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US CONGRESS  
NATIONAL ENERGY POLICY PLAN

NATIONAL ENERGY POLICY PLAN

MESSAGE

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

THE NATIONAL ENERGY POLICY PLAN, PURSUANT TO SECTION  
801 OF THE DEPARTMENT OF ENERGY ORGANIZATION ACT



JULY 17, 1981.—Message and accompanying papers referred to the Committee on Energy and Commerce and ordered to be printed

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THE WHITE HOUSE, July 17, 1981.

*To the Congress of the United States:*

The National Energy Policy Plan that I am sending you, as required by Section 801 of the Department of Energy Organization Act (Public Law 95-91), represents a break from the format and philosophy of the two National Energy Plans that preceded it.

Our national energy plan should not be a rigid set of production and conservation goals dictated by Government. Our primary objective is simply for our citizens to have enough energy, and it is up to them to decide how much energy that is, and in what form and manner it will reach them. When the free market is permitted to work the way it should, millions of individual choices and judgments will produce the proper balance of supply and demand our economy needs.

Overall, the outlook for this country's energy supplies is not nearly as grim as some have painted it, although our problems are not all behind us. The detailed projections, along with the supplementary documents on environmental and economic questions, are being submitted separately by the Secretary of Energy.

The approach explained in the basic National Energy Policy Plan cannot be divorced from the Administration's program for national economic recovery. Energy is one important aspect of our society, but it is only one.

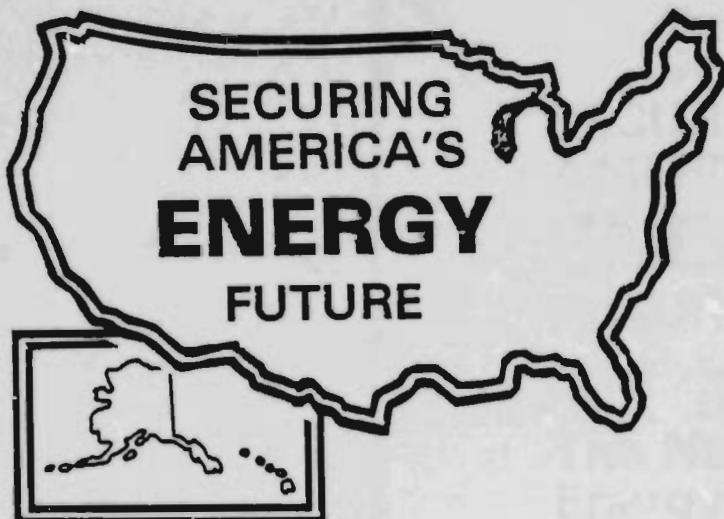
This Administration's actions to end oil price controls and to dismantle the cumbersome regulatory apparatus associated with those controls demonstrate the intent stated in my February 18 economic message to minimize Federal intervention in the marketplace. Reforms in leasing policies and the removal of unnecessary environmental restrictions upon the production, delivery, and use of energy are part of this same effort to reduce bureaucratic burdens on all Americans.

This does not mean that the Federal government is withdrawing from all involvement in energy. It cannot and should not. The Government itself is directly responsible for lands which contain a major share of our resource wealth.

There is also an appropriate Federal role in certain long-term research and development related to energy production and distribution. The goal of these projects is to develop promising technological innovations to the point where private enterprise can reasonably assess their risks.

Given our continued vulnerability to energy supply disruptions, certain emergency preparations—such as rapid filling of the Strategic Petroleum Reserve—remain principally a Government responsibility. But our basic role is to provide a sound and stable economic and policy environment that will enable our citizens, businesses, and governmental units at all levels to make rational decisions on energy use and production—decisions that reflect the true value, in every sense, of all the Nation's resources.

RONALD REAGAN.



# The National Energy Policy Plan

A Report to the Congress  
Required by Title VIII of the  
Department of Energy Organization Act  
(Public Law 95-91)

July 1981

U.S. Department of Energy

**SECURING  
AMERICA'S  
ENERGY  
FUTURE**

**The National  
Energy Policy  
Plan**

A Report to the Congress  
Required by Title VIII of the  
Department of Energy Organization Act  
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July 1981

U.S. Department of Energy  
Washington, D.C. 20585

A NEW ENERGY POLICY FOR THE NATION

During its first six months, the Administration has reformulated energy policy guidelines within the context of its overall Economic Recovery Program. This new national energy policy (of which Executive Branch action is but one part) will continue to develop and to be refined; it will not be tied to a static and unresponsive plan. This document defines the approach for reformulation of policy, and it presents the current energy outlook of the Nation. It is submitted to Congress in accordance with the requirements of Section 201 of the Department of Energy Organization Act (Public Law 95-91). As specific new legislative policy initiatives are developed over the coming months, they will be forwarded promptly to Congress.

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THE FEDERAL ROLE

The Federal Government has one overriding concern in energy during the years ahead. That is to establish sound, stable public policies that will encourage individuals and groups in the private and public sector to produce and use energy resources wisely and efficiently.

Sound public policies must be based on recognition of the Government's and the private sector's respective roles in energy production. The Federal Government's most direct impact on America's energy future arises from its position as the steward of the Outer Continental Shelf and of 762 million acres of publicly controlled land, one-third of the land area of the United States. These lands contain an estimated 85 percent of the Nation's oil, 40 percent of our natural gas, 40 percent of our uranium, 35 percent of our coal, 85 percent of our tar sands, 80 percent of our oil shales, and 50 percent of our geothermal resources. The Federal role in national energy production is to bring these resources into the energy marketplace, while simultaneously protecting the environment.

The Administration is committed to the wise use of our Federal lands and waters. Failure to know our resource potential and to inventory our resources is this Nation and its ability to produce and use energy resources effectively.

Except for rough estimates, we do not know the full extent of our mineral values, our oil and gas reserves, our oil shales, tar sands, and geothermal capabilities. It is the Administration's policy to inventory the Federal lands and waters to determine the quantities of energy resources so that wise resource decisions can be made.

Quantitative levels for the production, the consumption, or even the importation of energy in its various forms are not objectives in themselves. The American economy will choose the energy consumption for a strong, productive, and secure society in the year 2000 whether it be 80 quads or 100 quads or 120 quads of energy annually. Consumption of energy is not the sole determinant of a strong economy; we could be consuming primary energy resources at any of those same levels and have a weak economy, a less satisfied people, a huge bureaucracy, a damaged environment, and continuing apprehension about our position as the leader of the free world. The differences among these possible "energy futures" will depend in part on a wide variety of events and issues that cannot be predicted today. Fundamentally, however, the best guarantee of maintaining a wholesome balance among competing interests in regard to energy lies in allowing the American people themselves to make free and fully informed choices.

All Americans are involved in making energy policy. When individual choices are made with a maximum of personal understanding and a minimum of governmental restraints, the result is the most appropriate energy policy.

Computers cannot gauge human response to future situations with precision. That is the key explanation of why projections of future energy consumption and production have been so often wrong, although there has also been a general bias against market flexibility in the assumptions of many models. Increased reliance on market decisions offers a continuing national referendum which is a far better means of charting the Nation's energy path than stubborn reliance on government dictates or on a combination of subsidies and regulations. Certain mitigating measures may be required from time to time to avoid unacceptable burdens on one sector of our society or another, but these can best be considered in the context of social, not energy, policy. With these considerations in mind, the Reagan Administration is advancing a national response to our present energy situation which will be stable, resilient, and most likely to have beneficial results.

The President's action to end oil price controls and to dismantle the burdensome regulatory apparatus associated with those controls was a major step in implementing an energy policy focused on market realities. The challenge ahead is to provide a healthy economy and policy environment that enables citizens, businesses, and State and local governments to make rational energy production and consumption decisions--decisions that reflect the true value, in every sense, of all the Nation's resources.

This approach represents a radical departure from the prevailing policy instituted after the first shock of rapid oil price increases in 1973 and 1974. There has been intermittent recognition of the pivotal long-term role that must be played by reinvigorated domestic production, and the previous Administration was moving in its latter months toward the view that energy prices should sometimes reflect true costs and market realities, and that environmental concerns must be tempered with common sense. Even so, the regulatory emphasis was overwhelming, and experience suggests that national energy policy should now break cleanly and candidly with that approach.

Past U.S. energy policy relied heavily on Federal intervention, and it attempted (unsuccessfully, for the most part) to protect U.S. consumers from the reality of higher world oil prices. Domestic price controls, which were in place on both crude oil and oil products when global prices increased sharply in 1973, led to gasoline lines and supply uncertainties. Panicky, piecemeal efforts to relieve those uncertainties instantly led to still more complex regulations, including detailed regional allocations, which only added to the confusion. Price controls actually inhibited efficient energy use and discouraged domestic production. The entitlement program also provided multibillion dollar subsidies to oil imports. Government regulation encouraged demand by controlling the average price of oil on the U.S. market and reduced the cost to the buyer of continuing imports. The inevitable result was more oil imports, which increased our vulnerability to damage from disruptions in world oil supplies, such as those occasioned by the Iranian Revolution and its aftermath.

In time, a bipartisan recognition of the stability of this approach led to legislation that envisioned the eventual decontrol of energy prices. Now that oil price controls have been ended finally through Presidential initiative, the Nation is making good progress toward more intensive and extensive exploration, and domestic production continues to be stable despite earlier fears that its steady decline was imminent. Americans generally are using energy more efficiently in response to market forces.

As a result, oil imports have decreased substantially. Even though efficient displacement of imported oil is an important objective, achieving a low level of U.S. oil imports at any cost is not a major criterion for the Nation's energy security and economic health. Even at its current high price, imported oil in some cases is substantially less expensive than available alternatives. The Nation would be remiss if it did not press the search for less expensive domestic alternatives. Yet its vision would be equally narrow if market forces were distorted through indiscriminate subsidies for alternatives that cost more than imported oil now and offer no short-term to midterm likelihood of being economically competitive. Furthermore, there is an international dimension to the problem of oil vulnerability. Damage to other free world economies inevitably affects the United States as well, so it is important that we cooperate with our partners. We cannot entirely protect ourselves from disruptions in the world energy market by reducing our own dependence on imports and trying to isolate ourselves from everyone else. The United States can best help the global community by remaining the leading economic force and a reliable trade partner.

Part of the effort to ensure energy security consists of cooperation with American partners and a sound economic evaluation of our respective circumstances and the requirements of free world security. The U.S. Government is committed to increasing oil stockpiles against potential disruptions in world markets, and to eliminating controls or other impediments that could discourage the private sector from dealing with disruptions efficiently if they should occur again.

The Administration's reformulation of policies affecting energy is part of the President's comprehensive Program for Economic Recovery, which includes elimination of excessive Federal spending and taxes, regulatory relief, and a sound monetary policy. When fully implemented, the Economic Recovery Program will release the strength of the private sector and ensure a vigorous economic climate in which the Nation's problems, including energy problems, will be solved primarily by the American people themselves--consumers, workers, managers, inventors, and investors.

Public spending for energy-related purposes is secondary to ensuring that the private sector can respond to market realities. Even then, Federal spending should be considered only in those promising areas of energy production and use where the private sector is unlikely to invest. This will not stifle innovation. On the contrary, the history of venture capital shows that risk-taking will always be done privately when financial resources are available--in the hope of greater financial gains. The collective judgment of properly motivated technical innovators, businessmen, and consumers is generally superior to any form of centralized programming. Public spending is appropriate (and will continue) in long-term research with high risks, but potentially high payoffs. In most cases, however,

using public funds to subsidize either domestic energy production or conservation buys little additional security and only diverts capital, workers, and initiative from uses that contribute more to society and the economy.

Quite apart from energy matters, another legitimate government concern is the special problem of the poor that arises from increased energy prices. The President has made it clear that funding for programs that aid the truly needy will be protected; but ideally such programs should be administered by agencies that consider people's overall needs instead of one or another disjointed part of those needs, such as heating fuel, gasoline, or electrical energy. Furthermore, allowing prices to fluctuate can be part of a solution to our energy problems rather than the hard core of these problems. As a practical matter, holding energy prices down is ineffective as a means of helping people on low or fixed incomes; such a policy impedes improvement across the board in both the energy and the social welfare fields. The Administration's Economic Recovery Program deals directly with the burdens of inflation and unemployment that have rested unduly upon the disadvantaged. The Administration is confident that it will succeed.

These are guiding principles. The Administration recognizes that some laws that remain in effect are not completely consistent with them; but there are a number of instances in which we have determined that precipitous change would be undesirable. Over the coming months, the Administration will work with Congress, State and local governments, and the private sector in evolving energy policies that reflect these principles more fully.

## II. PRODUCTION

### A. Oil

Oil still represents about 40 percent of all the primary energy consumed each year in this country, so it is the most appropriate starting point for a survey of energy sources in this section.

The prices of petroleum products, such as heating oil and gasoline, had been increasing steadily before January 28, 1981, when the President eliminated Federal price and allocation controls on U.S. oil production and marketing. The full effects of the December round of OPEC price increases coincided with the removal of the subsidy for imports which had resulted from controls. The combination caused a temporary rise in average domestic prices early this year, but petroleum markets adjusted rapidly. Prices stabilized generally, and have dropped for the past several months. There will continue to be short-term ups and downs in prices; but it is Administration policy to let market forces, rather than government fiat, direct the pricing and sale of petroleum products, as well as investment within the exploration, production, and refining segments of the industry.

There is good reason for optimism about the future effects of this policy on the discovery and production of domestic oil reserves. New oil will not be found unless somebody looks for it. More than 650 land crews and marine vessels were engaged in seismic exploration during May 1981--roughly a 30-percent increase over the level a year earlier. U.S. drilling activity is increasing too. Rising prices prior to decontrol led to a 15-year drilling record in 1979, and it increased still further in 1980. But new drill rigs are coming on line now at a substantially faster rate than they did even last year--with more than 375 beginning operation during the four and a half months after decontrol. Oil well completions for January through April were 41 percent above last year's record during the same period.

The new efforts are productive, even though much of our "easy oil" may be gone. In 1979--the last year for which nationwide industry data are available--additions to reserves were 2.2 billion barrels (about twice the average annual additions reported for 1976 through 1978), and the discovery of new fields accounted for 239 million barrels within that figure. No larger volume of new field discoveries has been added at any time in the past quarter century, except for 1970 (when the giant Prudhoe Bay field in Alaska was added to proved reserves).

Rational development in a free-market economy puts a premium on knowing the available resource base. The Administration's approach toward accelerating exploratory leasing will help raise the degree of certainty in future estimates of our energy resource potential.

By very definition, proved reserves increase to some extent as prices increase, because they are an estimate of the total amount of any resource within recognized fields that can be produced economically over the lifetime of the fields with presently accepted technology. Thus, even wells that had once been considered depleted may again become producers--if economics justify the use of more expensive recovery techniques.

Refiners, too, are responding to decontrol by additional investments. New facilities can upgrade heavy, high-sulfur crude oils into lighter products such as gasoline. Adding only the formally announced new projects to those that have been completed recently, we already see a capability of processing about 600,000 barrels per day of so-called "residual oil" into lighter fuels for which substitutes are less readily available.

Domestic production of oil--along with several other of the energy sources that are discussed in this section--will be greater as a direct result of Administration initiatives to remove unnecessary regulations apart from price. These policy directions are discussed in Section V.

#### 3. Natural Gas

Natural gas provides more than half of all the energy used within U.S. households. It is a leading commercial fuel in the country. And it is also a leading source of energy for our industrial sector.

Current Federal law already provides for some increase in permissible natural gas wellhead prices and deregulation of some post-1977 gas by 1985. (Prices to the consumer are also dependent on transportation costs, long-term contracts, and regulation by the public utility commissions within the respective States). However, the Natural Gas Policy Act of 1978 was based on two assumptions that have since been overturned by events. It assumed that oil prices would average roughly \$15 per barrel in 1985, but world oil prices are already more than double that level. As a result, if current trends continue, the existing law will produce a sharp jump in gas prices when most new natural gas is deregulated in 1985.

The act also was written under the assumption that domestic supplies of natural gas were severely limited, yet there are now heartening signs of additional gas reserves in such areas as the Eastern and Western Overthrust Belts and the Anadarko Basin. Expansion of our domestic gas reserves and increased U.S. production of that fuel, however, will lag somewhat below potential so long as controls continue. Because natural gas prices are well below free-market levels, the incentive to explore for new gas reserves is much less than the incentive for oil exploration. As a result, U.S. drilling activity has concentrated on oil--not gas. For the first 4 months of 1981, natural gas well completions increased by only 6 percent over the same period last year, compared to the 41-percent increase for oil.

In view of the situation described above, the Administration currently is assessing options for future natural gas policy.

#### C. Coal

Coal is the Nation's most abundant fossil fuel, although it still supplies only one-fifth of the primary energy we consume each year. The Administration intends to reform Federal regulations that place unnecessary constraints on coal demand, to revise outdated leasing policies which threaten to limit future coal production, and to create an economic environment that enables the private sector to develop coal's potential.

Coal's price advantage over oil has widened rapidly during the past decade. Coal is the most economical fuel for most new large boiler applications, even if an oil-fired boiler is abandoned. The average fuel price difference between coal and oil delivered to utilities in the United States increased from about \$2 per barrel of oil equivalent in 1973 to \$23 per barrel in January of this year.

The coal industry has been responsive to such market forces. Although coal production remained nearly constant between 1970 and the middle of the decade, it rose by an average of about 5 percent annually between 1975 and 1980. Nevertheless, coal production is actually below capacity; and this rate of increase would have been much steeper, in fact, if domestic markets for coal had not been limited by many barriers to its use. The private sector is fully capable of meeting the anticipated future demand for coal in this country if it is not hampered by inappropriate Federal leasing policies and nonessential regulations. Because of the long lead-time required to develop new production capacity, the coal industry is planning now for increases in demand expected to result from higher gas and oil prices, expanding export markets, and the emergence of a coal-based synthetic fuels industry.

Domestic demand for coal is subject to many governmental restraints. The Federal regulatory process is being reformed to reduce impediments to the use of coal, including the excessive costs and lead-times now involved in building coal-fired utility and industrial installations. A switch to coal has been impeded by the significantly higher capital cost of the equipment to use this fuel, as compared with that for oil and gas. The Administration's Economic Recovery Program, which cuts taxes to encourage capital investments, should stimulate industrial and commercial users who will thus benefit from long-term fuel savings—and be able to share those economic benefits with their intermediate and ultimate customers. Several environmental laws are scheduled for review in the 97th Congress—the Clean Air Act and the Federal Water Pollution Control Act being most prominent. The Administration's current review of these acts is examining ways to maintain an appropriate balance between environmental quality and the Nation's need to produce and use more coal. (See Section V.) State and local governments also should focus on regulatory reform to remove unnecessary barriers to coal use and provide economically rational supervision of the Nation's regulated utilities.

National coal production capacity should also expand, even though it might take some time for domestic markets to "catch up." Fortunately, world demand for coal should put the excess output to good use, while also improving our trade balance through U.S. exports of steam coal as well as metallurgical grades. The Administration expects vigorous response by the private sector to rapidly increasing demand for such exports through further investment in mining, inland transportation, handling, and ocean transportation facilities. The costs of port and channel improvements needed to accommodate increased trade can be offset by users' fees; and foreign participation in the improvement of facilities intended for export markets should be encouraged. At the same time, the Administration is examining ways to assist the effort by reducing delays in facility and system improvements caused primarily by existing government regulations and permit-issuance procedures.

In the future, more coal is likely to be produced on Federal lands. The Federal Government controls four-fifths of all the known reserves in the western United States--where low-cost, stripable beds of coal are heavily concentrated. Within a few weeks the Administration is scheduled to conclude a review of the existing program for coal leasing. This review is seeking changes that would accelerate the rate at which coal-bearing lands are leased and would eliminate redundant regulations for implementing such leases.

The Department of the Interior (DOI) has announced that by next year the primary responsibility for supervising compliance with regulations of the Surface Mining Control and Reclamation Act of 1977 (SMCRA) will be transferred fully to those States that wish to assume this responsibility. The Department also has decided to rewrite the regulations to foster initiative and efficiency in the way compliance is reached. This can be done by replacing rigidly prescriptive "cookbook" design standards (telling industry precisely what it must do) with performance standards that are more responsive to local needs and conditions (telling industry what it is obliged to accomplish through its own resourcefulness).

Coal is delivered primarily within this country now by rail, truck, and barge; and private enterprise is exploring actively the possibility of transporting it extensively by slurry pipeline. The Administration is committed to removing regulatory constraints that would prevent the free market from determining the best way to move coal from mine to customer. The development and smooth operation of coal-carrying capacity is essentially a private sector issue, although maintenance of coal-hauling roads for truck movement is the responsibility of the States in which such roads are located.

Finally, by creating an environment that encourages private sector innovation and adoption of new coal technologies, it will be possible for the Administration to withdraw Federal support from near-term development and demonstration programs which could and should be carried forward by private industry. Government research funding can then be directed toward solving fundamental problems and toward generic research which may benefit many companies, rather than toward helping specific companies to develop new equipment and processes. Coal technology efforts by the Department of Energy (DOE) will focus on long-term, high-risk research and development

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where the payoff in the long run can be perceived, yet may not be clear  
enough to motivate adequate investment by individual companies or private  
institutions. The Administration plans to issue a policy statement on coal  
exports consistent with these principles.

### 3. Nuclear Power

For several years, between one-eighth and one-ninth of all U.S.  
electricity has come from nuclear power. During certain months of the year,  
nuclear plants now generate more electricity nationwide than those using  
oil, gas, or hydropower; and nuclear power already accounts for more than  
half the electricity needs of some States. New plants that are now ready  
for operation or that are scheduled to be ready by the middle of the decade  
will raise total generating capacity to approximately twice what it was at  
the beginning of last year. Looking ahead to the early 1990s, the national  
share of kilowatt-hours supplied by nuclear power is projected to increase  
to about 25 percent--based solely on plants now under construction.

Nuclear power has proved to be a safe, economical, and environ-  
mentally acceptable energy source. Furthermore, the United States has  
substantial domestic resources of uranium ore, capable of lasting well into  
the 21st century as used in the current generation of reactors. Breeder  
technology multiplies the effectiveness of these resources sixtyfold, so  
that they could last easily for several centuries.

After the 1973 oil embargo made people more cost conscious about  
energy, U.S. utilities cut back their projections of future growth in demand  
for electricity, from 7 percent annually to about half that. Many orders  
for generating plants of all kinds were cancelled or postponed. The cutback  
was most severe for nuclear units, however--primarily because excessive and  
unpredictable government regulatory procedures added cost and time to  
earlier construction plans, and because the importance of such differences  
was exaggerated at the time by high inflation rates and high interest  
rates. Those two factors in the economy worked against capital-intensive  
projects whose schedule might be stretched out, even though the projects  
might embody the probability of savings after becoming operational.

The Administration is committed to reversing past Federal  
Government excesses and to providing a more favorable climate for efficient  
energy production, thus allowing nuclear power to compete fairly in the  
marketplace with other potential sources of energy supply. The President's  
Program for Economic Recovery will reduce inflation and improve the avail-  
ability of capital to the utilities. Decontrol of oil encourages its more  
cost-effective allocation and the substitution of lower cost, resource-  
conserving alternatives, including nuclear power. (See Section III.)

The Economic Recovery Program can provide regulatory relief without  
compromising safety or basic environmental values. The Administration has  
begun to work with Congress and the Nuclear Regulatory Commission to improve  
the existing licensing process. The Administration will also work with  
State regulatory bodies to identify and implement needed changes in such  
areas as siting and waste disposal.

The Federal Government has direct responsibility for two areas that are integral to the future role of nuclear power: (1) proper disposal of highly radioactive or very long-liver wastes, and (2) development of breeder technology to a point where timely commercialization is feasible. In regard to the first, there is no question that technically acceptable means of disposal exist; and the promise has been made for many years that disposal technique(s) would be demonstrated once a number of potential repository sites had been explored and the suitability of a preferred site could be verified through the emplacement of waste. The Administration is taking steps to make that pledge a reality. The Administration's program of breeder reactor demonstration, which contemplates the reprocessing of spent fuel by either the private or the public sector to provide a complete cycle, reflects a similar commitment. With private sector cooperation, the breeder program provides the necessary focus to maintain this potentially important supply option for the future. Appropriate safeguards against the possible misuse of nuclear power must accompany each new step. To further articulate its nuclear power view, the Administration plans to issue a nuclear policy statement.

#### E. Electric Utilities

Electricity is not itself a primary source of energy, but it serves as a more flexible and convenient delivery system for many applications of the energy content of coal, gas, uranium, falling water, and a variety of other sources that could be important to us in the future. Thus, electric utilities are consumers, converters, and distributors of energy. They are regulated at the State level for sales to consumers and at the Federal level for "wholesale" transactions. Historically, regulation was meant to prevent utilities from taking advantage of natural monopoly power to charge excessive prices; but some regulations of recent years are not relevant to that purpose (for example, regulations mandating the use of specific fuels). In connection with the Fuel Use Act, the Secretary of Energy has recently exemplified the Administration's preference for allowing purely business decisions to remain with business to the greatest practical degree.

For financial reasons, however, many utilities have not been able to make decisions consistent with real-world economics or based on long-run energy and capacity needs. Regulation has increased at an alarming rate, delaying construction and licensing of needed new plants. Cost escalations, coupled with construction delays and the regulatory lag in public utility commission proceedings on rate adjustments, have greatly weakened the financial health of the utility industry. Consequently, that industry is faced with levels of oil and gas usage that are higher than economically desirable, and reliable service in some sections of the country could be threatened during the 1980s because of insufficient generating capacity.

The Administration is reviewing Federal licensing activities, fuel use stipulations, and environmental restrictions, with an emphasis on streamlining procedures, eliminating costly delays and uncertainties, and rescinding ineffective and unnecessary regulations. State public utility commissions will continue to have principal responsibility for economically rational regulation of the utilities; but successful implementation of the

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Administration's Economic Recovery Program will help to surmount the low economic growth, high inflation, and high interest rates which have made it so difficult to raise capital for this and other industrial sectors.

#### F. Synthetic Fuels

The United States has enormous hydrocarbon resources in the form of coal, oil shale, tar sands, and heavy oil. Existing processes can extract those resources and/or transform them into synthetic substitutes for conventional oil and gas; and improved processes are being developed.

The Administration has restructured the national synthetic fuels program to rely more heavily on private investment initiatives and less on the general taxpayer. Responsibility for commercializing the technologies of alternative fuels is shifting to the private sector, with potential support from the Synthetic Fuels Corporation (SFC). Feasibility studies and cooperative agreements which merely subsidize companies to prepare proposals for larger government construction subsidies are being terminated, and DOE funding is being ended for demonstration projects which do not muster significant private-sector support. Under this restructuring, DOE will continue to support and fund long-term, high-risk research and development projects which industry would not be in a position to finance.

This course will reduce Federal outlays substantially. By providing consideration for SFC assistance rather than nearly total DOE funding, the Administration's fiscal year 1982 budget revision document shows that taxpayers save at least \$2.7 billion in budget authority for construction over the next 5 years and another \$900 million in operating expenses. The development pace for a U.S. synthetic fuels industry will be determined appropriately by private investors, with assistance from the SFC. As its first priority, the SFC will provide financial assistance through minimal outlays "up front" (for example, it will emphasize loan guarantees and price guarantees). If current projections of actual process performances and world oil prices are reasonably correct, such "risk insurance" mechanisms will also minimize total budget outlays.

The prospective competitive position of synthetic fuels has improved as a result of high world oil prices, even though synfuel costs also rise on the basis of the conventional energy required in their production. Private corporate planning activities looking toward oil shale or coal synthetic fuels projects have intensified. Initiatives and financial support from the private sector alone have launched several commercial-scale projects, as well as major technical development programs. Seventeen of the top 20 oil companies are now involved in oil shale projects; and these companies have the financial and technical resources to commercialize technology. Among more than 60 responses to SFC's initial solicitation for proposals, many projects show that private enterprise has invested an impressive amount of corporate resources in them over the past 10 years.

Decontrol of conventional fuel prices, revitalization of the economy, and removal of regulatory uncertainties will improve the growth climate for synthetic fuels.

## G. Renewables

Although there is some confusion over what constitutes a renewable energy source, this section will consider those technologies that are commonly called "renewable": solar, wind, ocean systems, biomass, and urban waste. These tend to be small scale; and in many (but not all) cases they are characterized by short lead-times for individual installations. Most "renewables" in this sense have little or no public opposition; nor do they pose severe long-term environmental problems. Thus, they are well suited (and may be confined) to any specific regional markets where they make economic sense. The Administration's clear and consistent adherence to free-market principles will remove artificial barriers and provide a major impetus to the development of such technologies.

The Administration's program for renewable energy resources has three major components that emphasize greater reliance on market forces and private investment initiatives. First, the elimination of large Federal subsidies for conventional fuels, together with the general increase in energy prices, enhances the competitive position of renewables. Second, the continuation of existing tax credits for the time being will stimulate further investment in renewable technologies (although ultimately these credits are subject to careful scrutiny to make sure that the systems favored by them have a reasonable chance of being competitive on their own within a reasonable time frame, via cost reductions, through high-volume production and installation, etc.). Third, the heightened ability of DOE to focus on long-range research and development should encourage the private sector to take greater responsibility for developing, and marketing renewable systems.

Direct Federal spending on solar, alcohol fuels, biomass, and urban waste systems, projected through 1986, will drop by \$2.2 billion. The use of renewables should continue a healthy growth as the rising cost of conventional fuels and the new tax incentives stimulate demand. In addition, more capital will be available for private investment in renewables projects as a result of the President's Economic Recovery Program.

State governments, partially following the Federal example, have begun to offer solar tax credits and have begun to reduce institutional barriers (such as zoning codes and building standards) that were hindering solar development. In the private sector, financial institutions are becoming more familiar with renewables, so that loans in connection with these technologies are easier to arrange. Some utilities now market residential solar equipment.

In 1978 and 1979, more than 100,000 individuals claimed residential solar tax credits; and by last year 364 manufacturers were shipping a total of 19.5 million square feet of solar collectors. Actual and planned investments by the private sector in solar photovoltaics are estimated at nearly \$300 million to date. Direct combustion of wood (primarily in the pulp and paper industry) already provides 2 percent of our national energy consumption, and annual sales of wood stoves (generally for rural residential use) have increased from 160,000 in 1972 to more than 1 million today. In the mid-1970s there were only about half a dozen importers or manufacturers of

small wind systems, and little private funding was available for larger systems. Today about five times that many firms manufacture small wind systems in the United States, and there are at least five privately supported developers of intermediate and large-scale systems in this country. Electricity generated by a wind farm is now reaching utility customers, and similar wind farms are expected in other naturally favorable locations.

#### H. Fusion

The Federal Government recognizes a direct responsibility to demonstrate the scientific and engineering feasibility of nuclear fusion.

The U.S. fusion program is designed to answer basic questions about confinement of plasma and to demonstrate the actual production of net energy (which remains to be done, even in the laboratory). Beyond that, the program will also investigate the severe engineering and materials problems that need to be solved before fusion can be considered a practical energy source. Fusion presents some of the most challenging problems facing our technical community, and even when it reaches operational status it will not be a panacea for energy ills. No single energy source is ever likely to be that. Yet fusion is one of the most promising new approaches to the generation of electricity; and the Administration supports it accordingly.

### III. CONSERVATION

#### A. A Specific Philosophy

Wise and efficient use of energy resources in this country is a key element of our national response to the world energy situation.

Motivated by rising energy prices, individuals, businesses, and other institutions are undertaking serious efforts to use energy more efficiently, generally substituting capital, labor, and known and new technology to modify energy-use patterns of the recent past. Techniques range from weatherstripping to industrial cogeneration.

Because of the way the marketplace works, freely selected changes are likely to involve fuel switches as well as simple reductions in energy consumption as related to productivity. With careful energy management, it is often possible to do the same job with less energy--and definitely with less of the most expensive forms of energy.

One reason that demand for electricity is expected to rise more rapidly than overall energy demand in the United States during the 1980s and 1990s (see Section VI, Table 1) is that the generation of electricity need not rely on expensive oil. This has potential economic (as well as national security) advantages. Oil is the only energy source for which domestic production is unlikely to offer essential energy self-sufficiency in the near future; and it is the only one for which the market price is not determined primarily within our borders. The increasing shift to cheaper means of generating electricity, such as coal-fired and nuclear powerplants, allows the replacement of more expensive oil in two ways: (1) by replacing it as a utility boiler fuel, and (2) by making electricity economically competitive with oil in many end uses. For example, electric heat pumps can substitute for oil burners at an economic saving under most circumstances.

All these efforts are being accelerated by the Administration's decontrol of oil prices. Furthermore, the most astute conservation measures frequently require investment, with a view to long-term saving; and it will be easier in the future for all Americans--individuals and local institutions as well as small and large businesses--to reach a position where they can make such capital outlays. This should result from the President's tax proposals (including income tax reduction and accelerated depreciation) as well as from the inflation-fighting reductions in the rate of growth for federal spending and borrowing. In addition, the President's Program for Economic Recovery estimates that tax credits will provide approximately \$740 million in support to private conservation efforts during 1981 and an additional \$800 million next year.

### 9. Recent Results

Recent history suggests that the American people are responding to market conditions, even with high interest rates and with some controls and subsidies continuing to affect energy prices.

The ratio between national consumption of primary energy and our Gross National Product (GNP) is a useful measure of energy conservation in our economy. The amount of energy used for each dollar of real GNP in 1980 was 15 percent less than in 1973.

The importance of short-term changes in energy consumption (for example, over a single year, or even over a 6-month or 1-month period) has been exaggerated too often by "experts" who wished to make a point. Such figures are affected too much by variations in weather and other random factors to be thoroughly reliable clues to a trend. In the case of U.S. reaction to the last sharp price increase by the principal nations from whom we import petroleum, however, the marketplace seems to have sent an unmistakable message. Net oil imports declined from an average of 6 million barrels per day in 1979 to 6.3 million barrels per day in 1980 (while the economy was clearly weak); and during the first 6 months of 1981 they showed a further decline of more than 20 percent from the 1980 level. A large part of the continuing decline came from prompt behavioral changes in energy use in response to the immediate price change, but another part was almost certainly a result of longer term trends toward more efficient use of energy and the removal of import subsidies.

All types of users and uses are involved in the conservation that has taken place. By the end of 1979, overall fuel consumption by passenger automobiles in the United States was 13 percent below the level that could have been expected if both travel behavior and automobile technology had remained the same as in 1973. In the residential sector, the absolute level of energy consumption per household dropped 14 percent during the same period; and within the commercial sector energy consumption per square foot declined by 13 percent. Industrial energy efficiency (measured in output per unit of energy consumption) rose 12 percent at the same time.

"Energy stores" have opened their doors, offering audits for residences and energy-saving products ranging from insulation to high-efficiency heating systems. More than a dozen companies offer similar services to industry. As a temporary analog for the tax incentives mentioned earlier, the Administration will continue a program of grants to public institutions (such as schools and hospitals) for energy audits and installations to improve energy efficiency. Nonprofit organizations do not have the same response to market forces as profit-seeking groups and do not receive the incentive that tax credits offer homeowners or businesses; but, in time, rising energy costs will make conservation investments compellingly attractive to them also.

In keeping with the Administration's policy to eliminate unnecessary Federal spending, support will be withdrawn from technology programs where sufficient market incentives exist. Such projects include consumer products, advanced automotive engine development, demonstration of electric and hybrid vehicles, and industrial process efficiency. Many of these projects are indeed valuable, but they do not need Federal funding.

C. The Special Case of the Poor

People with low incomes and few assets find it especially difficult to respond to rising energy costs. Lacking the financial resources to make major home improvements or to buy more fuel-efficient new cars, poor families facing higher fuel bills may have little choice but to curtail their energy consumption--even at the cost of severe discomfort, inconvenience, or threats to health.

This problem must not be overlooked; but it is a broad social problem that does not relate exclusively to energy and should not prevent a national energy and economic recovery program that is designed to help all Americans and restore a sound economy that is most helpful to the poor.

The special burdens placed on the poor by higher energy prices are best addressed by agencies most sensitive to people's overall income and housing needs. In view of great price variations by region and by fuel form, the means of relief may best be gauged by agencies close to those in need.

The Administration will continue to provide assistance to the neediest households through the Energy and Emergency Assistance Block Grant Program it has proposed to be administered by the Department of Health and Human Services. The Department of Energy's weatherization program will be incorporated into the Department of Housing and Urban Development's Community Development Block Grant Program.

These block grant funds will be allocated and administered by State and local governments. Decision-makers in continuing close contact with specific programs are best equipped to devise programs and methods of implementing them that will suit particular needs and circumstances. The Administration's aim is not only to make these efforts more efficient, but to increase their effectiveness as well.

#### IV. ENERGY SECURITY

##### A. Oil Stockpiles

The Nation's energy security can be ensured by a mix of private and government efforts.

A Federal role in stockpile development is essential, because--although the private sector has incentives to develop and maintain its own stockpile of both crude oil and petroleum products--commercial enterprises have no economic reason to achieve stockpile levels that are optimal from the national perspective. Under present conditions, many of the economic, national security, and international policy benefits from such stockpiles accrue to the general public rather than to investors.

To ensure optimal stockpiling of oil, the Administration is working toward a Strategic Petroleum Reserve (SPR) of 750 million barrels by 1989. The SPR will be filled as rapidly as possible, consistent with world oil market conditions and with the availability of storage capacity. In only the first 12 weeks of its tenure, the Reagan Administration contracted for more oil for the strategic reserve than had been contracted during all of 1979 and 1980. At current fill rates, the SPR inventory will more than double during the Administration's first year. Furthermore, various methods are being studied to accelerate the schedule and thus give the United States added protection from foreign oil cutoffs at any time during the 1980s.

Large public and private petroleum stockpiles may be a cost-effective form of insurance. They can lessen the adverse impact of any substantial supply interruption and give time to resolve the problems that may have caused the interruption without the type of severe pressures that can limit diplomatic options. The United States is a major force in the world oil market; so by controlling the short-term effects of supply interruptions on domestic prices, public and private petroleum stockpiles in this country restrain the cost of all imports during a disruption. Furthermore, the very existence of such stockpiles will deter some possible supply interruptions. Reducing the potential economic impact of such interruptions on the United States and restricting the economic benefits to suppliers in the area of a possible disruption leaves us as masters rather than prisoners of any unfortunate situation that might arise.

The stockpiling approach is contrary to past government policies that attempted to manage any oil shortage by intervening in the market-place. Oil made available from stockpiles actually alleviates a shortage and thus reduces its economic and social losses, without forsaking the principles of free choice for individuals and enterprises.

### B. International Cooperation

The U.S. economy and our country's international objectives are intertwined with the economic and geopolitical postures of other free world nations. Thus, security in energy supply is an international challenge. As a member of the International Energy Agency (IEA), this country is committed to cooperation under the IEA emergency oil-sharing system in the event of major oil supply disruptions. Market forces will be the primary means of response to disruptions, but useful adjuncts to those forces may include advance preparations for surge capacity in the production of oil and other energy resources, more flexible methods of using oil stocks during times of emergency, and emergency fuel-switching plans.

### C. Emergency Preparedness

Analyses of previous disruptions of normal oil supply show that imposing an elaborate system of price and allocation controls only drives the social and economic costs higher. Many experts now agree that proposed gasoline rationing programs are administratively expensive and unworkable. A new approach to emergency preparedness is clearly called for, so the approach envisioned by the Administration encompasses the following features:

- o Primary reliance on market forces to determine the price and allocation of energy supplies, even during an emergency.
- o Rapid growth in the Government's Strategic Petroleum Reserve, and simultaneous removal of factors that have discouraged private firms from building up their own emergency oil stockpiles (for example, their assumption that government allocations will "rescue" those who have not planned ahead if a supply shortfall should occur).
- o Development of criteria and mechanisms for making the strategic reserve available for use in case of emergencies.
- o Encouragement of manufacturers and utilities to stress dual-fuel capability for installations and equipment, so that they could switch readily to the most widely available fuels during a disruption.
- o Advance planning to permit domestic energy producers to increase output and delivery above optimum levels temporarily during a disruption without economic penalties.
- o International coordination of emergency response.

The Administration realizes that free markets will not work perfectly during a severe disruption. In general, however, they will work more smoothly, with greater certainty, and ultimately more fairly than complex systems of price and allocation controls managed by the Government. If disruptions should occur in the future, the success of the Administration's policies should not be measured against normal conditions, but against the chaotic conditions that have been experienced as a result of the rigid "father knows best" approach which was tried in the past for small

disruptions. If a major disruption should occur, limited Government involvement might be warranted to make sure that essential services and functions (such as those connected with national security and public health and safety) continue.

Numerous Federal agencies, the States, and the public must all work together to make emergency policies effective in practice. The Administration intends to work closely with the States to ensure that Federal and State plans mesh, instead of moving at cross-purposes to one another.

V. REGULATIONS

A. Regulatory Reform

The Administration is acting to eliminate excessive Federal regulation generally, and this broad philosophical commitment will have especially important results in the energy field.

Some regulatory activity is needed to protect the health and safety of the public. However, it does not follow that all health and safety regulation is necessary . . . or that all such regulation even improves health and safety . . . or that, even when regulation is effective, it is the only way to accomplish the public protection desired. With these thoughts in mind, the President's Task Force on Regulatory Relief is focusing a comprehensive review on existing and proposed regulations in the petroleum and other energy areas.\*

On January 28, 1981, President Reagan issued an Executive order decontrolling the price of petroleum and petroleum products immediately. On April 30, DOE issued a notice in the Federal Register revoking 206 sections of the Code of Federal Regulations relating to control of petroleum. Besides removing impediments to free-market adjustments, the Administration's action reduced reporting burdens throughout the industry by more than 700,000 man-hours annually.

Apart from petroleum, DOE has identified more than 150 individual rulemaking activities pertaining to energy, and the task force has recommended that about half of these be rescinded or modified. In conformance with Executive Order 12291, decisions about particular regulations will be based on four principles: (1) limiting Federal involvement, (2) increasing agency accountability for regulatory actions, (3) putting greater emphasis on cost-effectiveness in setting regulatory requirements, and (4) generally reducing regulatory burdens on the private sector.

Under its "General Requirements" section, the Executive order points out that the objectives of all Federal regulation will be chosen in the future to bring the maximum possible benefit to society, but that no regulatory action is to be undertaken unless sufficient information is available to determine that the potential benefits to society from a proposed regulation outweigh its cost. Furthermore, if there are various ways of achieving any given regulatory objective, the alternative involving the smallest net cost to society is to be chosen.

Burdensome regulations, promulgated by numerous Federal agencies, have so pervaded the energy field that it was impossible to treat energy production at all within earlier parts of this document without discussing such regulatory aspects as the restrictions on oil and gas prices and the rules for surface mining. This section will not repeat what has already been said, but will confine itself instead to regulations relating to generic environmental quality, many of which are administered by the Environmental Protection Agency, leasing regulations administered by the Department of the Interior, and miscellaneous Department of Energy regulations. Not all of these are embodied specifically in statute.

### 3. Environmental Regulations

The Administration's approach to environmental policy is to aim for a reasonable balance between "energy values" and "environmental values." By streamlining administrative processes, reducing decision-making delays, and clearly weighing economic costs against effectiveness, the Administration seeks to minimize uncertainties on all sides in specific cases and to resolve conflicts according to an informed public consensus.

"Environment" really means everything around us—not only air, water, sunlight, minerals, plants, and animals, but also manmade constructions that now exist. These environmental resources in each locality are complex and interrelated, so that any human application of them to any purpose (whether the application takes commercial, scientific, recreational, or any other form) affects other activities.

Energy-environmental conflicts arise because diverse groups place different values on energy itself and on individual elements of the existing environment which are altered as energy is produced, delivered, or used. Market mechanisms can resolve such conflicts if each of the resources in question (say, a certain number of tons of coal, or so many square feet of undisturbed soil and grass) can be valued in terms of price or opportunity cost. In these cases, the market values (not only to potential buyers and sellers, but occasionally to the public at large) allocate such environmental resources as land use and water rights. In other instances, however, such mechanisms have not been developed; and political-administrative processes are used instead. Everyone agrees, for example, that clean water and clean air are valuable; it is more difficult to decide how clean "clean" is—and how much each change in the degree of cleanliness is worth in dollars and cents.

Several key policy discussions on energy-environmental issues are now under way. These include Clean Air Act requirements, Federal Water Pollution Control Act requirements, leasing policies for the Outer Continental Shelf (OCS), effluent specifications during the production of synthetic fuels, permit-issuance procedures for industrial and energy facilities, terms of radioactive waste disposal, and nuclear plant safety. In addressing each one, the Administration will try to use free-market principles to assess public attitudes whenever possible; but the success of such a policy will depend on broad citizen understanding that some tradeoffs are inevitable. Optimal resolutions are possible; perfection is not.

Efforts to step up domestic energy production are too important to be frustrated by inadequate access to the mineral wealth of our land. It has been estimated that the Federal Government controls up to 90 percent of all U.S. energy resources, and the Administration is evaluating Federal leasing policies to guarantee that these energy resources on Federal lands can be explored and produced at a pace consistent with our national energy needs, legitimate social and environmental values, and the public interest. The governments of affected States and tribes will be consulted in developing the revised leasing plans.

Outer Continental Shelf Program: To increase the Nation's domestic energy sources, the Outer Continental Shelf leasing program must be seen as a significant national energy program. Only 20 million of the 1.1 billion acres on the federally owned Outer Continental Shelf have been leased; yet OCS furnishes nearly 10 percent of our total domestic oil production and more than 20 percent of our domestic gas production. The 1978 amendments to Outer Continental Shelf Lands Act place on the Federal Government an affirmative responsibility to obtain for the public the benefits of oil and gas resources located on the U.S. Outer Continental Shelf. These resources, as the act states, are to "be made available for expeditious and orderly development, subject to environmental safeguards" in order to "achieve national economic and energy policy goals, ensure national security, reduce dependence on foreign sources, and maintain a favorable balance of payments in our trade."

The fundamental purpose of the OCS program is to discover, identify, and inventory those oil and gas resources that lie beneath the ocean on Federal lands. To that end, the Administration has announced a new major offshore oil and gas leasing program designed to increase the pace, scope, and quality of offerings and to achieve early leasing of high-priority areas. This is to ensure that the resource reserves on the OCS are made available for expeditious and orderly development.

The proposed leasing schedule is for 42 sales. It accelerates sales in high-priority Alaskan OCS areas and incorporates a streamlined lease process that is designed to implement a sale in about half the time it takes now. Larger areas of the OCS are to be offered for leasing, and wide environmental assessments are to be prepared in a shorter time, and the pre-sale review process is to be telescoped.

Onshore Oil and Gas Leasing: The Secretary of the Interior has directed that all excessively burdensome regulations and procedures be eliminated and that the others be streamlined. This process is now under way. Onshore leasing, especially in Alaska and the promising Overthrust Belt, will also be increased and accelerated to bring additional oil and gas resources into the marketplace.

Oil Shale Leasing: An oil shale leasing program will be announced in late summer. In addition, the Administration will support legislation to amend existing law to provide for leasing of tracts for offsite waste disposal and facility siting, increasing oil shale lease size, increasing

the number of leaseholds per company, resolving the Department of the Interior's multi-mineral authority, and addressing the difficulty of consolidating fractional interests and indirect holdings in lease areas.

Tar Sands Leasing: The Department of the Interior will support legislation to end the current statutory and administrative limitation on tar sands development, so that tar sands areas will be leased for the first time in two decades.

Coal Leasing: The Administration is working to reform inappropriate Federal leasing policies that threaten to constrain future production of coal. Only 300,000 acres--or eight-tenths of one percent--of the 100 million acres of publicly owned lands containing commercial coal deposits are under lease now. The Administration has ended a 10-year moratorium on leasing of Federal coal and is committed to accelerating the Federal coal leasing program and removing regulatory barriers to coal production. A decade ago, production from Federal coal leases stood at 7 million tons. Last year, production had climbed to 70 million tons, 8 percent of America's total. The Interior Department estimates that by 1990 coal production on Federal lands will be at 310 million tons, or 60 percent of western U.S. coal production.

Geothermal Leasing: The Department of the Interior will support legislation to end statutorily established barriers to development of America's vast geothermal energy resource. In addition, by Secretarial order, the Department will end administrative delays to the leasing of geothermal lands.

#### D. DOE Regulations

In February 1981, the Department of Energy established its own group on regulatory review (aside from decontrol) to assist the President's task force. The DOE group identified more than 150 Departmental regulations, on topics ranging from Federal utilization of photovoltaics to test procedures for clothes washers. As noted above, the task force recommended that about half of these be considered further for modification, rescission, or withdrawal; and a list of these will be issued as soon as it can be determined whether the most appropriate relief lies in administrative action, proposals for legislative change, or a combination of both.

Under the new procedures established in Executive Order 12291, regulatory analyses prepared in conjunction with these reviews will include a description of the rule's benefits, its potential costs, and alternative approaches that might achieve substantially the same regulatory goal at lower cost.

## VI. ENERGY PROJECTIONS

### A. Value and Limitations of Projections

Projections of energy supply and energy demand for various dates in the future tend to attract attention--both from those working in the energy field and from the general public. As long as supply and demand are both included and price assumptions are made clear, honest and carefully prepared projections are useful in cross-checking the feasibility of national energy policy. Yet even the traditional "best estimate" projection is not a prediction, and it should not be described or regarded as one. Projections cannot and should not be used as a blueprint for the future; the projections in this section do not represent a statement of energy goals.

The one thing that is certain about the future is that the exact path of energy developments and markets is uncertain. Technological innovations, geologic discoveries, changes in the economy at home or abroad, political or military conflict, variations in public attitude--all of these are inherently unpredictable events that can alter the Nation's energy situation drastically. Under the free-market philosophy of this Administration, the American people themselves will actually conduct a continuing national plebiscite in the marketplace to express their individual and collective evaluation of possible courses of action. Their actions will determine ultimately whether energy consumption per capita in this country rises or falls between now and the year 2000--and what our mix of energy sources will be at the turn of the century.

The energy projections included in this report indicate possible trends in U.S. energy supply, demand, and prices over the next 20 years--given current policies and programs. Policies not in effect as of June 1, 1981, are not reflected in the assumptions underlying these projections. Therefore, these projections represent a set of alternative base cases, or starting points, to reexamine expectations of future energy markets.

The range of estimates--for example, from 79 to 85 quads<sup>1</sup> of primary energy consumption during 1985, between 60 and 64 quads of energy

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<sup>1</sup> A "quad" is a convenient quantity for expressing relationships among very large amounts of energy, especially energy derived from diverse sources. Literally, the term means one quadrillion British thermal units (that is, a "1" followed by 15 zeroes). One quad represents the energy value obtained by burning about half a million barrels of typical crude oil daily (or somewhat more than 125,000 tons of coal daily) for a year. During 1980 the United States used 78 quads in all.

Figure 1 shows the relationship between supply and demand in the market for calendar year, 1960, that is the period during which the market was in surplus. Demandsupply, expressed in billions of dollars per year, is measured on the vertical axis and supply, in billions of dollars per year, on the horizontal axis. The intersection of the two curves determines the equilibrium price, \$1.25, and the equilibrium quantity, 1.25 billion dollars.

3. **Projections (Not Predictions)**, 1985, 1990, and 2000

multiple regressions try to estimate how much each variable contributes to the most likely outcome given different characteristics of the sample.

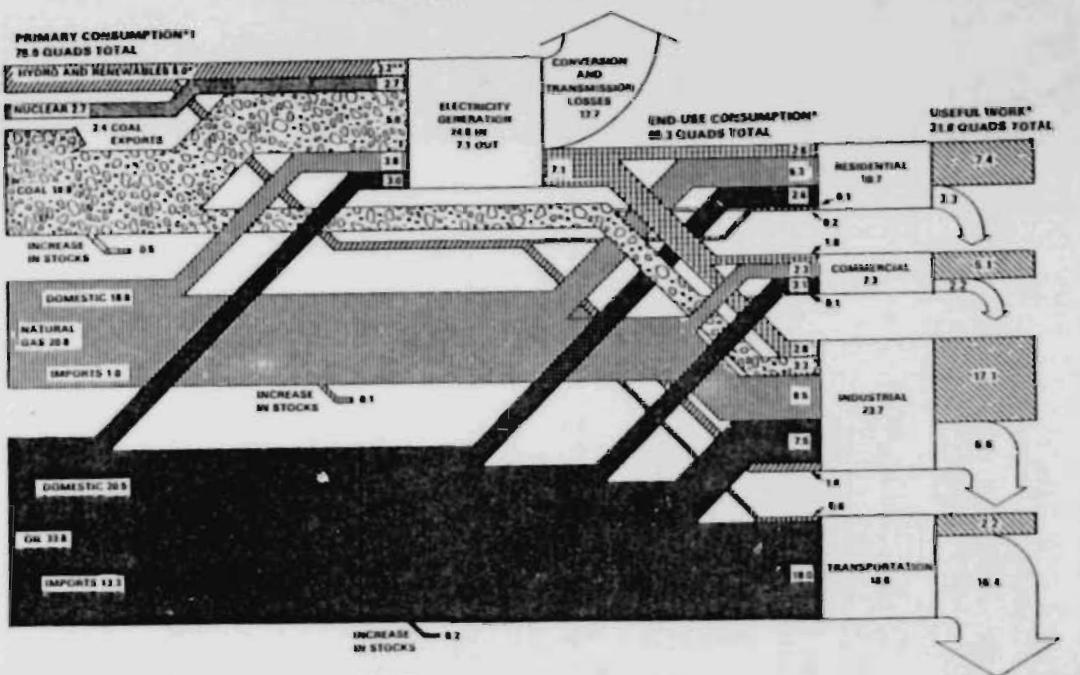
The prompt production response to clearing world prices and to the more limited a free market for U.S. society. (Recent world-wide exploration, as well as U.S. production, has surpassed most expectations.)

the absorption of total and partial reductants in the demand for energy at the new plants. (Total consumption of energy in all forms during 1973 was 1990 M.E. per day, 2 per cent above 1972 level, whereas previous projections indicated much higher levels.)

9 The sudden and substantial increases in world oil prices  
10 occurred in 1973 (as a result of which 1980 prices averaged 50 per  
11 barrel—twice as high as in 1970). The century's  
12

We cannot be certain, of course, that the key assumptions about future energy prices, the economy, and energy markets will hold true. In this case, relatively certain price, for example, there were significant price movements as the years passed.

**FIGURE 1**  
**U.S. ENERGY SOURCES AND USES IN 1986**  
**(IN QUADRILLIONS OF BTU's)**



#### EXCLUDING COAL EXPORTS AND INCREASES IN STOCKS

**INCLUDES 1 QUADRILLION TONS OF BIOMASS USE NOT CURRENTLY ACCOUNTED FOR IN DOE STATISTICS.**

• INCLUDES 9.2 QUADS OF IMPORTED HYDROELECTRIC POWER

BASED ON INJ USE EFFICIENCIES FROM 1979 BROOKHAVEN DATA

END USE LOSSES  
2.5 QUADS TOTAL  
(NET OF ELECTRICITY  
EFFICIENCY GAINS)

to reduce the final amount of useful work derived from all primary energy inputs to 31.8 quads.

Projections from this base involve possible changes in both demand (energy consumption) and supply (domestic production of energy, plus net imports).

The major portion of Table 1 summarizes projections of U.S. energy consumption by end-use sector and by type of fuel. The upper part of Table 2 projects changes in domestic production of primary energy. In the case of each table, the literal "bottom line" is the projected figure for total consumption of primary energy resources during each of three years--1985, 1990, and 2000. This is a projected answer to the often-asked question: "How much energy will the country use?"

For the consumption table, we must add electrical conversion and transmission losses to the measurement of energy consumption at the point of ultimate use, because electricity--a factor of great and growing importance in our energy economy--has undergone most of the inevitable "use" losses before it ever reaches a customer. For the production table, the difference between domestic production and total domestic consumption is made up by imports and/or exports.

In Table 1 and the computations on which it is based, the midrange projection for energy consumption offers the following outlook:

- o Underlying trends in the world oil market suggest that world oil prices will increase (in terms of constant dollars) over the long term. However, the price increases of 1979 and 1980 have depressed energy demand and have created a "slack" market, with little if any pressure for price increases in the near term.
- o Based on the effects of higher prices alone, the U.S. economy should continue to become more energy-efficient. With economic growth averaging 2 percent to 3 percent per year until 2000, total energy consumption is projected to increase at only about 1 percent to 1.5 percent per year over the same period. As a result, energy consumption per GNP dollar would fall by 1 percent to 1.5 percent per year, from more than 50,000 Btu's to about 40,000 Btu's per constant 1972 dollar.
- o By 1990, increased efficiency in energy use (as projected) would reduce consumption about 16 percent compared to what it would be if energy use were to grow at the same rate as the economy over the next decade. Energy use per household would decrease by 18 percent in a similar comparison; energy use per unit of industrial output would decrease by 19 percent; and average Environmental Protection Agency (EPA) fuel efficiency for the entire auto fleet would increase to about 30 miles per gallon (compared to 17 mpg today). The increase in mileage efficiency is thus projected to go well beyond mandated goals for 1985 on the basis of market forces alone.
- o Although total energy consumption would increase slowly, the mix of sources and uses is projected to change considerably. Oil, which

TABLE 1  
ENERGY CONSUMPTION  
(Quadrillion Btu's Per Year)

CONSUMPTION BY SECTOR	PELICANARY <sup>2/</sup> 1980	PROJECTED <sup>3/</sup> 1985		PROJECTED <sup>3/</sup> 1990		PROJECTED <sup>3/</sup> 2000	
		distance	range <sup>1/</sup>	distance	range <sup>1/</sup>	distance	range <sup>1/</sup>
<u>CONSUMPTION BY SECTOR</u>							
Residential	10.7	10.7	10-11	10.8	10-11	10	9.1-11
Commercial	7.3	7.3	7.0-7.5	7.5	7.3-8.3	8.5	7.8-9.3
Industrial	23.7	25.4	25-26	27	25-29	31	28-34
Transportation	18.8	18.2	18-19	18	17-19	19	17-20
End-use Consumption	60.3	62	60-64	63	59-67	68	62-74
<u>CONSUMPTION BY FUEL</u>							
Direct Oil <sup>4/</sup>	31.2	19	28-30	27	26-29	24	23-25
Direct Gas <sup>4/</sup>	16.7	17	17-17.5	18	17.5-18.5	20	18-22
Direct Coal	3.5	4.7	4.4-5.0	3.5	3.0-4.4	7.5	6.8-8.2
Direct Renewables	1.8	2.1	2.1-2.2	2.1	2.6-2.8	4.2	3.9-4.5
Electricity <sup>4/</sup>	7.1	8.2	7.8-8.1	8.8	8.2-11	12	10-14
End-use Consumption	60.3	62	60-64	62	59-67	68	62-74
Conversion Losses <sup>5/</sup>	17.7	20	19-21	24	21-27	27	24-26
TOTAL CONSUMPTION	78.0	82	79-85	87	80-94	100	90-110

<sup>1/</sup>Totals may not add due to rounding.

<sup>2/</sup>Residential, commercial, and industrial consumption based on preliminary 1980 data adjusted to reflect 1973-1978 trends. Transportation consumption from Energy Information Administration, Monthly Energy Review, March 1981. Includes 1.8 quads of biomass not included in DOE/EIA statistics.

<sup>3/</sup>Range comes from varying DEP assumptions (see Table 3).

<sup>4/</sup>Includes liquid synthetic fuel from coal.

<sup>5/</sup>Includes synthetic gas from biomass and coal. Net electricity generated from coal, nuclear, oil, gas, renewables, and hydroelectric powerplants and delivered to final consumers.

<sup>6/</sup>Includes losses of energy in the production, transmission, and distribution of electricity. Plus losses in the production of synthetics from coal is relatively minor portion of the total within this time period.

TABLE 2  
ENERGY PRODUCTION/  
(Quadrillion Btu's Per Year)

	ACTUAL 1980	PROJECTED 1985					
		1985 RANGE	1985 RANGE	1985 RANGE	1985 RANGE	1985 RANGE	1985 RANGE
<u>ENERGY PRODUCTION</u>							
Oil and gas/ <sup>1</sup>	25.3	18	17-20	18	16-21	20	17-24
Natural gas/ <sup>2</sup>	19.8	18	17-19	18.5	16-21	18	14-21
Coal/ <sup>3</sup>	18.9	22	20-23	27	24-30	42	37-45
Nuclear	2.7	5.5	4.9-6.2	7.6	6.7-8.7	10.6	7.8-14
Hydro/Geothermal/ <sup>4</sup>	3.2	3.4	3.2-3.6	3.6	3.3-3.9	4.3	3.7-4.9
Renewables/ <sup>5</sup>	1.4	2.2	2.0-2.4	2.5	2.4-2.7	5.4	3.9-7.0
<u>TOTAL</u> / <sup>6</sup>	66.9	67	64-75	78	68-88	100	83-116
<u>NET IMPORTS</u>							
Oil	13.3	13	10-18	10	4-15	3	0-11
Gas	1.0	2	1-3	2	1-3	2	1-3
Coal	(2.6)	(2.7)	(2.0-3.1)	(3.5)	(2.3-4.3)	(1.9)	(3.4-5.4)
<u>TOTAL CONSUMPTION</u> / <sup>7</sup>	78.0	82	79-85	87	80-94	100	80-110

<sup>1</sup> Ranges reflect uncertainties in key assumptions, which are detailed in Energy Projections to the Year 2000 (EIA/PE-0229).

<sup>2</sup> Includes shale oil, but excludes coal liquids.

<sup>3</sup> Excludes synthetic gas from coal and natural.

<sup>4</sup> Includes coal production for synthetics and coal exports.

<sup>5</sup> Includes about 0.2 quads of imported hydroelectric power.

<sup>6</sup> Renewables include about 1.6 quads of biomass not currently part of EIA/DOE statistics.

<sup>7</sup> Totals may not sum due to rounding.

<sup>8</sup> Range in projections of total energy consumption (rounded to the nearest quad) results from varying DIP assumptions. Total consumption for 1980 includes 0.8 quads of net stock increases; zero stock change assumed in 1985 and beyond.

provided 44 percent of the Nation's energy needs in 1980, would provide only about one-third of all energy inputs in 1990 if the midrange assumptions prove to be approximately correct.

Table 2 projects these "midrange" changes in energy production:

- o Conventional production of oil and natural gas would continue to decline over the coming decades. However, new sources--especially enhanced oil recovery, shale oil, synthetic fuels, and unconventional gas--would help offset this decline.
- o Coal and nuclear production would increase significantly over the next 20 years.
- o Production of liquid fuel substitutes for petroleum from coal and oil shale would total roughly 500,000 barrels per day (about 1 quad) by 1990.
- o Hydroelectric and geothermal energy production would increase by about one-third, while the energy contribution from use of what are classified as "renewable" sources would grow from 2 percent of total domestic consumption in 1980 to about 5 percent by the year 2000.

#### C. Energy Trade Projections

Under the assumptions used, the projections indicate that net U.S. oil imports would level off and decline in the future. The midrange estimate would suggest that oil imports, which were 8 million barrels per day (MMBD) in 1979 and 6.3 MMBD in 1980, would be 6 to 7 MMBD in 1985 and 4 to 5 MMBD in 1990.

Of course, these projections are subject to great uncertainty. Changes in the world oil market (particularly in OPEC pricing behavior) might increase or decrease oil imports by 1 MMBD or more in 1990. Changes in the rate of GNP growth could cause oil imports to be roughly 1 MMBD higher or lower in 1990. Uncertainties in domestic energy supply could add or subtract another 2 MMBD. Taking into account all these variables, oil imports in 1990 might range anywhere from 2 to 7 million barrels per day.

Coal exports are projected to increase substantially over the next decade, with the precise extent being determined largely by foreign demand. If adequate demand exists, actual coal exports could exceed the projected level.

#### D. Comparison of Current Projections with the National Energy Plan of 1979

Table 3 compares the current energy projections with those prepared 2 years ago. World oil prices have increased substantially since 1979, while the condition of our economy has been modified as the economy moves out of a recession. In addition, actual gains in energy efficiency have proved larger than expected, and projections for continued improvement in

TABLE 3

## COMPARISON OF RECENT AND CURRENT U.S. ENERGY PROJECTIONS FOR 1990

	ACTUAL	PROJECTED 1990		
		1979 FORECAST <sup>1/</sup>	CHANGE	RANGE
WORLD OIL PRICE <sup>2/</sup> (1981 \$/barrel)	\$37.70	\$28	\$52	\$41-\$61
U.S. GNP GROWTH <sup>3/</sup> (percent per year from 1980)	**	2.4%	2.8%	2.1-3.6%
<u>DOMESTIC PRODUCTION</u> (Quadrillion Btu's Per Year)				
Oil and Gas <sup>4/</sup>	20.5	**	18	16-21
Natural Gas <sup>5/</sup>	19.8	18	18.5	16-21
Coal <sup>6/</sup>	18.9	27	27	24-30
Nuclear	2.7	9.4	7.6	6.7-8.7
Hydro/Geothermal <sup>7/</sup>	3.2	3.6	3.6	3.3-3.9
Renewables <sup>8/</sup>	1.8	2.9	2.8	2.4-3.3
<b>Total<sup>9/</sup></b>	<b>66.9</b>	<b>83</b>	<b>78</b>	<b>68-88</b>
<u>NET IMPORTS</u> (Quadrillion Btu's Per Year)				
Oil	13.3	19	10	4-15
Gas	1.0	2.3	2	1-3
Coal	(2.4)	(2.1)	(3.5)	(2.3-4.3)
<b>STOCK CHANGE</b>	<b>(0.8)</b>	<b>**</b>	<b>**</b>	<b>**</b>
<b>TOTAL CONSUMPTION<sup>10/</sup></b>	<b>78.0</b>	<b>102</b>	<b>87</b>	<b>80-94</b>

<sup>1/</sup> Forecast taken from the second National Energy Plan, prepared May 1979.  
<sup>2/</sup> Average acquisition cost of crude oil imports by U.S. refiners.  
<sup>3/</sup> Substantial variations in world oil price are possible, depending upon future world energy market conditions.

<sup>4/</sup> The current projections assume a range compatible with the President's Economic Recovery Program.

<sup>5/</sup> Includes crude oil, but excludes coal liquids.

<sup>6/</sup> Includes synthetic gas from coal and methane.

<sup>7/</sup> Includes coal for synthesis and coal exports.

<sup>8/</sup> Includes about 0.7 quads of imported hydroelectric power.

<sup>9/</sup> Includes about 1.8 quads of biomass not currently included in EIA/DOE statistics.

<sup>10/</sup> Totals may not add due to rounding.

<sup>11/</sup> Range in total energy consumption in current projections results from varying GNP assumptions. Total consumption rounded to the nearest quad.

the future are brighter as market forces come to the forefront in spurring conservation. Overall, demand in 1990 is thus projected now to be 15 percent lower than the level projected 2 years ago.

On the supply side, however, domestic production is also projected at a lower level. The decrease of 6 percent from the NEP-1979 forecast results primarily from delays and cancellations in the construction of nuclear powerplants and a more conservative evaluation of domestic oil production potential. The supply differences reflect positive influences from recent economic and policy improvements, but these are more than offset in net effect by more realistic assessments of how rapidly domestic production can respond under any circumstances. Because the gains projected now in practical conservation (including fuel-switching) outweigh the potential losses in supply counted on earlier, current projections of net oil imports in 1990 are lower by more than 4 MMBO when compared to the official forecasts prepared just 2 years ago.

#### 5. Conclusion from Projections

The energy outlook for the United States, especially in regard to the Nation's current and projected dependence on foreign oil, continues to evolve. The economy's ability to use energy more efficiently has been underestimated in the past. Current estimates suggest that domestic energy production can increase steadily to the year 2000, but the final determination of whether consumption requirements are 80 quads or more than 100 quads by that time rests ultimately with the American public and American industry operating in a free-market economy and within a democratic society.

Although the United States would continue to import oil at close to today's levels through the mid-1980s according to present midrange projections, net oil imports would decline gradually beyond 1985 under all but the most pessimistic energy assumptions.

As indicated throughout this report, the Federal Government under this Administration will allow energy markets to function effectively, rather than trying to bind them within the confines of a hard-and-fast National Energy Plan like NEP-I or NEP-II. This should allow energy consumers and producers to use, find, and produce energy more efficiently.

While the current projections are consistent with recent projections prepared by other government and private groups, the future is far more uncertain than these or any other projections might indicate. Factors such as the world oil market and the behavior of the economy have proved to be unpredictable, even in the near term. The most one can expect from these projections is an association of potential trends in energy supply and demand patterns, and their sensitivity to key uncertainties.

Regardless of whether the particular projections in this document prove to be optimistic or pessimistic, it is clear that the United States remains vulnerable to disruptions in the world oil market. Emergencies can be foreseen, even if they are not predicted; and there will be a continuing need for preparedness measures to handle them if they should arise.

DOCUMENTS SUPPLEMENTING  
THE NATIONAL ENERGY POLICY PLAN

Energy Projections to the Year 2000  
(DOE/PE-0029)

Interrelationships of Energy and the Economy  
(DOE/PE-0030)

Environmental Trends to the Year 2000  
(DOE/EP-0021)

**END OF  
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