct, nonelectric uses of geothermal energy for residential space conditioning and industrial and agricultural process heat in areas where this resource has not previously been exploited.

The Plan's additional research and development program focuses on projects with near-term and mid-term potential. It emphasizes small, dispersed, and environmentally sound production and use of energy, particularly renewable energy. It also seeks to redress the advantage enjoyed by big business in the Government's current research and development program.

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Chapter VIII.–The National Energy Plan: The Role of Government and the American Public

Government at all levels has a critical role to play in guiding the course of energy production and use. In addition to proposing specific initiatives, the Federal Government should:

—establish clear national energy goals;
—organize itself to administer national energy policy effectively;
—create a comprehensive, reliable repository of energy information;
—ensure competition in the energy industries generally and among the major oil and natural gas companies in particular; and
—provide assistance to low-income people during energy emergencies.

State and local governments will be asked to assume major responsibilities in cooperation with the Federal Government. Nongovernmental organizations and individuals can also make significant contributions to the success of energy policies. The private sector will continue its primary role as the major producer and consumer of energy resources.

NATIONAL ENERGY GOALS

There is no quick or easy solution to the energy problem. The reorientation of American society to the newly recognized energy realities will occur only as a result of a multitude of measures over many years. An important part of the Plan is Congressional adoption of specific national energy goals, so that progress can be monitored and assessed. The proposed goals, to be achieved between now and 1985, are:

—reduce the rate of growth of energy consumption to below 2 percent per year;
—reduce gasoline consumption by 10 percent below the 1976 level;
—reduce oil imports to less than 6 million barrels per day, about one-eighth of total energy consumption;
—establish a Strategic Petroleum Reserve of 1 billion barrels;

—increase coal production by about two-thirds, to more than 1 billion tons annually;
—insulate 90 percent of American homes and all new buildings; and
—use solar energy in more than 2½ million homes.

The Plan does not seek illusory goals, such as energy independence. Rather, it seeks goals that are ambitious, but that are achievable in light of the present widespread waste of energy, and the large potential for conversion from oil and natural gas to coal. However, the proposed conservation goals do not reflect merely what can be achieved by the measures formally proposed in the Plan. These goals are set at more demanding levels in order to take account of voluntary actions outside the scope of the specific measures in the Plan, such as keeping buildings at 78° in the summer and 65° in the winter, carpooling instead of driving alone, and spending leisure time in ways that consume less energy. The goals challenge the American people to go beyond the Plan through voluntary actions.

If the proposed goals are adopted, then, beginning 2 years after enactment of the National Energy Plan, the President will submit to the Congress biannually a report on the nation's progress in moving toward the 1985 goals. The report will recommend any changes in the existing Plan, or any additional measures needed to meet the 1985 goals.

THE DEPARTMENT OF ENERGY

The initiatives presented in the National Energy Plan underscore the importance of creating at the earliest possible date a Department of Energy. Legislation to create this Department has been sent to the Congress by the Administration, and hearings have been held in both the House and Senate.

Although organizational changes alone will not solve any energy problem, creation of the Department of Energy is a necessity if the elements of the Plan are to be carried out in a coherent and effective manner. The Plan proposes a unified policy. The Department would carry out this policy through a unified organization that would coordinate and manage energy conservation, supply development, information collection and analysis, energy regulation, and research, development, and demonstration. Only through creation of a Department that combines the skills and expertise now dispersed through numerous Federal agencies will the Government obtain the compre-

hensive overview of interrelated energy problems and the organizational coherence needed to implement the National Energy Plan.

By consolidating more than 100 important energy data collection programs in the Federal Government, the Department of Energy would provide comprehensive and reliable energy information. An Energy Information Administration within the Department would organize and analyze information so that it could be used by governments, industry, and the public.

In addition, the ability of the Federal Government to administer the regulatory process when market forces do not suffice would be significantly enhanced by unification of most of the responsibilities for economic regulation of energy. The Department of Energy, operating within congressional mandates, would be able to avoid the inconsistencies and uncertainties inherent in a situation where agencies operate in isolation and sometimes at cross-purposes.

The Department of Energy would enable the Federal Government to coordinate its research, development, and commercialization activities within a policy-planning process that takes full account of the importance of conservation and near-term resource development. The Department would be the most effective means for ensuring that the priorities established in the National Energy Plan are translated into the Government's ongoing research, development, and commercialization efforts.

Finally, by combining the conservation programs of various agencies, the Department would be in a position to ensure that the strong emphasis of the Plan on fostering genuine conservation and improved energy efficiency will not be frustrated by a mass of competing, conflicting, and overlapping jurisdictions in the Executive Branch.

INFORMATION

The Federal Government needs more detailed and reliable information on energy matters than is now available. Much of the nation's remaining reserves of oil and natural gas are located on Federal lands and belong to the American people. More information is needed on the size of particular reserves and the rates at which they are being depleted. To identify and assess possible anticompetitive behavior on the part of major oil companies, the Government needs detailed data on their operations. To deal swiftly and effectively with energy emergencies, such as an interruption of foreign oil supply or a natural gas shortage, governments need information on local energy supplies and consumption patterns.

Accordingly, a three-part energy information program is proposed. It would include a Petroleum Production and Reserve Information System, a Petroleum Company Financial Data System, and an Emergency Management Information System.

For the Petroleum Production and Reserve Information System, the Federal Government would assume the data collection responsibilities now performed by the American Gas Association and the American Petroleum Institute. The oil and gas industries would be required to open their reserve estimation processes to Federal officials, who would supervise the collection and preparation of reserve data. Information collected and submitted to the Federal Government through these processes would be verified and randomly audited at the company level. Existing law regarding the protection of confidential proprietary information would not be changed.

The Petroleum Company Financial Data System would require all large companies, and a sample of small firms, engaged in the oil or gas business to submit detailed financial information to the Federal Government. Companies would have to conform to specified accounting principles and to report capital expenditures and operating results by geographical region and type of fuel. They would be required to submit information relating to functional areas, including refining, production, marketing and distribution, and information relating to foreign as well as domestic operations.

This comprehensive reporting program would enable the Government to assess the performance of the industry and individual firms, by providing a system of vertical accountability of the operations of integrated oil companies. The reporting program would restore confidence within the Congress and among the American people that the Government, not the oil industry, is in charge of national energy policy.

The Emergency Management Information System would provide governments with up-to-date information on local energy supplies and consumption. Such information is needed to respond if there should be an interruption of foreign oil supply, a natural gas shortage, or other energy emergencies. State energy offices, assisted by the Federal Government, would collect and maintain the data. As further preparation for possible electrical power shortages in the West this coming summer and natural gas shortages in future winters, the Administration is formulating contingency plans for submission to the Congress under the Energy Policy and Conservation Act.

COMPETITION

Promotion of competition is a critical component of public policy. Since energy is an essential commodity for all Americans, effective

competition within the energy industries is a matter of vital concern. Continuous vigilance is needed to ensure that the structure, behavior, and performance of the energy industries are vigorously competitive.

The Federal Trade Commission and the Antitrust Division of the Department of Justice will continue active programs of enforcement of the antitrust laws in the energy industries. Moreover, the promotion and maintenance of competition would be a major objective of the proposed Department of Energy, and would be the responsibility of a high-ranking official with appropriate staff support.

A prime responsibility of the Under Secretary for policy and evaluation would be to make certain that policies and programs of the Department promote competition. In particular, the Under Secretary would monitor resource leasing policies and rules, and research, development, demonstration, and commercialization programs to ensure that they are carried out in accordance with the purposes of the antitrust laws.

The Under Secretary would also direct an active program to monitor the structure, behavior, and performance of the energy industries. The conduct of individual firms, prices, profits, concentration ratios, and similar matters would be closely reviewed; and any indication of a lessening of competition would elicit a prompt response.

In recent years, trends and practices in the energy industries have created substantial public concern. Attention has focused particularly on the oil and natural gas industries, with special reference to vertical and horizontal integration, as well as joint ventures and the international activities of the major multinational firms.

Public policy toward vertically integrated firms, those that span exploration, production, refining, and marketing of petroleum products, has long been a matter of dispute. The Federal Trade Commission is currently litigating a vertical integration case that addresses some of the relevant legal issues. In recent years, concern about vertical integration has increased due to the possibility that Federal oil price regulations have not held down ultimate prices to consumers, but instead have led to abnormally high profits for refiners. Further investigation is needed to determine whether in fact vertically integrated firms have manipulated profit margins of their various operations in order to circumvent regulations or to exercise market power for anticompetitive purposes.

Horizontal diversification by oil and gas producers, particularly into the coal and uranium industries, has led to concern that the major firms will be able to restrict the development of alternative energy sources. The potential exercise of such power could be detrimental as the nation increases its reliance on coal, uranium, and renewable energy sources.

Traditionally, the structure of the coal industry has been extremely competitive. It is still relatively unconcentrated compared to industries such as steel and automobiles. Nevertheless, recent trends have caused legitimate concern. A total of 32 oil and gas companies accounted for 16 percent of total U.S. coal production in 1974, a 48 percent increase over their share in 1967. These companies accounted for more than 18 percent of coal shipped to electric utilities in 1974, a 27 percent increase over their share in 1967. In 1974, they held 5 percent of total U.S. coal resources, compared to 1 percent in 1967. These figures do not indicate that the oil and gas companies have a dominant position or even significant market power in the coal industry. But the trend of oil and gas company entry into coal mining and the companies' activities and performance merit continuous attention to make sure that a competitive industry does not become noncompetitive.

At this time it does not appear necessary to proceed with new legislation mandating either vertical or horizontal divestiture in order to promote or maintain competition in the energy industries. However, the performance of the energy industries will be closely monitored to make sure that prices are in line with costs and that costs are reasonable. Armed with an efficient organizational structure and new information-gathering programs, the Department of Energy would have an active analysis and evaluation program to study these matters in depth. The proposed Petroleum Company Financial Data System would provide needed vertical accountability for major energy companies. In particular, as the oil and gas companies receive additional incentives, this system would show whether the benefits are being passed through to the public or are being captured as excessive profits by firms with undue market power. If it should appear that there are anticompetitive problems in the energy industries that cannot be reached under current laws, new legislation would be proposed.

The uranium industry is another area of concern that will merit continued attention. Recent rapid increases in uranium prices have raised questions about competition in that industry. In addition, private litigation has produced information that suggests possible anticompetitive actions. Effective competition in the uranium industry must be a matter of high national priority.

The competitive structure of the energy industries depends significantly on the independent producers of oil, natural gas, coal, and solar energy equipment and on the independent refiners and marketers of petroleum products. The Administration supports legislation similar to the pending "dealer day in court" bill. The Department of Energy would seek to preserve the competitive viability of independents in all segments of the energy industries.

Finally, a problem has resulted from the Tax Reform Act of 1976, which changed the tax treatment of intangible drilling costs. Some independent oil and gas producers have lost a tax deduction for such expenses, while corporate producers continue to enjoy the deduction. The law has thus put those independent producers at a competitive disadvantage and has adversely affected their exploratory drilling. This anomaly should be removed as part of the President's program for extending oil and gas price controls. As part of that program, the Administration would urge that independent oil and gas producers receive the same tax treatment for intangible drilling costs that their corporate competitors receive. However, investors who finance oil and gas exploration in order to obtain a tax shelter for income earned in other occupations should not receive such a benefit.

STATE AND LOCAL GOVERNMENT PARTICIPATION

A National Energy Plan can be built only on a foundation of partnership and understanding among the Federal Government, the States, local governments, and the nation's Indian tribes, which regulate or own a substantial part of U.S. energy resources.

Many of the programs proposed in the Plan cannot succeed without the active cooperation of State and local governments. The assistance of State and local governments will also be needed to harmonize the varying interests of the different regions of the country, all of which are affected by national energy policy. State and local governments performed admirably during the recent natural gas shortage, and their role in energy matters should increase in the future.

The States will play a critical role in developing an adequate repository of information for energy decision-making. The States' role in the proposed Emergency Management Information System is particularly important. That system should be of great value to both the Federal Government and the States in dealing with energy shortages. The utility reform program is another instance where the State role is crucial.

The Federal Government is willing to do its part to assist States, localities, and Indian tribes in coping with new energy developments, principally from coal utilization, that will occur under the Plan. Large-scale development places heavy demands on local communities for schools, roads, sewage treatment facilities, and other municipal improvements. Without proper planning for such developments, small communities may be overwhelmed and may be unable to prevent serious social and environmental problems.

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A variety of existing Federal programs can assist States, communities, and Indian tribes in coping with development of major energy producing installations. A review will be conducted of these programs, and the views of States, local governments, and Indian tribes will be sought. If it should appear that there are gaps in coverage, additional legislation will be proposed.

EMERGENCY ASSISTANCE FOR LOW-INCOME PERSONS

Government at all levels has the responsibility for protecting low-income citizens from the most severe effects of the energy crisis. The Plan contains several programs to carry out that responsibility.

The weatherization program, by insulating large numbers of low-income homes, would moderate the effect of rising fuel costs on low-income families. Proceeds from the crude oil equalization tax and the standby gasoline tax would be distributed in a progressive manner that benefits low-income people. Protection for low-income people from the long-term increase in energy prices lies in a reformed welfare system, on which the Administration is hard at work.

The remaining major problem is the possibility of future supply disruptions, such as the natural gas shortage last winter or another oil supply interruption. Such events could cause temporary, but sharp increases in basic energy costs in some regions, or to users of particular fuels. Such increases are particularly harmful to low-income people, who have little or no discretionary income with which to meet energy price rises. Present programs are deficient in meeting this need. Therefore, the Department of Health, Education, and Welfare will promptly complete a redesigned emergency assistance program for submission to the Congress.

PUBLIC PARTICIPATION

The general strategy of the National Energy Plan reflects the tenor of comments received from the public during the preparation of the Plan. As a general matter, members of the public who expressed views preferred voluntary to regulatory measures, though not uniformly so. The public placed strong emphasis on conservation, stockpiling of oil to reduce vulnerability, and development of solar energy and other renewable or essentially inexhaustible resources. A summary of the public participation in the development of the Plan appears in a separate report.

The announcement of the National Energy Plan marks only the beginning of the effort to deal with the energy problem comprehensively. As the Plan's legislative proposals are considered by the Congress and as its administrative proposals are implemented, they will

be the subject of extensive public comment. The Administration encourages broad national discussion of the Plan and its specific elements.

The President will meet periodically with the Governors to discuss actions that the States can take to deal with the energy problem. The Federal Government will also sponsor additional town meetings and other public events to encourage citizen comment on national energy policy. Private organizations are also encouraged to sponsor seminars and meetings to consider the energy problem and how to deal with it.

But public participation can go far beyond discussion. There is much that individual Americans can do to help the country solve the energy problem. American families can reduce energy waste and their own fuel bills by investing in insulation and other energy-saving home improvements, and by reducing their use of air-conditioners this coming summer. Individuals can use public transportation where it is available instead of automobiles, or, if they must drive, go in car pools or van pools and observe the 55-miles-per-hour speed limit. Schools can help young people understand the energy problem and develop the conservation ethic. Employers can make conservation a high priority in incentive awards and suggestion programs. Business can develop better processes and practices to use energy more efficiently.

In sum, meeting the nation's energy goals should be a great national cooperative effort that enlists the imagination and talents of all Americans. At home, on the road, at work, and elsewhere, all Americans can do their part to help solve the energy problem.

Chapter IX—The National Energy Plan and the Future

To be successful, the National Energy Plan must squarely address the energy crisis and propose actions consistent with the President's principles. The Plan seeks to:

—reduce U.S. dependence on oil imports and vulnerability to interruptions of foreign oil supply;

—lower the rate of growth of total U.S. energy demand and make the U.S. stock of capital goods more energy efficient;

—shift industrial and utility consumption of oil and natural gas to coal and other abundant resources;

—provide incentives for new oil and natural gas discoveries;

—advance the development of new energy sources for the long-term future.

The Plan should be assessed by comparing its results with the likely situation without it. The year 1985 has been selected for the purpose of comparison. The middle of the next decade now appears likely to be the critical time when world oil production will approach the limit of readily expandable capacity. At that time the United States should be prepared for the subsequent period of growing oil stringency.

In some instances, the results of the measures proposed in the Plan may not be sufficient to achieve the goals proposed in Chapter VIII. These goals are ambitious. Their achievement will require voluntary action in addition to the Plan's specific legislative and administrative measures. In some instances, mandatory measures would be considered if voluntary actions are insufficient. The energy savings projected to be achieved by specific proposals in the Plan should be regarded as a basic minimum. Achievement of the Plan's more ambitious goals could be materially aided by the accomplishments of a purposeful citizenry or, perhaps, by unforeseen developments, such as technological improvements in transportation or exploitation of new gas supplies.

Achievement of the goals and strategy of the National Energy Plan could demonstrate the benefits of indicative planning. If private decision-makers voluntarily act within the framework proposed in the Plan, the United States could achieve its energy and economic goals with relatively little direct Government regulation of economic activity.

THE IMPACT OF THE PLAN ON THE ENERGY CRISIS

The first test of the Plan is whether it would make a significant improvement in the trends in energy usage that have produced the energy crisis.

The projections of future impacts are based on certain assumptions about population and economic growth. The U.S. population is projected to increase from 216 million people today to 235 million by 1985. The projections are also based on the assumption that the President's economic goals will be achieved, and that, accordingly, the gross national product (GNP) will increase about 46 percent by 1985.

Without the Plan and without any other Government restraints, U.S. demand for oil could be as much as 25 million barrels per day in 1985. The model projects oil demand in 1985 to be 22.8 million barrels per day, if the automobile efficiency standards under present law are met and if higher gasoline prices since 1973–74 reduce driving. The Plan would reduce oil demand by 4.5 million barrels a day, 20 percent below the projected level of demand without the Plan. Industrial consumption of oil would be reduced from 7 million barrels per day to 4 million.

If U.S. demand for oil were 25 million barrels per day in 1985, oil imports could be as much as 16 million barrels per day. At the level of 22.8 million barrels per day of oil demand, oil imports would be about 12 million barrels per day. The Plan would reduce imports to 7 million barrels per day. Voluntary conservation could achieve a further reduction to the national goal of below 6 million barrels per day.

The Plan is projected to reallocate natural gas to high-priority uses and to stimulate additional domestic production, as shown in Figure IX–1. Total natural gas consumption in 1985 would be the equivalent of 9.4 million barrels of oil per day, with or without the Plan, but the distribution of gas among energy consumers would be altered. Under the Plan, the residential and commercial sector would consume the equivalent of 4.1 million barrels of oil per day instead of 3.8 million, and electric utilities would consume 0.5 million instead of 0.9 million. Total industrial consumption would stay the same, with some industrial shifts of gas use to coal, and some shifts from oil to gas within the total. The Plan would also stimulate additional domestic gas production equivalent to 600,000 barrels of oil per day.

As a result of the conservation initiatives, the United States would achieve an annual rate of growth of energy demand of less than 2 percent by 1985. With additional voluntary conservation efforts, energy demand could be reduced even further.

The Plan would increase the use of coal in 1985 by the equivalent of 2.4 million barrels of oil per day (200 million tons) above the

level without the Plan, and 6.5 million barrels per day (565 million tons) above the 1976 level. The effects of the Plan on consumption and supply are shown in Figures IX–1 and IX–2.

Significant progress would be made to prepare the country for the period of oil stringency beyond the mid-1980's. The rate of growth of total energy demand and oil imports would both be brought down to manageable levels. The projections of the effects of the conservation program imply that the U.S. capital stock would have become more energy efficient. The reductions in industrial and utility use of oil and natural gas, and the increase in the use of coal together would represent a very important shift from scarce to abundant resources.

Figure IX–1

Fuel Balances by Sector

[Millions of barrels of oil equivalent per day]

	1976	1985 without Plan	1985 with Plan	1985 Plan plus additional conservation
Demand	37.0	48.3	46.4	45.2
Residential and commercial:				
Oil	3.5	3.2	2.7	
Natural gas	3.9	3.8	4.1	
Electricity	6.3	9.1	8.4	
Coal	.1	(1)	(1)	
Total [2]	13.8	16.1	15.2	
Industry:				
Oil	3.2	7.0	4.0	
Natural gas	4.4	4.5	4.5	
Electricity	4.2	7.2	7.1	
Coal	1.9	2.7	5.0	
Total [2]	13.7	21.4	20.6	
Transportation:				
Oil	9.2	10.6	10.2	
Natural gas	.3	.2	.3	
Total [2]	9.5	10.8	10.5	
Electricity: [3]				
Oil	1.6	2.0	1.3	
Natural gas	1.5	.9	.5	
Coal	4.9	8.2	8.3	
Nuclear	1.0	3.6	3.8	
Other	1.5	1.6	1.6	
Total [2]	10.5	16.3	15.5	

See footnotes at end of table.

Figure IX–1—Continued

Fuel Balances by Sector

[Millions of barrels of oil equivalent per day]

	1976	1985 without Plan	1985 with Plan	1985 Plan plus additional conservation
Supply	37. 0	48. 5	46. 4	45. 2
Domestic:				
Crude oil [4]	9. 7	10. 4	10. 6	----
Natural gas	9. 5	8. 2	8. 8	----
Coal	7. 9	12. 2	14. 5	----
Nuclear	1. 0	3. 7	3. 8	----
Other	1. 5	1. 7	1. 7	----
Refinery gain	. 4	. 9	. 6	----
Total [2]	30. 0	37. 1	40. 0	----
Imports/exports (—):				
Oil	7. 3	11. 5	7. 0	5. 8
Natural gas	. 5	1. 2	. 6	----
Coal	—. 8	—1. 2	—1. 2	----
Total [2]	7. 0	11. 5	6. 4	5. 2

[1] Less than 0.05 million barrels of oil equivalent per day.
[2] Detail may not add due to rounding.
[3] Included in previous sectoral totals.
[4] Includes natural gas liquids.

Figure IX–2

Balances by Fuel [1]

[Millions of barrels of oil equivalent per day]

	1976	1985 without Plan	1985 with Plan	1985 Plan plus additional conservation
Oil:				
Consumption	17. 4	22. 8 [2]	18. 2	17. 0
Domestic supply [3]	9. 7	10. 4	10. 6	10. 6
Refinery gain	. 4	. 9	. 6	. 6
Imports	7. 3	11. 5	7. 0	5. 8
Natural gas:				
Consumption	10. 0	9. 4	9. 4	----
Domestic supply	9. 5	8. 2	8. 8	----
Imports	. 5	1. 2	. 6	----
Coal:				
Consumption	6. 8	10. 9	13. 3	----
Domestic supply	7. 9	12. 2	14. 5	----
Exports	. 8	1. 2	1. 2	----

[1] Detail may not add up to total due to rounding.
[2] Assuming compliance with automobile efficiency standards under current law, and reduced driving as a result of higher gasoline prices. Without these assumptions, consumption would be 25 million barrels per day.
[3] Includes natural gas liquids.

The reduction of oil imports, together with the expansion of the Strategic Petroleum Reserve, the diversification of U.S. sources of foreign oil supply, and the development of contingency plans would significantly reduce U.S. vulnerability to a supply interruption.

Finally, implementation of the Plan would enable the United States to make a contribution to the maintenance of economic progress and political stability throughout the world. By reducing its own demand for world oil, the United States would help reduce the economic dislocations and political tensions that would result from an intense scramble for diminishing world supplies of oil.

THE ECONOMIC CONSEQUENCES OF THE PLAN

The macroeconomic impacts of the Plan would be quite small in a $2 trillion economy. In view of the range of uncertainty surrounding any econometric projection across a period of 8 years, the following projections should be regarded as merely indicative of the direction of the consequences of the Plan, rather than as precise forecasts.

Various macroeconomic analyses have been examined. From these analyses it appears that the program would not have a negative economic impact. Some analyses indicate the Plan could be slightly stimulative. The effects on employment are consistent with the impact on GNP. The standby gasoline tax, if triggered, would have a slightly dampening effect compared to base conditions.

Inflation would increase on the order of one-quarter to one-half a percent per year over the next 4 years. The smaller number would occur if the standby gasoline tax were not triggered, and the larger number would be more likely if the gasoline tax were in effect.

It is important to emphasize that with or without the Plan, the price of fuels will rise. The Plan would increase the price of fuels somewhat. However, the conservation program would moderate the impact on energy bills and might even offset the increases.

The program is designed to stimulate capital investment in conservation and coal conversion. Between now and 1985, coal conversion would require an additional capital investment of more than $45 billion beyond what would otherwise be required. Four billion dollars of additional capital investment would be required for coal mining. The Plan could reduce new capacity requirements for electric utilities by as much as $40 billion. Thus, the net additional investment required for coal conversion and for new electrical generation capacity could be reduced.

A substantial part of the investment generated by the Plan would go to make homes energy efficient. Estimating the capital cost of that

effort is exceedingly difficult. However, the total additional investment probably would be around $20 billion.

The effect of the Plan on domestic automobile sales would be small, but probably positive. However, due to the large uncertainties involved, it is extremely difficult to predict the exact level of new car sales. If the standby gasoline tax were triggered, sales would be slightly lower compared to base conditions.

It should be emphasized once again that all of these projections are subject to a substantial range of uncertainty. They suggest that the National Energy Plan would not adversely affect economic growth. There would be a moderate increase in the rate of inflation. But this disadvantage is outweighed by the impacts on energy use. The future availability of energy has significant economic implications that are not captured by current projections of the GNP or other economic indicators. Standard projections implicitly assume energy will continue to be available at reasonable prices. If it were not available at reasonable prices, all economic activity would be severely affected. An assessment of the economic consequences of the National Energy Plan cannot be made without taking into account the benefit of adequate supplies of energy to maintain the very health of the economy. The economic and social advantages of solving the energy problem are obvious.

THE IMPACT OF THE PLAN ON CITIZENS AND THE ENVIRONMENT

The Plan is based on the principle of equity. Revenues from the crude oil equalization tax would be returned to the economy progressively, as would any revenues from the standby gasoline tax. Although the major price, tax, and regulatory burdens would fall on industry rather than on individuals, those economic burdens would be reflected in higher priced goods and services.

Although energy costs would be generally higher, consumers would receive specific benefits from the Plan. The residential energy conservation program would be available for all households to help reduce energy waste and moderate high energy costs. Residential consumers of natural gas would have more assured supplies, would be protected from the cost of higher priced new gas, and would benefit from the gas utility reform program. Residential consumers of fuel oil would receive an additional share of the equalization tax proceeds as a reduction in price when they buy fuel oil. All users of electricity would benefit from reductions in new capacity construction brought about by conservation, and residential users would also benefit from the

electric utility reform program, which would result in improved utility load curves and, therefore, lower costs. All consumers would also receive, through energy payments from the equalization tax revenues, the bulk of the surpluses generated in bringing oil prices up to the true replacement cost.

American workers would benefit from more assured supplies of energy and a reduced risk of factories shutting down for lack of fuel. There would also be less incentive for industrial firms to move from one part of the country to another in search of reliable fuel supplies. The Plan would also create jobs directly through specific programs such as residential energy conservation, and might have positive indirect effects, as well.

The special needs of the poor and the elderly are addressed. Expansion of the existing Federal weatherization program would particularly benefit the poor and the elderly. The existing HEW Federal-State emergency assistance program would be revised to meet energy emergencies. The progressive nature of the energy payment system is also a benefit. The long-term needs of the poor and the elderly for protection from rising energy prices will be met through a reformed welfare system.

Small firms in the energy industries would benefit from the Plan's emphasis on competition and from the reorientation of the Federal Government's research, development and demonstration programs. Commercial establishments that consume natural gas would benefit from the Plan's pricing proposals.

Businesses would benefit from creation of a single market for natural gas instead of the segmented market that has resulted in the anomaly of plentiful but high priced gas in the intrastate market and cheap but scarce gas in the interstate market. Energy prices would be sufficient to elicit a flow of capital for investment in the energy industries. Investment decisions throughout the business sector would be facilitated by stability and predictability in pricing, environmental and other policies. A healthy business climate for the long run can be preserved only through an effective response to the energy crisis.

Many of the proposed measures would help preserve the quality of the environment. The conservation measures, the support for stringent environmental standards, the emphasis on solar energy and improved technologies for the use of coal, and the measures to increase the safety of light–water reactors are all positive steps.

Implementation of the conservation program clearly is the most important action that could be taken to protect environmental quality

while allowing for continued economic growth. The quality of the nation's air would be preserved despite increasing use of coal. The development of solar energy systems would have a modest short-term impact, but over the long run should make a valuable contribution. The proposed steps for siting criteria for nuclear plants, plant inspectors, and waste management, would make important contributions to nuclear safety and safeguards.

Despite the strong environmental measures discussed in the Plan, some uncertainty will continue over the impacts of increasing coal utilization. The President will appoint a special committee to study the health effects of increased coal production and use. In addition, the Government's coal research and development program will be expanded. The program will focus on meeting environmental requirements more effectively and economically.

THE FUTURE BEYOND 1985

The period from 1985 to the end of the century will test the success of the National Energy Plan. If oil importing countries have failed to restrain their demand by the time world oil production levels off, prices are likely to skyrocket and critical shortages are likely to develop. Reduction in the rate of growth of energy demand, combined with additional domestic energy production, should enable the United States to make the energy transition successfully without major dislocations.

More than two-thirds of the additional private investment required to carry out the Plan is projected to be made before 1985, but many of the benefits, particularly of the conservation programs, are much larger after 1985.

Steps taken during the next few years should produce much greater efficiency in vehicles, buildings, and factories. It is realistic to envision a period of growth for the U.S. economy for the remainder of this century, together with a steady reduction in the amount of energy required to drive a car, heat a home, or run a factory. The lower birth rate of recent decades will also reduce energy requirements after 1985. Fewer Americans will be entering the family-forming age group, which creates the largest demand for housing, automobiles, and energy intensive appliances.

If the National Energy Plan is adopted promptly, the nation's energy requirements per dollar of GNP will steadily decline. The United States will have the time it needs to develop sources of supply to build a more reliable energy base for continued economic growth in the 21st century. Growth rates in energy consumption during the 1985 to 2000 period will be significantly below those projected up to 1985.

The present and future markets for energy can be divided roughly into three categories. The first is transportation, which now is wholly dependent on petroleum. The second is high quality, high temperature energy such as electricity or high temperature steam, which is used for most industrial processes and such household needs as lighting and appliances. The sources of high quality energy currently are fossil fuels and nuclear power. Solar electric technologies and certain geothermal resources can also produce high quality energy. The third category is low-grade heat—temperatures below the boiling point of water—which can be used to heat and cool buildings and provide about one-third of the process heat for industry.

Roughly two-thirds of energy consumption requires petroleum or other high-quality energy in the form of fossil fuels or electricity. It is the low-quality energy requirements that could substantially be met by decentralized solar heating and cooling systems, waste heat from power plants, direct use of geothermal energy, or other diffused and less concentrated energy sources. Over the long run, it is wasteful to use high-grade energy sources, such as fossil fuels and electricity, for end-uses that can be satisfied by low-grade heat.

The strategy of the Plan beyond 1985 is twofold. First, it seeks to encourage dispersed solar energy systems, waste heat, and, within geographical limits, direct use of geothermal energy for those uses for which such low temperature energy is adequate. These uses constitute roughly one-third of the total energy market. Second, the Plan seeks to promote the economical, environmentally sound use of various forms of coal, supplemented by nuclear power, for the high temperature needs of powerplants and industry. A variety of other energy sources—solar electric, biomass, municipal solid waste, high temperature geothermal resources and others—would be developed to supplement coal and nuclear power as sources of high grade industrial heat and electricity.

It is possible that by 1985 a significant share of new buildings in the United States will be incorporating solar technology as the primary source of energy for water and space heating and perhaps cooling. Solar energy can also supply some of the low grade process heat needed by industry and agriculture. Geothermal energy, a virtually untapped but potentially large resource, could meet many direct thermal needs in areas near geothermal resources. Both resources could also, during the 1990's, supplement the light-water reactor and coal for generating electricity.

Some very important questions currently remain unanswered. It is not yet clear what energy source will replace petroleum in transportation. Coal can be converted to petroleum products, as Germany demonstrated during World War II, but current synthetics are extraordinarily expensive, more than double the world price of oil. Perhaps electric cars, buses, and trains will be part of a long-term solution for

reducing oil consumption. Methanol, an alcohol even now sometimes used for fuel, could also make a major contribution as a substitute or additive to gasoline. New opportunities no one can foresee may appear during the next two decades. The United States will need to pursue research and development on all promising options to determine whether any of them can fill the petroleum gap.

Another major question for the future is the long-term source of electric power. The year 2000 is a short period away in terms of the time required to develop new sources of energy. Nuclear energy was discovered 38 years ago, but today provides only about 3 percent of total U.S. energy. Experience with nuclear energy teaches that the development of a new energy source is not simply a matter of solving technical problems. Assessment of an energy system from the perspectives of health and safety, economics and environmental quality must also be an integral part of any research and development program.

Under the Plan, the Federal Government will pursue a diversified effort to develop new sources that can meet electricity generating needs beyond the turn of the century. The major options include the nuclear breeder technologies, nuclear fusion, centralized solar energy and hot dry rock geothermal resources.

Many countries are developing breeder technologies. These technologies could be made commercial by the end of the century. However, the proliferation risk from a plutonium economy and the availability of energy alternatives make it advisable to defer further development of the plutonium breeder technology. Alternative breeder technologies that do not raise the same proliferation concerns are in the very early stages of development. A diversified breeder research effort should be continued as an option for future energy supply, providing insurance if other alternatives fail.

Fusion power remains an enigma. If proven feasible, it could provide a virtually limitless source of energy. Its scientific feasibility, however, has yet to be established despite years of intensive research, and it may bring environmental problems of its own, which have yet to be evaluated. Fusion research should be pursued in a deliberate and careful manner. The United States cannot now count on fusion power to meet energy needs.

Solar energy is also a possible source of electrical energy for the future. The options available are to generate electricity through photovoltaic systems, power plants in the desert, ocean thermal gradients, biomass or perhaps even space satellites. The economics of all these options are poor at this early stage of development. Solar electric technologies also present various environmental problems that require evaluation.

The current economics of solar electric systems do not doom them for the future. The research and development effort has hardly begun, and

conventional economics do not reflect solar's major advantages—the absence of the problems of proliferation and safety inherent in most of the nuclear technologies. Even so, it must be recognized that solar electric—as distinguished from decentralized solar—is still an unproved technology. It, too, is not yet an option on which society can rely.

Finally, hot dry rock geothermal resources may provide substantial quantities of high grade energy during the next century. Hot dry rocks deep in the earth contain vast quantities of heat, but no fluid with which to bring the heat to the surface. Before this resource can be tapped, difficult engineering problems will have to be solved.

In sum, the long-term future of electrical energy in America is still open. It is critical that the United States develop a broad range of nonconventional technologies to assure that in the future it will have energy options that are reasonably priced and environmentally acceptable.

CONCLUSION

Implementation of the National Energy Plan would enable the United States to achieve the President's goals in a manner consistent with his 10 principles. The United States would reduce its short-term vulnerability to a supply interruption by reducing oil consumption and imports, by expanding the Strategic Petroleum Reserve, and by proceeding with diversification of foreign oil supplies and the development of contingency plans. Through effective conservation programs, the United States would upgrade the efficiency of its stock of capital goods so that it could weather the period when world oil production approaches its capacity limitation. Thereby, the United States would avoid sudden and possibly severe interruptions in the flow of goods and services resulting from shortages of energy. By proceeding with research, development and, when appropriate, early commercialization of renewable energy sources, the Plan would do much to prepare for the time when oil and gas will be virtually unavailable for energy use and alternative energy sources will be needed.

The effort to achieve the major objectives of the Plan would provide a sense of mission to the American people. Previous generations of Americans have faced major challenges—settling the frontier, industrialization, war, depression. This generation is discovering that it faces a challenge that is equally great—the energy crisis. Meeting this challenge will require sacrifice, hard work, skill and imagination on the part of the American people. It will require a new national ethic that values energy efficiency and condemns energy waste. And it will require a degree of cooperation that the United States has attained only in meeting the great challenges of the past. As the President stressed in his address on April 18, 1977, "This difficult effort will be 'the moral equivalent of war'—except that we will be uniting our efforts to build and not to destroy." The prospect of America organizing to meet the energy crisis is not grim. It is exciting.

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