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Energy Policy Alternatives

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ENERGY POLICY ALTERNATIVES

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Congressional Budget Office

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PREFACE

Energy Policy Alternatives analyzes major energy policy issues facing the nation. This paper addresses energy policy issues in a broad context by bringing together in one analysis the combined effects of such diverse policies as price controls, import restrictions, federal expenditures for research and development, conservation and environmental standards, subsidies and loan guarantees for production of synthetic and other fuels, and tax incentives for both conservation and production. While most energy-related decisions are likely to come before Congress as individual decisions on programs, projects, authorizations, and appropriations rather than in the unified context presented here, it is nonetheless useful to consider the issues in a comprehensive framework so that major alternatives can be carefully evaluated.

This paper is one of a continuing series of CBO background papers and budget issue papers focusing on energy issues before the Congress. In keeping with the Congressional Budget Office's mandate to provide nonpartisan analysis of policy options, this paper contains no recommendations.

This paper was prepared jointly by Richard D. Morgenstern of CBO's Natural Resources Division and by W. David Montgomery, formerly of that division, under the direction of Douglas M. Costle and Nicholai Timenes, Jr. It was edited by Katharine Bateman. Angela Z. Evans provided assistance.

Alice M. Rivlin
Director

January 1977

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SUMMARY

Utility bills, as a part of the American household budget, have risen enormously in the past three years. At the same time, imports have increased sharply to fill the ever widening gap caused by falling domestic production and rising demand. In addition, the deterioration of the environment, particularly as it pertains to the production, consumption, and transportation of energy, is an issue of growing concern. Taken together, these factors have one major effect: the abundant, low-priced supply of energy on which this country has depended and on which Americans have predicated a lifestyle and workstyle is no longer available -- nor is it ever likely to be again.

U.S. relationships with foreign countries, the results of developing energy technologies, and macroeconomic conditions all must be taken into consideration as a new energy policy course is being charted.

Background

Following the oil embargo of 1973 and the abrupt quadtupling of world oil prices, Congress concentrated its efforts on minimizing the effects of the energy crisis on lifestyles and on the impact the rapidly rising energy prices would have on the economy, which was already feeling the threat of high unemployemnt and serious inflation.

The 94th Congress addressed a number of issues regarding the management of the nation's energy resources. The passage of the Energy Policy and Conservation Act of 1975 (EPCA) was one result of this Congressional initiative. EPCA attempted to combine energy and fiscal policies that would provide noninflationary relief from a most severe recession, while at the same time providing incentives for domestic energy production and for the conservation of energy resources. Specifically, the bill provided for, among other things, control of oil prices to be phased out over a 39-month period, and the establishment of oil storage and conservation programs. Other major initiatives of the 94th Congress include The Energy Conservation and Production Act of 1976 (ECPA), The Naval Petroleum Reserves Production Act, and The Federal Coal Leasing Amendments of 1976.

The 95th Congress will face further legislative decisions in the energy area. Some of these decisions are not primarily budgetary, but could have a profound effect on the economy. For example:

- o whether and how to deregulate natural gas prices,
- o possible additional controls on strip mining, and a variety of other environmental and regulatory issues which could affect the use of coal,
- o the production and transportation of Alaskan gas to the lower 48 states,
- o changes in automobile emission standards (amendments to Clean Air Act) and
- o the rate at which to allow domestic oil prices to rise under the provisions of the Energy Policy and Conservation Act of 1975.

Other energy-related decisions facing the 95th Congress could have important budgetary impacts. These include decisions concerning:

- o the level and mix of funding for energy research, development, and demonstration, including the relative emphasis to be accorded nuclear power, solar energy, conservation and other programs;
- o how and at what rate to provide uranium enrichment services;
- o whether to provide loan guarantees, price supports and direct subsidies for commercialization of new emerging energy technologies such as synthetic fuels;
- o the ultimate size and rate of growth of the petroleum stockpile established by the Energy Policy and Conservation Act of 1975; and
- o the treatment of the nuclear fuel cycle and the question of nuclear proliferation, including

regulation, research, reprocessing of spent fuels and ultimate disposal of nuclear wastes.

Energy Policy Goals

A major theme developed in this paper is that choices must be made concerning frequently competing energy policy goals. A look at past Congressional action suggests four broad and often conflicting goals for the nation's energy policy: the efficient economic use of alternative energy resources; low cost of energy to consumer; protection from supply interruption; and protection of the environment. Two further considerations -- the desire to preserve domestic energy resources, and to limit budgetary impact -- have also influenced the shape of the nation's energy policy. It is important to note that measures to achieve these goals must be evaluated, to a substantial degree, on the basis of their potential for reducing unemployment and stabilizing prices.

However, the conflicts among these goals are obvious. Low cost energy encourages energy use, which in turn generates pollution. Protecting the environment through strong regulations on air quality, strip mining, and nuclear waste disposal raises the cost of energy. Protecting the nation from supply interruptions means the creation of domestic reserves or alternative sources of supply, both of which would raise energy costs. The efficient use of alternative energy sources, which would require modifying the regulations that currently hold down the price of natural gas and domestic oil, might adversely affect both the rate of inflation and unemployment. While mechanisms can be developed to diminish the contradictions inherent in some of the conflicting goals of energy policy, ultimately tradeoffs must be made among objectives.

Alternative Energy Policy Packages

Formulating energy policy requires choosing among dozens of instruments in the areas of energy pricing, import policies, oil storage, energy research and development, and others. These instruments affect the demand for and supply of energy, as well as the quantity (and possibly the price) of imported fuel.

In this paper, groups of energy policies are discussed in what are referred to as energy policy packages. These packages touch on a wide range of energy-related issues. The use of the energy package technique also is helpful in isolating contradictions in present federal policy and thus in trying to streamline energy initiatives.

Drawing on the four energy policy goals enumerated above, the set of energy policy packages outlined here is developed emphasizing, in turn, each of the four goals.

Thus the energy packages analyzed are:

1. A package that represents a continuation of present policies, useful in relating the alternative policies to what is being done now

2. An environmental protection package in which environmental considerations are given top priority in solving the nation's energy problems

3. A low import package in which emphasis is placed on reducing U.S. dependence on foreign supplies of energy

4. A free-market package which emphasizes low cost and efficiency

5. A package that would represent low costs to consumers, in which top priority is given to keeping energy prices as low as possible.

In broad terms, any energy policy package must address three interrelated questions concerning energy balances:

- How much, and what kind of, energy should the United States use each year?

- How much energy should be produced domestically?

- How much should be imported?

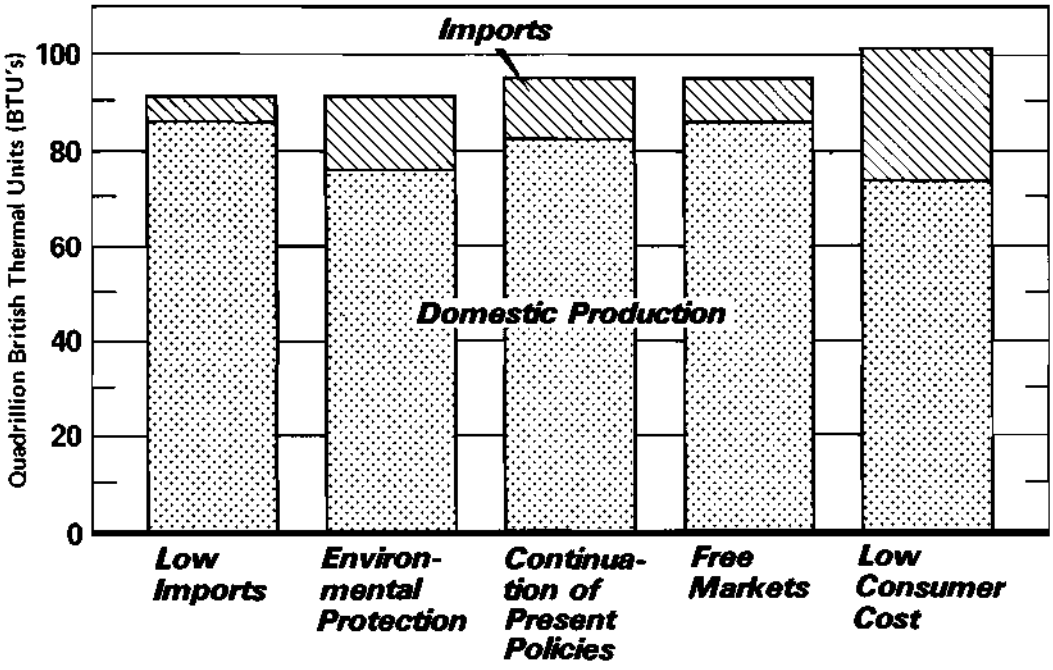
The following Figure compares the five energy policy packages in terms of domestic production and imports.

Both the highest level of energy demand and the highest level of imports in 1986 would result from the energy policy

package emphasizing low costs to consumers. Low regulated energy prices would encourage high consumption and at the same time provide relatively little incentive for producers to expand output.

At the other extreme, the lowest level of demand and imports and the highest level of prices would result if the low import package were implemented. Oil prices would rise (by imposition of a tariff on oil and gas and by decontrol and deregulation of domestic production). This package would also offer strong incentives for producers to expand production and thereby limit the demand for imports.

Summary Figure.
Projected Energy Consumption in 1986 for Alternative Energy Policy Packages



Note: One-half million barrels of oil per day yields approximately one quadrillion BTU per year.

Lying between the low costs to consumers and the low import packages is the continuation of present policies. This policy package is based on the assumption that controls expire on schedule and that no significant market imperfections prevent the construction of certain large energy projects (i.e., the Alaska gas pipeline).

The free market package involves the removal of price and other controls, removal of most conservation requirements, encouragement of competition in the energy industries, and a reexamination of tax and other government incentives in light of market imperfection criteria. The result is demand approximately equal to that expected with a continuation of present policies but with a higher level of domestic production in 1986.

Finally, the environmental protection package would reduce both demand and domestic production. Under strict environmental safeguards, doemstic production would drop below what is expected with a continuation of present policies, and imports would rise.

Effects on the Federal Budget

Although the federal budget dramatically understates the economic impact of federal activities in the energy area, it is nonetheless useful to examine the effects on the federal budget implicit in the alternative energy policy packages. Federal energy expenditures (budget subfunction 305) currently support research and development programs, general operating programs including the Federal Energy Administration, uranium enrichment services, regulatory agencies including the Federal Power Commission and the Nuclear Regulatory Commission, and the petroleum storage program. Potential production subsidies are also assumed to be included in subfunction 305.

An analysis of the budgetary effects of the alternative energy policy packages indicates that budgets for all packages are expected to grow somewhat even under a strict interpretation of current policy. The continuation of present policies and the free market packages are the least costly to the federal government. The low import and the low costs to the consumer packages would require considerably larger government outlays because of their

greater reliance on production subsidies and/or very large petroleum storage programs. The environmental protection strategy lies in between the two extremes in terms of budgetary costs.

In Conclusion

Since energy markets are changing rapidly, national energy policies must be flexible if they are to avoid creating future instabilities. Federal expenditures for energy, though important in the absolute sense (estimated $4.9 billion in fiscal year 1977) often have much smaller effects on the energy-production industries than do government regulations, especially those concerning the pricing and importing of energy. Furthermore, there are inherent conflicts among desirable energy policy goals, and among the various policies designed to support them. These conflicts can be minimized to some extent by new technologies and by other policy mechanisms, but they cannot be eliminated altogether.

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CHAPTER I INTRODUCTION

THE PROBLEM

The low cost, abundant, and secure supply of energy, which has historically fueled our factories and our lifestyles, is no longer available. Although legislation adopted by the Congress has slowed somewhat the increase in domestic prices, U.S. energy prices have approximately doubled in the past three years. The United States and other western nations are still in the midst of the most severe recession in 40 years. At the same time, national attention has been focused on the deterioration of our natural environment, particularly as it relates to the production, transportation, and consumption of energy. Technological and economic perspectives, and our relationship with foreign nations, including one of the strongest international cartels in history, all bear on U.S. energy problems.

Because these problems involve many nations, new and unproven technologies, and basic considerations of a largely market-oriented economy in search of both full employment and price stability, each perspective adds a useful dimension to the analysis. However, in the interest of addressing the immediate decisions facing Congress, the principal focus of this paper is on the economic perspective.

Although cartels have generally not endured for long periods, this paper assumes that the Organization of Petroleum Exporting Countries (OPEC) will remain viable for the time being. At this writing it appears doubtful that OPEC will crumble soon. Certainly it would be unwise at this time to take major risks with the American economy or the economies of our allies with the expectation of undermining the cartel.

As rising energy prices tend to decrease demand, as new oil fields come into production in the United States and abroad, as plans progress for implementing the petroleum storage and energy conservation programs mandated in

the Energy Policy and Conservation Act (EPCA) of 1975 and the Energy Conservation and Production Act of 1976 (ECPA), and as the production of energy from alternative sources expands, the relative power of OPEC may be diminished. Accordingly, one issue that is addressed in this paper is the uncertain investment climate created by the possible instability of OPEC.

Unlike the tradeoff between unemployment and inflation, for example, which was acknowledged in the Employment Act of 1946 and has been commonly accepted in both public and private sectors, there is far less agreement concerning the tradeoffs involving energy. There is also disagreement on the part of some Americans as to the true extent of the energy crisis, or even a suspicion that it doesn't exist at all.

An important theme developed in this paper is that major choices have to be made concerning the frequently competing goals of low consumer cost, security of supply, environmental protection and economic efficiency. Further, all these choices must be made in the context of the macroeconomic targets of full employment and price stability and in the context of the desired size and type of federal participation in the production and marketing of energy. This paper focuses on decisions facing the nation over the next ten years. A companion budget issue paper, Energy Research, Development, Demonstration and Commercialization, explores decisions which will shape technological options likely to affect the longer-term energy outlook.

BACKGROUND

The history of energy markets 1/ is one of continual change. Increased domestic oil and gas production that aided the U.S. economic growth through the 1960s has peaked. Oil imports have risen rapidly to close the

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1/ Energy markets refer to the quantities of various fuels consumed and to their prices.

widening gap between declining production and rising demand, thereby increasing our vulnerability to embargoes or production cutbacks. Energy prices, which had declined in real terms through the 1960s, have risen rapidly in the 1970s as the more accessible and economic oil reserves are depleted; and the power to set prices shifts to an increasingly cohesive foreign cartel.

Attention thus turns to more abundant domestic resources and to new technologies that offer promise of developing alternative resources. Yet, environmental considerations have constrained coal production, nuclear power is beset by a variety of concerns, and most other technologies have not been commercialized on a wide scale. 2/

The 94th Congress addressed a number of critical issues regarding management of the nation's energy resources. Perhaps the most significant piece of energy legislation was the Energy Policy and Conservation Act of 1975. Passed after extensive Congressional debate, this bill attempted to combine energy and fiscal policies so as to:

- o permit a noninflationary recovery from a severe recession and
- o provide incentives for both domestic production and conservation of energy resources.

The resulting legislation provided for a 39-month decontrol of oil prices and established oil storage and conservation programs.

Other major energy initatives of the 94th Congress include the Naval Petroleum Reserves Production Act (opening the Naval Petroleum Reserves for production); the establishment of Energy Research and Development Administration (ERDA) authorization and appropriations bills that shape the federal energy research and development (R and D) program; the Federal Coal Leasing

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2/ A short history of energy markets is contained in Appendix A of this paper.

Amendments Act of 1975; and the Energy Conservation and Production Act of 1976 (ECPA), which included additional conservation programs.

DECISIONS FACING CONGRESS, FISCAL YEAR 1978

The 95th Congress is certain to face additional energy questions. Clean Air Act amendments and assistance to private investment in synthetic fuels and uranium enrichment, which faltered in the closing days of the last Congress, are likely to be reintroduced early in the new session. Other measures that can now be anticipated deal with energy conservation; deregulation of natural gas prices; the rate at which oil prices shall be allowed to rise; the direction and amount of federal energy R and D; the ultimate size of the oil stockpile; the production of gas in Alaska and its transportation to the lower 48 states; strip mining legislation; and a set of issues concerning nuclear waste management, safeguards, and reprocessing.

Major decisions that are not primarily budgetary include:

- o at what rate to allow domestic oil prices to rise, under provisions of the Energy Policy and Conservation Act;
- o whether and how to deregulate natural gas prices; the production of gas in Alaska and its transportation to the lower 48 states (possibly a budget issue);
- o changes in automobile emission standards (Clean Air Act) and possible additional controls on strip mining, and a variety of other environmental and regulatory issues with implications for energy demand, supply, price.

Decisions with important budgetary impact involve:

- o energy conservation;

- level and mix of funding for energy research, development, and demonstration, including relative emphasis on nuclear power, solar energy, conservation and other programs;

- how and at what rate to provide for the nation's needs for uranium enrichment services;

- whether to provide loan guarantees and/or direct subsidies for commercialization of new and emerging energy technologies, such as synthetic fuels;

- general questions regarding the need for federal assistance for financing energy development, and the appropriateness of alternative mechanisms--such as loan guarantees and price supports;

- the ultimate size, and rate of creation, of storage for petroleum;

- the question of how the nation is to treat the total nuclear fuel cycle, including both regulatory, researcn, and subsidy decisions with respect to reprocessing of spent fuels and ultimate disposal of nuclear wastes; similar decisions with respect to the breeder reactor.

In making choices among these measures the Congress will determine an energy policy for the nation. To provide some perspectives on the issues, this paper addresses major energy policy questions and presents several alternative courses of action. While no single document can possibly bring together all energy-related issues which have received public attention, it is possible to focus selectively on a series of critical issues. The aim of this paper is to present a comprehensive, but not encyclopedic, analysis of energy policy alternatives.

In the course of selecting the issues for this paper, some topics--notably those relating to problems of competition in the energy sector and the effect which alternative energy policies might have on the nation's long-term growth prospects--were omitted. In part, these omissions reflect the belief that these areas have already received considerable attention by the Congress and that a comprehensive analysis of certain other issues would be more helpful at this time.

The issues selected for the paper include those related to the production, pricing, use, and conservation of energy resources; problems of security of supply; the effects on the environment of energy production and use; and the proper role of government in subsidizing the research, development, demonstration, and commercialization of new technologies. An attempt is made to relate these issues to one another so that the potential interaction of collections of policy instruments can be considered.

OUTLINE OF THIS PAPER

The plan of the paper is as follows. Chapter II describes the short-run macroeconomic considerations relevant to energy problems. Many initiatives designed to achieve longer-term energy policy goals could adversely affect both unemployment and inflation in the short run. This tension between mid-term energy goals and short-term economic objectives has been at the heart of much of the recent energy debate. Macroeconomic concerns, then, can determine the pace of innovation in energy policy. An energy policy that might be highly desirable when the economy is strong might be inappropriate when it is weak. At the same time, it may be possible to carry out some energy policy initiatives regardless of the overall health of the economy.

Chapter III analyzes four major goals of energy policy--economic efficiency, security of supply, low consumer cost, and clean environment--and examines the conflicts inherent in attempting to attain them all at the same time.

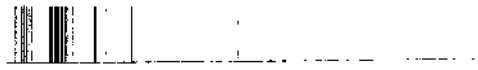
Chapter IV discusses the potential energy policy instruments available to the nation. While not exhaustive, this chapter develops a list of potential instruments and discusses them in the context of the demand, supply and importation of energy.

In Chapter V, a series of illustrative energy policy packages is constructed--each of which emphasizes attainment of one of the major energy goals. These energy policy packages reflect relatively consistent, albeit different, approaches to the various energy problems

facing the nation. Forecasts of domestic energy supply and consumption for 1985 associated with the alternative energy policy packages are also presented.

Chapter VI contains estimates of the impact on the federal budget that would result from adoption of the alternative energy policy packages. Although regulatory actions may have a greater effect on energy markets and the economy than would changes in the federal energy budget, on-budget activities are an important part of the government's role in energy.

Finally, Appendix A contains an analysis of trends in the production and marketing of energy. Appendix B presents additional detail on federal expenditures and receipts for energy-related activities.

CHAPTER II ENERGY POLICY AND THE ECONOMY: THE PROBLEM OF TRANSITION

Experts disagree about the causes of our current economic ills, which have included double digit inflation and the highest level of unemployment in 40 years. Some believe that those ills can be attributed primarily to the abrupt quadrupling of oil prices by the OPEC nations in 1973. Others blame the monetary and fiscal policies that followed the price hikes.

Those who blame the OPEC actions argue that the oil price increase diminished spending power and injected a major inflationary bias into the economy. Those who blame monetary and fiscal policies accept the inflationary argument but suggest that the appropriate response would have been the use of stimulative monetary and fiscal policies to offset the loss of purchasing power caused by the price hike.

This controversy over recent events raises important questions: To what extent should macroeconomic policies be used to offset external shocks to the economy such as the abrupt quadrupling of OPEC prices? Further, if it is deemed desirable to pursue a particular set of energy policies (for example, to provide price incentives to producers to encourage domestic production and conservation), to what extent does knowledge about macroeconomic policies and their impact allow for the offsetting of undesirable side effects of such policies? And to what extent should macroeconomic conditions determine the pace of innovation in energy policy?

Strong evidence exists to support each position and, in light of the nonpartisan mandate of the Congressional Budget Office, no attempt will be made to take sides in the debate. What needs to be emphasized, however, is that there is a direct relationship between macroeconomic policies and most energy policy initiatives--especially those that raise the domestic price of energy.

THE RECENT RECORD

Following the abrupt quadrupling of world oil prices in the fall of 1973, Congress was confronted with the twin problems of:

- reducing the impacts on inflation and unemployment which the oil price hike was likely to have, and
- providing incentives to expand domestic production and to reduce consumption.

It was widely recognized that the dramatic rise in energy prices would escalate the already high rate of inflation and reduce purchasing power. Increased oil prices would direct more funds into the hands of owners of domestic and foreign energy resources. This new wealth, in turn, would probably not be spent quickly enough to maintain aggregate demand. Production would slacken because of reduced purchasing power, while higher energy prices would push up consumer prices.

The price control structure for oil began in 1971. Even older regulatory systems for natural gas and electricity did not allow domestic energy prices to rise to world levels. Even so, the increase in the average cost of energy had a major impact on the economy. In June 1975, a year and a half after the initial OPEC price hike, CBO summarized a set of macroeconomic simulations designed to analyze the effects of several proposed policy changes. This set of changes was equivalent to raising the price of imported petroleum by approximately $3.25 per barrel.

> With higher prices and lower real output, the net effect on GNP in current dollars is minimal. The top line of the accompanying table 1 strongly suggests that current dollar GNP is not the place to look for the impact of increases in the price of energy.
>
> GNP in constant dollars, on the other hand, is affected dramatically. The adverse effect on real output, while negligible at first is about two and one-half times as great as the estimated effect of a $15 billion tax cut by the end of 1976. It is nearly twice as large as the effect of accelerating

the rate of monetary expansion to 10 percent.

. . . . In human terms, it means an additional half million people out of work.

Inflation in 1976 is about 2.3 percent higher than it would be in the absence of higher energy prices, according to the models. By the end of 1976, the accumulated increase in the price level over the six /previous_/quarters (as measured by the GNP deflator) is about 2.4 percent. Unlike monetary and fiscal policies at this juncture in our history, energy developments exercise a powerful and immediate effect on inflation. 1/

In 1975, when the Emergency Petroleum Allocation Act expired, Congress continued price controls to prevent another precipitant price increase from crippling the then new recovery from recession. At the end of 1975, the Congress passed the Energy Policy and Conservation Act, which set a schedule for oil prices to rise gradually over a 39-month period. In the Energy Conservation and Production Act of 1976, the Congress acted to remove price controls on stripper wells (wells producing less than 10 barrels per day).

Since 1954 the Federal Power Commission has controlled the price of natural gas sold on the interstate market--which currently accounts for about one half of the gas consumed in the United States. Beginning in the early 1970s shortages of gas have been reported in the Eastern and Midwestern parts of the country and some curtailments of service have taken place. Further, very few new customers have been added to the interstate system in recent years. In response to these shortages, the Federal Power Commission raised the price of new natural gas several times over the period 1970-1975 and various bills were introduced in the 93rd and 94th Congresses to deregulate or substantially raise the price ceilings on new gas. None of these bills was approved

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1/ CBO, Inflation and Unemployment, A Report on the Economy, June 30, 1975, pp. 75-77.

TABLE 1. ESTIMATED EFFECTS OF RECENT ENERGY DEVELOPMENTS

Economic Variable	1975: IV	1976: II	1976: IV
Current Dollar GNP (in billions of dollars)	-$0.1	+$0.8	-$2.0
Real GNP (in billions of 1958 dollars)	-1.9	-8.1	-21.1
Price Level (percentage changes in GNP deflator)	+0.2%	+1.1%	+2.4%
Unemployment Rate (in percentage points)	0	+0.2	+0.6
Federal Deficit (NIA basis; in billions of dollars)	-$1.7	-$2.9	-$1.6

NOTE: All quantities are seasonally adjusted; dollar magnitudes are expressed at annual rates.

SOURCE: CBO, Inflation and Unemployment: A Report on the Economy, June 30, 1975, p. 76.

by Congress but, on July 27, 1976, the Federal Power Commission issued Opinion No. 770, which raised the price on new natural gas committed to interstate pipelines since January 1, 1975, from $.52 to $1.42 per thousand cubic feet. Price increases were also granted to other categories of gas and provision was made for ceiling prices to rise by approximately 2 percent per year hereafter.

Various estimates have been made of the economic impact these natural gas price increases are likely to have. While there is no doubt that these price increases will raise the heating bills for gas customers, the overall effects on both inflation and unemployment are expected to be small. The reasons for this are that (1) large amounts of gas are currently covered by long-term contracts and thus the effects on gas customers as well as on the general cost of living will be gradual and (2) offsetting the increases in gas bills will be reductions in the amount of high-priced imported oil (and gas), which would otherwise have been consumed. These latter effects will mute the inflationary impact of the

gas price increases and will stimulate domestic employment.

FUTURE ACTION

Some energy policy options now available to the nation pose little threat to either inflation or unemployment. These include a variety of production and conservation incentives such as price supports or loan guarantees for the production of new fuels, stronger efficiency standards and/or the use of tax credits to encourage conservation. Also, additional support for research and development is likely to have a favorable effect on the longer-term energy outlook.

Of course all these measures involve significant federal outlays and, to the extent they represent changes in the size of the federal budget, they may also have significant macroeconomic impacts. Other energy options--particularly those that have the effect of changing the domestic price of energy--are sure to have strong impacts on both inflation and unemployment. In evaluating the alternatives available to the nation, several considerations should be kept in mind:

- In principle, the recessionary impacts of most energy price increases can be offset by tax reduction and easy monetary policies.

- The overall inflationary impact of increases in domestic energy prices cannot be easily offset. However, price controls can be used to insulate domestic prices from foreign price hikes.

- In a rapidly expanding or full-employment economy there is more room for changes in the domestic price of energy than in a weak economy.

Future actions must be guided by these considerations. If the pace of economic activity picks up sharply in 1977, there will be more room for new initiatives in raising the domestic price of oil and gas--thereby creating incentives for both production and conservation. If, however, the pace of the economic recovery does not significantly advance, there will be little room for new initiatives in this area.

CHAPTER III GOALS OF ENERGY POLICY

Since the oil embargo of 1973 and the abrupt quadrupling of world oil prices, a principal direction of federal policy has been to keep domestic consumer prices relatively low and thereby minimize any disruptions to personal lifestyles and to the nation's economy caused by rapid increases in energy prices. Three years after the embargo, the major goals that vie for consideration in deliberations on new energy policy initatives are:

- o efficient economic use of alternative energy resources,
- o low cost and abundant supply to consumers,
- o protection from supply interruption,
- o and conservation of the environment.

All these energy goals must be analyzed in light of the macroeconomic targets of full employment and price stability.

Two other goals often suggested for energy policy are minimizing the depletion of domestic resources and limiting the impact on the federal budget. Rather than treat resource depletion as a separate goal, it is discussed in the context of efficient economic use of energy resources. The depletion of energy resources is quite similar to the depletion of other resources, such as tin and copper. Unless there is reason to believe that energy markets don't work well or that the federal government is unintentionally encouraging too rapid depletion of particular resources, it is best to discuss this problem in the larger context of economic efficiency and incentives.

Limiting the impact of new policies on the federal budget is certainly important. However, differences in the budget impact of alternative policies seem relatively less important than other effects. A discussion of

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budget impacts is deferred to Chapter VI, where they are treated as consequences, rather than as goals, of policy.

One reason consensus on energy policy has been so elusive is that the policies required to achieve desired energy goals are often conflicting. The more vigorously one goal is pursued, the more difficult it is to achieve another.

The major energy goals conflict with one another. Thus, the phrase, energy policy tradeoffs, has come into fashion. This chapter first describes the major energy policy goals and details their salient characteristics. The second part of the chapter focuses on the specific tradeoffs and examines how particular goals, which may be seen as extremely desirable, often conflict with other (equally desirable) goals.

EFFICIENT ECONOMIC USE

With a given level of energy demand, efficient use of energy resources would imply keeping the nation's energy bill--the total resources used to produce energy domestically and to pay for imported energy--as low as possible. This would be accomplished by purchasing energy from various domestic and foreign sources in those proportions that would keep total cost at a minimum.

In choosing among different levels of energy demand, the value of increased use (or the cost of decreased use) should be compared to the change in the total energy bill which would result. Further, since we are dealing with exhaustible resources, these decisions must be made in the context of both present and future requirements.

Characteristics of Efficient Use

In order to achieve the most efficient, short-run allocation of resources in energy production and use, three actions would be required:

- use of all the energy from domestic sources which can be produced at a unit cost less than the cost of imported oil;

- o introduction of all new production and conservation technologies that promise to reduce energy production costs or energy use sufficiently that future savings would repay, with interest, the cost of developing and implementing the new technologies; and

- o elimination of all uses of energy that have an economic value less than that of imported energy.

The first two actions would reduce to a minimum the cost of obtaining any given quantity of energy, measured in terms of the value of resources used to produce energy or to pay for imports. The third action would reduce demand in line with the goal of efficient use of energy. Finally, in the context of world oil prices, all these actions would tend to reduce the U.S. demand for imports. 1/

In a highly competitive, unregulated economic system (the textbook case), the private decisions of energy producers and consumers could be expected to result in exactly the three actions described above. There is concern, however, that either government policies or imperfections in the working of the market system would prevent those responses to higher energy prices.

Potential Problems of Efficient Use

Resource Depletion. While there is good reason to encourage domestic production at the expense of imports, there is also a basis for advocating a reduction in the rate of domestic resource extraction. Although mandatory

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1/ U.S. actions regarding domestic supplies are likely to have little impact on world prices. Actions taken in concert with other consuming countries, or actions of a political nature on the international scene, may of course have an influence both on prices and on the probability of another embargo.

unitization 2/ of petroleum fields removes one of the greatest incentives to over-production of oil, in actual practice there is some question about its effectiveness in discouraging over-production. Further, there is reason to believe that federal tax policy may encourage too rapid a depletion of the nation's oil reserves by allowing tax deductions for certain costs associated with the search for and production of oil. On both these grounds, there may be a basis for some governmental intervention in the markets to improve their overall efficiency.

Imports. It has been suggested that the heavy dependence of the United States on imported oil may increase the likelihood of another embargo or supply interruption. If this argument is valid, then the imposition of a tax on imported oil (sometimes called a supply interruption premium) might be appropriate as a means of discouraging such imports. Although this was not the stated purpose of the import tax imposed by the Administration in February 1974 (and rescinded in December of that year), such a tax may be viewed as a type of temporary supply interruption premium. Unfortunately, it is difficult to say with confidence whether such a tax is appropriate or, if it is appropriate, how large it should be.

Market Imperfections. Lack of competition among energy industries, the possible unwillingness of the private sector to invest in large-scale, risky ventures and the potential difficulties of making research and development profitable are specific examples of market imperfections that may inhibit efficient economic use of resources. These issues have been discussed in detail in other CBO papers. 3/

2/ Unitization of oil or gas fields is a legal procedure allowing for the orderly exploitation of oil or gas when the resource lies beneath the land of more than one owner.

3/ See, for example, CBO, Financing Energy Development, Background Paper No. 12, July 26, 1976.

Regulations. Finally, the federal government has long exerted considerable influence on patterns of energy production and use through regulation, ownership of resources, and development of technology. Changes in these actions or other initiatives to alter their consequences may be desired.

LOW COST AND AVAILABILITY TO CONSUMERS

In the aftermath of large increases in world oil prices, widespread concern has developed over the effects rising prices and reduced availability of energy resources will have on the U.S. consumer. Both businesses and individual consumers are being forced to alter their time-honored practices in response to the changing energy picture. While some change can be accommodated easily, there are some clear hardships as well. A family that is about to buy a home can usually decide among gas, oil, or electric heat; among various insulation possibilities; and even about the size of the home to be heated in the face of sharp changes in energy prices. But a family that bought a large, drafty, old house with gas heat when the wellhead price of gas was 16 cents per thousand cubic feet ten years ago, doesn't have all those choices when the price of gas goes to $1.50.

In the past three years, the goal of holding domestic price rises to a minimum has been of prime concern in the formulation of U.S. energy policy. Three facets of price and availability are of particular importance: (1) regional differences, (2) the effects on different income groups, and (3) effects on lifestyles.

Regional Differences

Although it is difficult to categorize all the types of hardships involved, one clear pattern falls along regional lines. Northeastern states, which depend heavily on imported oil and refined products not subject to price controls, have faced higher prices than other regions. More recently, FEA programs have reduced some disparities, though a finer pattern of regional differences in energy prices remains.

Impact on Income Groups

Since the percent of a family's budget spent on energy declines as income rises, the burden of increases in energy prices falls disproportionately on low-income groups.

In 1975, low-income families spent 5.9 percent of their income on natural gas, while lower-middle-income families spent 1.9 percent, upper-middle-income families 1.2 percent, and upper-income families only 0.8 percent. 4/ Consequently, natural gas price increases cause a relatively larger increase in the cost of living for lower-income groups than for higher-income groups. The impact of gasoline price increases would be somewhat more evenly distributed among the population than would a natural gas price increase. Low-income families spend 4 percent of their income on gasoline; both middle-income groups spend about 3 percent; and wealthy families spend 2.2 percent. 5/

Lifestyle

It is widely recognized that energy prices and availability have a major influence on lifestyle. Historically, housing, transportation, and other consumption and investment decisions have been made in the United States in the context of energy prices that were considerably lower than comparable prices in other developed countries. These low prices have led to the familiar suburban sprawl, dependence on the private automobile and various major appliances, and the development of industries that are extremely energy-intensive.

Adjusting to higher energy prices and diminished supplies will not be easy. It may require financial losses for some individuals and businesses who, having

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4/ Dorothy Newman and Dawn Day, The American Energy Consumer, Ballinger, Cambridge, 1975. Average annual incomes of the four groups in 1972 were $2,500; $8,000; $14,000 and $24,500 respectively.

5/ Ibid.

made major consumption and investment decisions in an era of low energy prices, are now forced to cancel or alter those plans. It will most certainly require a change in lifestyle for millions of Americans.

ENSURE SECURITY OF SUPPLY

The oil embargo of 1973-1974 illustrated a threat which has long been perceived, 6/ but that had not been a central, national concern. The embargo experience, however, created strong support for a goal of security of supply for the United States and its allies, whether it be called energy independence or by some other name.

Protection from supply interruption can be obtained in several ways: (1) reduction of imports, which reduces the country's vulnerability to new interruptions; (2) formation of a stockpile to replace interrupted supply; (3) other actions to cope with interruption; and (4) economic and diplomatic actions to decrease the likelihood of interruption. The last is generally beyond the scope of this paper.

Proposals by the Nixon and Ford Administrations have emphasized import reduction as a means of gaining protection from possible supply interruptions. An oil storage program mandated in the Energy Policy and Conservation Act of 1975 is currently in the early stages of implementation. Two questions relevant to both approaches are: How high a level of imports can be tolerated and how large a stockpile should be created?

The two questions must be considered simultaneously, for a change in the level of imports will alter the protection provided by a stockpile of any given size, and

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6/ See, for example, The Oil Import Question: A Report on the Relationship of Oil Imports to the National Security, by the Cabinet Task Force on Oil Import Control, February, 1970 (GPO); Oil Impact Controls, Hearings before the Subcommittee on Mines and Mining of the Committee on Interior and Insular Affairs, House of Representatives, March and April 1970, Serial No. 91-17.

a change in the stockpile will alter the harm done by an embargo on any specific amount of imports.

Reduction of Imports

Imports can be controlled directly by the traditional methods of tariffs and import quotas, or indirectly by actions to reduce energy demand and/or to increase domestic energy supply. Reduction of imports would limit our dependence on so-called insecure supplies and thus limit the economic effects of another embargo.

To judge how large a reduction in imports is appropriate, two comparisons are relevant:

- the cost of reducing imports should be compared to the diminished threat of an embargo that would be associated with lower import levels, and
- the cost of reducing imports should be compared to the cost of other measures that would provide equivalent protection, such as stockpiling.

Oil Storage

A strategic petroleum reserve is, in a sense, like an insurance policy, by which the economy buys protection against the potential effects of an interruption in the supply of petroleum. The decision on the required size of the reserve, then, is like the decision on how much insurance to buy. One must balance the cost of insurance against the likelihood and severity of the threat insured against. It is possible to buy too much insurance, or too little.

Difficulties arise because the reserve is to be created and paid for now, in order to guard against interruptions which may or may not occur in the future. The costs of the reserve will depend on the anticipated date, duration, and frequency of interruption. 7/

7/ See for example, CBO, Petroleum Storage: Alternative Programs and Their Implications for the Federal Budget, Background Paper 14, October 28, 1976.

Alternatives for Coping with Interruption

Once an interruption occurs, measures other than use of the strategic petroleum reserves could be taken to counteract the effects of interruption.

EPCA calls for the creation (by FEA) of emergency conservation contingency plans and a rationing contingency plan. The conservation plan envisions the imposition of reasonable restrictions on public or private use of energy which might be necessary to reduce energy consumption. Several such measures were attempted during the last embargo, e.g., mandatory allocation of fuels to high-priority users, lowering speed limits, changing business hours and reducing heating and cooling in public buildings. FEA estimates that the standby authorities that had been requested under their 1975 plan would have the potential to reduce energy consumption by the equivalent of 1.7 million barrels of oil per day in 1985.

PROTECTION OF THE ENVIRONMENT

In recent years, increasing fear that degradation of the physical environment could affect human health and property value, as well as aesthetics, has led to an increasing national concern for preservation and enhancement of environmental quality. Energy production, transportation, and use have a significant impact on the environment. The nature and extent of this impact--while known to vary with technology, with type of resource and with usage levels--are not entirely understood.

Rather, there is a tradeoff between the cost of energy and protection of the environment. Choices among energy forms may be influenced by the relative environmental impact of developing those forms as well as by the cost of limiting their undesirable effects.

Nuclear policy issues may be somewhat different. In the coming months, public discussion is likely to focus

on radiation and safety hazards and/or problems of proliferation of nuclear materials.

TRADEOFFS AMONG GOALS

Once major goals for an energy policy have been agreed upon, the next step is formation of a policy to achieve those goals. Unfortunately, because these goals are often in conflict with one another, it is virtually impossible to design an energy policy that satisfies all of them.

Perhaps the most obvious conflict among goals is between low consumer cost and all the other goals. If the domestic price of energy were allowed to rise substantially--and estimates of size of the increase vary widely--major progress could be made in meeting the goals of economic efficiency, security of supply, and a clean environment. At the same time, the price rises would seriously affect the nation's inflation and unemployment rates, would force consumers and businesses to change their habits regarding the use of energy, may cause serious inequities across the country, and may even affect the long-term rate of economic growth.

On the positive side, a major price rise would encourage consumers and businesses to use energy in a manner that reflected its true cost to society. Thus, an individual wishing to raise the temperature of his/her home in winter by one degree would not face the current regulated (rolled-in) price of interstate natural gas, but would instead be forced to pay the price of importing additional gas--which may be several times as much. At present, many people are obtaining natural gas and other fuels at prices considerably below the import price. As a result, they are heating (cooling) their homes more than they might if they had to pay the higher import price. Thus, higher prices would tend to reduce wasteful uses of energy and to decrease the total amount of expensive imports consumed.

Similarly, high prices would be most helpful in meeting the goal of security of supply, by simultaneously encouraging energy conservation and increased production

from domestic sources. Conservation would, in turn, tend to reduce the adverse effects on the environment.

Thus, it appears that higher energy prices would help meet several major energy goals--but at what cost to the nation? It is difficult to specify all the implications of dramatically increased energy costs, but several have been discussed in previous sections of this report: higher inflation and higher unemployment; higher energy costs to consumers, especially those with low incomes; higher costs for raw materials, especially petrochemicals; and major lifestyle changes for large portions of the U.S. population.

There are many other tradeoffs. For example, increased security of supply, which requires increases in domestic energy production, conflicts with the environmental goals. Environmental standards on both mining and burning coal impede more rapid development of that resource. For example, FEA cannot order an electric company to switch from oil to coal until EPA certifies that its plants can burn coal in compliance with the Clean Air Act.

The automobile exemplifies the conflict between the goals of conservation of energy and preservation of the environment. The Energy Production and Conservation Act of 1975 gives priority to emissions standards in determining how stringent fuel economy standards shall be.

In sum, there are many conflicts among the nation's energy goals. It seems impossible to have abundant, low-cost, domestically produced energy that doesn't degrade our environment. It may have been possible 20 years ago, but it is now impossible. Technical solutions involving the discovery or harnessing of some new low-cost, clean-burning, domestically produced fuel do not appear close at hand. The nation will have to choose among the various goals and will have to make some sacrifices. What these sacrifices will involve, whom they will affect, and who will pay for them are the major issues facing the nation.

CHAPTER IV POTENTIAL ENERGY POLICY INSTRUMENTS

Chapter III outlined the major goals of energy policy and the conflicts inherent in attempting to attain all the goals simultaneously. This chapter and the next address the question of how energy policies may be formulated to pursue those goals. Chapter IV, which focuses on individual policy instruments, is in two sections: The first catalogues the potential instruments and the second analyzes a number of instruments in light of their usefulness for alternative policy contexts. Chapter V then shows how individual policy instruments may be combined into packages that are consistent with an overall energy policy.

COMPILATION OF ENERGY POLICY INSTRUMENTS

Since 1973 the macroeconomic concerns of unemployment and rising prices--especially as they affect low- and middle-income families--have limited energy policy choices. The primary policy instruments have been price ceilings on oil and natural gas, coupled with a series of allocation policies intended to ensure reasonably equal treatment of consumers in different parts of the country. These instruments--and the policy their use implies--have served the short-run objective of minimizing macroeconomic consequences of external events (price increases), but have not served the longer-term energy policy goals articulated in Chapter III.

As noted earlier, various other initiatives, which do support specific longer-term objectives, have been undertaken, especially in conservation. Other initiatives include encouraging production from government-owned resources, creating a national petroleum reserve, and supporting energy-related research and development, to name but a few. In principle, however, the range of possible energy policy instruments includes many not heretofore considered by the Congress.

The potential energy policy instruments listed in Table 2 deal specifically with three broad areas: (1) demand, (2) supply, and (3) imports. Within each of these categories, there are regulatory mechanisms, federal development of technologies and information, financial incentives, and other classes of measures.

Some instruments are quite specific, and can be directed to particular problems of fixed scope; others are more diffuse and of uncertain effect. The individual instruments may support, overlap, or conflict with one another, or with general policy instruments not specifically related to energy. Energy development may also be influenced by a variety of general measures--for example, those designed to increase employment or improve the quality of the environment--none of which are catalogued here.

ANALYSIS OF POLICY INSTRUMENTS

Options Related to Demand

The options related to demand listed in Table 2 include a variety of instruments designed to reduce the amount of energy demanded by individuals and businesses. The rationale for government action to reduce energy demand is that:

- Consumers may lack information that is required to make choices. They may not, for example, know how much electricity an air conditioner uses.

- Consumers may not be able to finance or capture such benefits of conservation investments as home insulation.

- Prices paid by consumers may not reflect the true cost to the nation of additional energy supplies such as oil and gas whose prices are regulated.

- It is possible that the demand for major appliances is so motivated by advertising that the purchaser's desire to conserve energy is not truly reflected. However, because the evidence on this point is so conflicting, it is not possible to determine the true significance of this theory.

TABLE 2. POTENTIAL ENERGY POLICY INSTRUMENTS

Options Related to Demand

- Remove or rapidly phase out controls on oil and natural gas prices
- Mandatory energy conservation measures
- Financial incentives
  - Tax expenditures for conservation
  - Sumptuary-type taxes (to discourage consumption)
- Development of technologies and information
  - Support of research, development, and demonstration
  - Collection and dissemination of information

Options Related to Supply

- Remove or rapidly phase out controls on oil and natural gas prices
- Specific financial incentives
  - Price supports
  - Guaranteed purchase
  - Loan guarantees
  - Grants
  - Cost-sharing
  - Buy-back guarantees
- Management of resources and technologies under federal ownership
  - OCS oil
  - Coal
  - Oil shale
  - Geothermal
  - Hydroelectric sites
  - Nuclear technologies
- Development of technologies and information (same as above)
- Nonspecific financial incentives
  - Tax expenditures

Options Related to Imports

- Import policies
  - Tariffs
  - Quotas
  - Political negotiation with OPEC
  - International agreements
    - Barter
    - Among consuming countries
    - Long-term agreements
- Measures to cope with a supply interruption should one occur
  - Stockpiles
  - Emergency powers to allocate and ration supplies
- Sealed bid plan

Meeting Energy Policy Goals. Options related to demand can meet the goals developed in Chapter III in the following ways: Reducing demand would lessen dependence on imports, improve environmental quality, and reduce consumer expenditures on energy. Imports could be reduced because conservation reduces consumption of energy without affecting the incentives to domestic energy production. Environmental quality could be improved because of the decreased danger of oil spills, for example. Because conservation programs can substitute for programs designed to stimulate domestic energy production, conservation could also allow more restraint in the exploitation of environmentally damaging energy sources. Finally, by reducing the amount of energy consumed in the United States, conservation would directly reduce total expenditures on energy.

The difficulty in judging the merit of conservation proposals arises from their relation to the goal of efficient economic use of resources. Many conservation measures substitute one type of expenditure (for example, insulation or improved appliances) for expenditures on energy. Whether the net effect is to increase purchasing power or to decrease it varies from one situation to another.

The Options

1. The immediate deregulation or rapid phasing out of price controls on oil and natural gas is certainly one way to reduce consumption. However, as has been discussed in earlier sections of this paper, such a move could also involve serious macroeconomic and distributional consequences, especially in the short run. Because the economy may not be in a position to absorb the shock that would accompany immediate deregulation and because of the impossibility of designing a set of policies that completely offset both the recessionary and inflationary impacts of deregulation, attention has been directed to more gradual moves toward a free market situation. The tension between short-run economic considerations and long-run energy policy goals is nowhere more evident than in the debate on oil pricing.

2. Regulatory and efficiency standards, such as mileage standards on new cars, maximum speed limits and efficiency standards for new appliances could be imposed. The majority of the conservation actions adopted within the past three years consists of such regulatory mechanisms as embodied, for example, in the Energy Policy and Conservation Act of 1975 (Title III) and in the Energy Conservation and Production Act of 1976. While generally effective in reducing energy consumption and requiring small government expenditures, conservation regulations often impose heavy costs on business and the public at large. Further, these regulations are usually coercive in nature and generally inflexible.

3. A third type of conservation mechanism entails financial incentives as proposed, for example, in the House version of the tax reform bill (H.R. 6860). That bill called for tax credits for several purposes:

a. A tax credit of 30 percent of insulation expenditures, with a limit of $150.

b. A tax credit of 25 percent on the first $8,000 of expenditure on installation of solar energy equipment in a residence.

c. A tax credit of 25 percent on the first $3,000 of expenditures on the purchase of electric cars for personal highway use.

The bill would also have repealed the excise taxes on radial tires, on intercity buses, and on new oil mixed with recycled lubricating oil.

A tax credit would certainly improve the economic attractiveness of conservation investments. However, the credit is an inflexible instrument that does not discriminate between investments that are difficult to finance or that are not profitable because of low energy prices; investments that would take place without incentives; and investments that would, without the credit, cost more than the benefits they provide.

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4. An alternative to providing financial incentives for energy conservation is to impose financial penalties for high energy consumption. One of the provisions of the Energy Conservation and Production Act is that electric utility rates be designed to encourage energy conservation and minimize the need for new generating capacity. Specific mechanisms for complying with these requirements include marginal cost or peak period pricing and the elimination of quantity discounts. FEA must submit all new proposals to Congress for review and further action.

5. A final option for promoting reductions in energy consumption is the development of conservation technologies. Research is underway in the Energy Research and Development Administration to identify areas for potential improvement in energy efficiency, and to develop the technologies required to realize such improvements. Research into ways to reduce energy consumption reflects the many ways and situations in which energy is used in the economy, ranging from research for more efficient engines and boilers to improved light fixtures and insulation. An advantage of this appraoch is that the new technology, once developed and proven to be cost effective, usually provides for a permanent reduction in energy use. This contrasts with other behaviorally oriented conservation methods such as campaigns for lower speed limits which, while often less expensive to develop, may have fewer permanent effects. The level of funding and relative emphasis on conservation research are perennial issues.

Options Related to Supply

Meeting the Energy Policy Goals. Expanded domestic energy production could be consistent with a number of major energy policy goals, depending on the mechanism employed to attain the additional production. Certainly, enhanced production would decrease the demand for imports and, accordingly, reduce the size of the required petroleum stockpile. If imports were replaced by environmentally clean fuels (e.g., solar or geothermal) overall

environmental threats might be reduced. However, most measures to expand domestic energy production involve either higher consumer expenditures and/or major federal subsidies.

The Options

1. Deregulation or rapidly phased-out price controls on oil and natural gas would certainly stimulate domestic energy production. As discussed in previous sections, however, macroeconomic and distributional considerations suggest a more measured approach. Further, there is wide disagreement among experts regarding exactly how much additional oil and gas would be produced as a result of deregulation.

2. Specific financial incentives are available for the production of particular fuels or the application of particular recovery processes not now in commercial use. Table 2 lists several such mechanisms, including:

a. Price guarantees for a particular fuel are appropriate when market prices are too low to make the desired amount of investment profitable. In such situations it is highly likely that the government will be required to make outlays equivalent to the difference between the market price of comparable energy forms and the price of the experimental fuel.

b. Loan guarantees could be offered by the government in cases where the risk and/or scale of a particular project might make it unattractive to investors even though a profit could probably be assured. These guarantees could also be applied when joint ventures or other methods of syndication, which would spread out the risk, are not feasible.

Actual situations are unlikely to fall neatly into one simple category. Some projects will go forward regardless; some few will be unprofitable under almost any

foreseeable circumstances, others will be unable to obtain financing because of size and risk, and some may face a variety of difficulties. An assessment of the extent of such difficulties is central to the design of an efficient set of financial incentives--and to a determination of whether any are needed.

3. Other sources of supply. The federal government is a major owner of energy resources: large amounts of oil, gas, and coal reserves lie under federally owned land. New sources of energy such as geothermal heat are also found in large quantities under federal land. Thus, the policies of the U.S. government in exploiting resources under its direct control can significantly affect domestic energy production. Leasing of oil fields on the Outer Continental Shelf, leasing of federal coal lands and regulation of mining thereon, and exploitation of Naval Petroleum Reserves are three examples of current actions to utilize federal energy reserves.

The U.S. government has also been a prime mover in the development of new technologies for energy production. Nuclear technologies have been developed entirely under the sponsorship of the Atomic Energy Commission and its successor, the Energy Research and Development Administration (ERDA). Recently, ERDA has begun to support development of new technologies in extraction of oil and gas; extraction, conversion, and use of coal; and utilization of solar and other inexhaustible sources of energy. Such new technologies are of particular importance in the transition from decreasing energy sources to new and less limited sources of energy. Under certain circumstances--particularly when development and implementation of techniques is expensive--federal initiatives may preempt technological choices, and thus have a dominant effect on the shape of future energy markets.

Options Related to Imports

Meeting Energy Policy Goals. Options related to imports affect energy policy goals in many of the same ways as do options associated with expanded domestic production. The basic dilemma is the difficulty of

increasing domestic production--and thereby reducing imports--without simultaneously forcing up consumer costs (or government subsidies).

Currently the United States is importing about 40 percent of its oil and 5 percent of its natural gas. Ten years ago, when quotas on imported oil were in effect, the United States imported about one fifth of its oil (and virtually no gas).

The Options

1. In February 1974 the Nixon Administration imposed an import tariff of $1 per barrel of oil, subsequently raised it to $2 per barrel, and rescinded it in December of that year. In the context of the present structure of oil price controls, the principal impact of any new tariff on imported oil would be to raise domestic energy prices. The benefits to domestic production resulting from such an action would be marginal.

Under current conditions any attempt to limit imports (for example, by the use of quotas) without simultaneously increasing the incentives for domestic production and consumption is likely to cause shortages.

2. An alternative to tariffs and quotas is some type of international agreement among oil importing nations. These issues have been widely discussed and will not be developed at length here. Suffice it to say, however, that the major difficulty with long-term agreements is that they tend to impose not only price ceilings but price floors as well. In view of the large gap between production cost and selling price 1/ and the historical instability of international cartels in general, setting too high a ceiling price may be unwise at this time.

1/ Reliable estimates of production cost are generally less than $1.00 per barrel compared to a selling price of approximately $11.50 per barrel (FOB Persian Gulf).

3. A related option is the development of a petroleum stockpile. Mandated under the Energy Policy and Conservation Act of 1975, plans call for beginning the actual fill this year with an eventual target of 500 million barrels of oil. Also mandated under the Energy Policy and Conservation Act of 1975 is the development of emergency plans to allocate and ration supplies in the event another embargo occurs.

4. The attempt to erode the unity of OPEC is a possible, albeit radical, import-related option. Significant erosion might be achieved by limiting the amount of imported oil allowed to enter the United States (for example, at its current level) and by having the U.S. government auction off permits to import oil. The idea is that producing countries would compete with one another on a sealed bid basis to gain access to the U.S. market. Oil companies, it is argued, would move from being the agents for exporting governments to being their customers. Thus, they would have a strong incentive to shop around for better deals. First proposed by Professor Morris Adelman of MIT, 2/ this plan has been modified to accomodate a variety of criticisms, especially regarding elements of secrecy that would be critical to its success.

A large U.S. stockpile of oil will lessen import requirements and thus strengthen the U.S. bargaining position and probably the success of this proposal.

It is extremely difficult to evaluate the Adelman proposal. On the surface it is appealing because of its reliance on simple market principles and because of the reduction in the country's fuel bill that might be obtained. Further analysis, however, suggests several difficulties. Most important, success requires that OPEC members be willing to undercut each other in their bids. At this point, with the cartel still in full operation, U.S. imports rising, and the national stockpile in its infancy, it is difficult to predict the success of an Adelman type plan.

2/ M. A. Adelman, "Oil Import Quota Auctions," Challenge, January/February 1976, pp. 17-22.

Other Considerations

There are indications that uncertainties in technical developments, uncertainties concerning the actions of foreign governments, and uncertainties concerning the action of the U.S. government as well as state and local agencies in the area of regulatory and environmental actions, are all tending to discourage private investment in energy-producing facilities. Although it is most difficult to document, it appears that these uncertainties are of greater concern in the energy-producing sector than in most other sectors of the economy.

A recent example involves the case of the nuclear reprocessing plant constructed by a private consortium at Barnwell, South Carolina. When the original construction began in the early 1970s, it was assumed that a market would exist for reprocessed fuel; and that liquid plutonium could be shipped for further processing and use. Furthermore, it was assumed that decisions would have been made on the appropriate form and fate of final nuclear waste products. Under these assumptions, it appeared that a reprocessing facility could be licensed and would be profitable. Since construction began, however, the Nuclear Regulatory Commission (NRC) has ruled that plutonium (which is both toxic and a proliferation hazard) may not be shipped in liquid form. Moreover, no final decision has been made on what form, if any, of plutonium may be shipped; on how or in what form wastes may be disposed of; or even on whether a reprocessing industry will be created in this country.

Some steps that do not involve the commitment of large-scale federal funds could be taken to improve the investment climate:

- Speed up decisions on questions involving the environmental standards to be adopted for nuclear plants, especially regarding nuclear waste disposal.

- Speed up decisions on questions involving offshore drilling and the transportation of petroleum liquids at sea and on land.

- Speed up decisions involving air quality standards for coal-fired generating plants. Also, speed up decisions involving environmental standards for coal production, especially strip mining.

- Encourage the development of energy futures markets, perhaps with some federal participation.

CHAPTER V ENERGY POLICY PACKAGES

Since an energy policy actually consists of dozens of decisions in areas such as energy pricing, imports, oil storage, energy research and development, and others, groups of energy policies are discussed in this chapter in what are referred to as energy policy packages. These energy policy packages are combinations of individual policy instruments concerning the development, production, pricing, use and importing of energy. The packages represent, to the greatest extent possible, consistent decisions regarding the individual policy instruments. The use of the energy policy package technique is helpful in isolating contradictions in federal policies and in streamlining federal initiatives in the energy area.

Drawing on the four principal goals discussed in Chapter IV, energy policy packages are constructed emphasizing, in turn, each of the four goals discussed in Chapter III. For the purpose of comparison, a reference case is included labeled continuation of present policies. Thus the energy policy packages analyzed are:

1. a package that represents a continuation of present policies;

2. an environmental protection package in which environmental considerations are given top priority in solving the nation's energy problems;

3. a low import package emphasizing the reduction of our dependence on foreign supplies of energy;

4. a free-market package emphasizing economic efficiency;

5. a low cost to consumers package in which top priority is given to keeping energy prices as low as possible.

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While the selection of policy packages is somewhat arbitrary, the ones chosen here probably encompass a broad range of the relevant alternatives facing the Congress. The authors stress, however, that other packages may be equally relevant and no claim is made that this set of examples is exhaustive or that it contains a strategy which will or should ultimately be selected for the nation. Further, it should be emphasized that actual choices are likely to be far more numerous than those developed here. There are many combinations of policies that may, in fact, be selected.

An energy policy package should contain judgments on each of the following:

- the pricing of oil and natural gas
- the amount and type of federally supported research, development, and demonstration in the energy area
- the size (and timing of the fill) of the strategic petroleum reserves
- the extent, if any, of subsidies and/or loan guarantees needed to commercialize or to stimulate production of particular fuels or resources
- environmental standards (air, water, land, radiation safety) to be imposed on the production, transportation, and use of energy resources
- amount and type of federally mandated energy conservation.

Conspicuous by its absence from this list is a comprehensive treatment of nuclear energy issues, such as waste management, reprocessing and the number and type of additional uranium enrichment plants required in coming decades.

Except for the goal of environmental protection and the largely philosophical question of whether uranium enrichment facilities should be privately or publicly owned, it is difficult to address these nuclear problems in the context of the issues raised in this paper.

Indirectly, of course, many nuclear issues--commercialization, research, environment--parallel similar issues involved in the development of other energy forms.

On environmental grounds one might opt for less nuclear energy production. And on free-market grounds one might opt for private ownership of uranium enrichment and perhaps other nuclear-related facilities. Yet, in the end, the major nuclear questions hinge on scientific judgments concerning the safety, reliability, and security of all aspects of the nuclear fuel cycle. Further, there are questions of the international proliferation of nuclear materials. Comparisons must be made between the risks associated with nuclear power and those associated with other fuels, as for example the various health and environmental risks associated with nuclear power and those associated with coal. Ultimately, these questions hinge on a political consensus on the risks society should accept for an energy technology.

ENERGY POLICY PACKAGES

Continuation of Present Policies

Table 3 lists the specific policies associated with the energy policy package entitled continuation of present policies.

Oil. Three tiers of oil prices are delineated in the Energy Policy and Conservation Act of 1975 (EPCA) as modified by the Energy Conservation and Production Act of 1976 (ECPA):

1. Imports and oil produced from stripper wells (wells producing less than 10 barrels per day) are exempt from controls, and thus receive the import price of approximately $13 per barrel.

2. Upper tier oil, including all new oil production in the United States, is now controlled at an average price of $11 per barrel.

TABLE 3. ENERGY POLICY PACKAGE: CONTINUATION OF PRESENT POLICIES

Oil and Gas Prices	Oil: 39 month phaseout of controls as specified in EPCA a/ and ECPA b/ Gas: $1.42 per thousand cubic feet; plus one penny increase every three months as specified in FPC Opinion No. 770
Research and Development	Continuation of ERDA's present programs, completion of ongoing projects, modest real growth but no major new starts
Uranium Enrichment	All owned by government
Petroleum Storage	500 million barrel goal for storage; buildings as specified in EPCA a/
Direct Production Subsidies	None
Environmental Standards	As per current legislation. EPCA a/, Clean Air Act, Clean Water Act, and others
Energy Conservation	As per current legislation. EPCA a/ and ECPA b/

a/ Energy Policy and Conservation Act of 1975.

b/ Energy Conservation and Production Act of 1976.

3. Lower tier oil, including specified amounts of oil produced on properties in production in 1973, is controlled at an average price of $5.25 per barrel.

Upper tier price increases will allow the price of new oil to rise to about $13 per barrel by 1979. However, imported oil already sells at over $13 per barrel, and OPEC is expected to continue to raise the price at least to keep pace with the world-wide rate of inflation. Consequently, even upper-tier oil is unlikely to reach parity with imported oil under the mandatory provisions of EPCA. The mandatory price control and allocation authorities granted by EPCA convert to discretionary authority after 39 months.

Congress does have some options for accelerating the rate of decontrol. FEA has proposed specific incentives to high-cost oil production, which would require Congressionally approved increases in the weighted average domestic price of oil. In addition, FEA may propose further annual increases in oil prices as a general production stimulus.

Natural Gas. Effective July 27, 1976, the Federal Power Commission (FPC) raised the ceiling price on natural gas dedicated (i.e. contracted) to interstate pipelines since January 1, 1975, from $.52 to $1.42 per thousand cubic feet (MCF). Thereafter, price ceilings are allowed to rise a penny every three months. For purposes of this paper, it is assumed that the FPC decision is supported in the courts and, further, that natural gas imports are limited in quantity, as proposed by the Ford Administration.

Research and Development. The currently funded energy R and D program will have little effect on energy balances prior to 1985. The continuation of present policy package assumes that modest growth rates are incorporated into current budgets and that projects already begun will be completed. However, since no new projects would be initated beyond 1977, this is very close to a

"no new starts" strategy. 1/

Thus, unless further expanded, the present R and D program would not respond to recently articulated priorities in solar energy, conservation, and environmental protection, nor would it permit pursuit of diverse technical approaches within any one source. The lack of diversity in current R and D does not offer insurance against possible future failures.

This strategy will result in gradual annual increases in budget authority during the next ten years, with nuclear R, D, and D dominating. Because there would be no funding for any major demonstration projects not initiated in 1977 or earlier, few major technologies would be developed at demonstration scale. For example, the Clinch River breeder reactor would be completed, as would three demonstration plants to make synthetic fuels from coal; however, a larger-scale breeder would not proceed, nor would a number of fossil energy demonstrations planned for fiscal 1978 and subsequent years.

Uranium Enrichment. Uranium enrichment involves processing natural uranium to increase the proportion of the critical material used in nuclear reactors. Three uranium enrichment plants all owned by the Energy Research and Development Administration are currently operating in the United States. A proposal was introduced in the 94th Congress to allow the private sector to own and operate a new round of uranium enrichment plants scheduled to come on line in the 1980s. Although the House of Representatives adopted the bill (H.R. 8401), the Senate version (S. 2035) was never voted on and hence the bill was not enacted. Continuation of present policy is interpreted to mean that the federal government will carry out all expansions in uranium enrichment capacity.

1/ This R and D budget strategy, like those used to exemplify other options in this report, is one of those developed in Energy Research: Alternatives for Development of New Energy Technologies and Their Implications for the Federal Budget, CBO Background Paper No. 10, July 15, 1976.

Petroleum Storage. An oil storage program has also been initiated under the EPCA. The act establishes a minimum early storage program designed to initiate the process of creating a reserve, and orders FEA to study and recommend a follow-on program.

EPCA provides (Section 151) for a reserve of up to 1 billion barrels, but not less than 150 million barrels by December 1978. The implementation provisions (Section 154) further specify that the reserve should ultimately contain a quantity of stored crude oil equal to the total volume of crude oil imported into the United States during three consecutive months of the 24-month period preceding December 1975, when the average monthly import levels were the highest, or a total of approximately 500 million barrels--the level assumed for this analysis.

Production Subsidies. From time to time, Congress has considered offering federal subsidies to encourage the production of particular fuels. Most recently, a bill (H.R. 12112) supporting the commercialization of synthetic fuels (primarily the conversion of coal and shale to liquid and gaseous forms) was introduced in the House of Representatives and was narrowly defeated at the close of the 94th Congress. In this paper, CBO interprets continuation of present policies to exclude production subsidies for synthetic fuels or other major commercialization projects.

Certain subsidies already exist, but they are indirect and are not reflected in a separate budget item. Examples include tax expenditures (provisions such as depletion allowances) and limitations to liabilities of nuclear power plants (the Price-Anderson Act). 2/

Environmental Standards. A variety of laws and regulations, such as the Clean Air Act, and Federal Water Pollution Control Act, and regulations concerning strip mining at both the federal and state level, set

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2/ The Price-Anderson Act has not, in fact, resulted in any outlays, nor is it very likely to do so.

TABLE 4. ALTERNATIVE ENERGY POLICY PACKAGES: NEW POLICIES REQUIRED a/

Name of Policy Package	Oil and Gas Prices	Research and Development	Uranium Enrichment	Petroleum Storage	Direct Production Subsidies	Environmental Standards	Energy Conservation
Environmental Protection		Nonfission emphasis: full funding for solar, coal, fusion and geothermal				More emphasis than current; slower growth of nuclear power	More emphasis than current
Low Imports	Accelerated phaseout of oil price controls; decontrol new gas; impose import fee	Full funding; add to current program all demonstration of projects in ERDA's national plan		150 million barrel goal	Heavy subsidies	Less emphasis than current	More emphasis than current
Free Markets	Accelerated phaseout of oil price controls; decontrol of new gas	Federal R and D focused on areas where private funding is inadequate; little on demonstration or commercialization	Private ownership				Less emphasis than current
Low Consumer Cost	Slower phaseout of oil price controls; regulation of new gas prices below $1.42 per thousand cubic feet	Full funding; add to current program all demonstration of projects in ERDA's national plan		1 billion barrel goal	Moderate subsidies		More emphasis than current

a/ To simplify the presentation the entries in this table are presented as changes from present policies. A blank indicates that the required policy is the same as continuation of present policy as shown in Table 3.

forth environmental standards. In the continuation of current policy strategy, those laws and regulations are assumed to continue in force, unmodified.

Energy Conservation. The 94th Congress passed two bills that established significant conservation programs, the Energy Policy and Conservation Act of 1975 (EPCA) and the Energy Conservation and Production Act of 1976 (ECPA). In both bills the Congress used specific conservation programs, rather than increased energy prices, to reduce energy demand. The major provisions of the EPCA are: mandatory automobile fuel economy standards, energy labeling and efficiency standards for home appliances, federal aid to state conservation programs, industrial energy efficiency, and federal energy conservation. The major provisions of ECPA are: electric utility rate design, energy conservation standards for new buildings, housing insulation assistance for low-income families, state conservation implementation plans, assistance to energy conservation in existing dwellings, and loan guarantees for energy conservation.

Table 4 summarizes the major provisions of the alternative energy policy packages. To simplify the presentation and avoid repetition, the entries in this table are presented as changes from present policies. A blank indicates that the required policy is the same as in continuation of present policies package shown in Table 3.

Environmental Protection

The environmental protection policy package differs from a continuation of present policies principally in the environmental emphases of research and development, environmental standards and energy conservation programs.

The detailed design of such a package is difficult, in part because of differing opinions on which environmental threats are more grave, and in part because environmental effects and environmental control technologies are still poorly understood. Lacking such understanding, an environmental strategy might, in fact, consist of an all-out effort to understand energy-environment interactions, coupled with a cautious approach to resource

development. The illustrations provided here reflect judgments that might be consistent with such an approach; they are by no means the only way to interpret environmental priorities.

Research and development would emphasize work on technologies that would create or increase energy sources without further damage to the environment. For example, nonfission technology would focus on a wide range of nonfission demonstrations, particularly in the areas of solar, geothermal, coal and fusion energy, but would not include new demonstrations for nuclear fission.

Environmental standards would be made more stringent. As a result, certain projects now on the drawing boards would probably be canceled. For example, at some point a moratorium might be imposed on nuclear power plants. Or, environmental controls required on coal-fired power plants might be further strengthened, leading to the closing of existing plants and deferring the construction of new ones. In any event, energy production would be expected to decline.

Energy conservation standards would be made more stringent, perhaps by strengthening mileage standards on new automobiles, increasing the efficiency requirements on new home appliances, and using tax credits or other mechanisms to encourage the installation of better insulation on private homes.

Low Imports

A low import policy package would differ markedly from a continuation of present policies. The underlying theme of the low import policy package is to expand domestic production of various energy resources and thereby reduce the volume of imports. In general, this approach raises the cost of energy to the American consumer.

To stimulate domestic production, oil price controls would be phased out more rapidly than under EPCA. Similarly, the price of new natural gas would be deregulated. An import fee equal to between $2 and $3 a barrel (equivalent) would be imposed on imported oil and gas.

Funding for research and development would be greatly increased. The increase would be applied across the board and would add to the current program all the demonstration projects identified in ERDA's national plan. 3/

Because the level of imports is to be reduced so drastically, it would no longer be necessary to maintain a petroleum storage program as large as currently envisioned. It might be possible to reduce the storage level to the minimum specified in the EPCA--namely 150 million barrels.

Measures would be included to stimulate production of some fuels not currently produced on a commercial basis. This would entail production subsidies, loan guarantees or other measures as envisioned, for example, in the various synthetic fuel commercialization proposals considered by the 94th Congress.

Because the goal is all-out domestic production, it might be consistent with this goal to relax environmental standards, particularly in areas where there is a big tradeoff between energy efficiency and environmental standards. The two possible areas for relaxation of standards are: (1) air quality standards, lowering of which would permit greater use of coal for generating electricity; and (2) automobile emission standards, the relaxation of which could increase gasoline mileage.

Finally, energy conservation standards might be strengthened as suggested in the environmental protection policy package, leading to reduced demand and therefore to reduced imports.

Free Markets

There are several major differences between the free-market policy package and the continuation of present

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3/ ERDA, A National Plan for Energy Research, Development and Demonstration: Creating Energy Choices for the Future, Volume I: The Plan; April 15, 1976.

policies. The underlying theme of the free-market package is that the goal of economic efficiency should be sought above all others. The free-market mechanism is the best, if not the only, way to achieve economic efficiency.

A key aspect of a free-market approach is that the market rather than government regulation should determine the prices of resources. Accordingly, such an approach involves accelerating the phase-out of oil price controls, and deregulating new natural gas prices. Also, it might be appropriate to examine the tax incentives currently available to energy producers to see if they are justified in a free-market strategy.

In the area of research and development, a free-market strategy would involve focusing federal R and D expenditures on removing the obstacles to adequate private funding. Adequate private investment in research may not be possible without government support, since the enterprise that bears the costs and risks of research frequently cannot collect all the benefits. However, investment in commercialization may be more profitable than investment in earlier stages of the research process. Thus, to improve efficiency of energy use, it may be appropriate to emphasize federal involvement in support of research while giving more responsibility for demonstration and commercialization to private enterprise.

One important objective of the free market R and D strategy would be the reduction of uncertainty. This could be accomplished by supporting an R,D, and D program emphasizing a few chosen long-term technologies and by providing financial incentives for high-risk but profitable enterprises (including uranium enrichment), but would include no subsidies for projects estimated to be unprofitable.

Moreover, the free-market approach implies carrying out future expansion of U.S. uranium enrichment capacity in the private as opposed to the public sector.

Because a good deal of the government's energy conservation program attempts to compensate for the effects of low energy prices, it would be possible to relax

conservation standards if a free-market approach were adopted. The higher energy prices associated with the free market policy package would take the place of conservation standards in discouraging uneconomic uses of energy.

Low Costs to the Consumer

A policy package oriented toward low costs to the consumer recognizes that rising energy prices are disruptive to many aspects of American life and that they disproportionately penalize those least able to pay. Thus this sort of package makes every effort to restrain the prices paid by Americans for energy and related products.

The principal mechanism for restraining energy prices is to regulate oil and gas prices. Accordingly, the policy package directed toward lower costs to the consumer would involve slowing down the EPCA schedule for decontrolling oil prices. Further, this package would require new legislation to rescind the recent rulings by the Federal Power Commission that set price ceilings on new natural gas at $1.42 per thousand cubic feet. Tightening price controls would tend to reduce the amount of domestic production and thereby increase U.S. demand for imports.

A strategy of lower costs for consumers would involve a major increase in funding for research and development as a means of offsetting the reduction in domestic production caused by the tightly controlled prices. The increase would be applied across the board and would add to the current program all the demonstrations identified in ERDA's national plan. Further, moderate subsidies would be required to stimulate domestic production of synthetic fuels.

Because the low cost approach would involve a vast increase in the amount of imported energy, the United States would be increasingly vulnerable to a new embargo. Therefore, prudence would require increasing the level of petroleum storage above the level of 500 million barrels assumed for the continuation of present policies. Here it is assumed that the petroleum storage goal would be raised to 1 billion barrels by 1985.

To offset the tendency of lower prices to discourage energy conservation, it may be necessary to expand mandatory energy conservation programs.

POTENTIAL RESULTS OF ALTERNATIVE POLICIES

Alternative energy policy packages will produce two different types of effects: (1) relating to the consumption, production, and importation of energy and (2) the macroeconomic effects.

Effects on Consumption, Production, and Imports

In broad terms, an energy policy package must address four interrelated questions concerning energy balances:

- What kinds, and how much energy, should be used each year?
- How much energy should be produced domestically?
- How much should be imported?
- How much energy, in the form of various fuels, should be stockpiled?

It is useful to examine these questions in the context of the following energy quantity relationship:

domestic production + imports =
consumption + change in stockpiles.

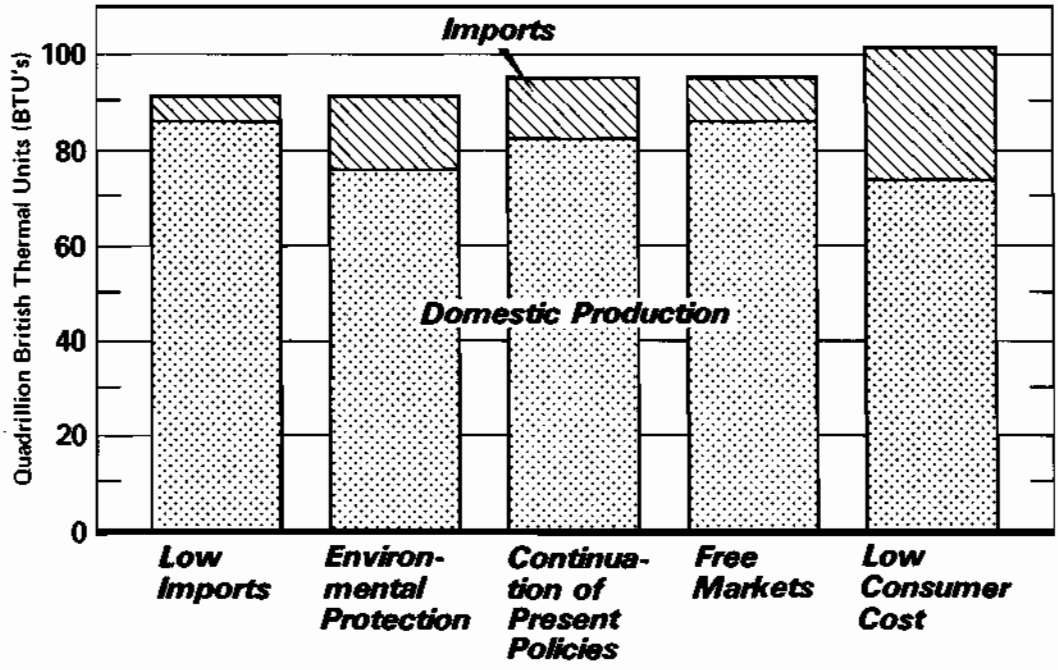
This energy equation states that the sum of energy production and imports equals the quantity of energy consumed plus the change in the nation's energy stockpiles. A comprehensive energy policy must take into account the changes in the demand for and the supply of energy that are likely to occur both in the short and long run. Since the size of the strategic reserve was addressed in the discussions of the individual energy policy packages (above) and will probably vary little from year to year, the focus in this section is on the effects each

alternative energy policy package is likely to have on the quantities of energy consumed, produced, and imported into the United States in 1986.

Figure 1 shows projections of energy consumption, production, and imports in 1986 for alternative energy policy packages. Levels are measured in quadrillion British Thermal Units (BTUs), a standard measure of energy.

Figure 1.

Projected Energy Consumption in 1986 for Alternative Energy Policy Packages



Note: One-half million barrels of oil per day yields approximately one quadrillion BTU per year.

This figure indicates that all three indicators--consumption, domestic production, and imports--fall in the middle of the range of alternatives under a continuation of present policies.

In contrast, both the highest level of energy consumption and the highest level of imports would result from the low cost to the consumer package. The low prices of this policy package simultaneously spur consumption and discourage domestic production, thereby increasing the demand for imports. If exceptionally strong conservation standards and/or incentives were adopted, the demand for energy and, correspondingly, the demand for imports, could be reduced slightly below the levels indicated in the figure.

At the other extreme, the lowest levels of consumption and of imports result from the low import policy package. High domestic prices and strong conservation efforts combine to discourage consumption, while the high prices, import fees, and production subsidies envisioned under this package all tend to encourage domestic production and diminish the demand for imports.

In terms of total energy consumption, the environmental protection policy package lies between the continuation of present policies and the low import package. However, the strong environmental standards would not encourage domestic production, thereby increasing import levels above those projected for either the present policy or low import package.

The free-market policy package would result in an overall energy consumption level almost identical to that projected under a continuation of present policies. The principal difference is that the production incentives implicit in the free-market policy package would permit the United States to become less dependent on imports.

Macroeconomic Effects

The principal macroeconomic effects of alternative approaches to energy policy are those that operate through the price mechanism to raise prices and simultaneously reduce purchasing power, thereby decreasing aggregate demand and increasing unemployment. To the extent the

price hikes stimulate domestic production and reduce demands for high priced imports, however, these effects partially offset both the inflationary and recessionary tendencies of the initial price hikes.

Of the five policy packages discussed, the most adverse macroeconomic effects, in terms both of inflation and unemployment, are likely to arise from the free-market approach, because there is only a small reduction in imports to offset the rapid phaseout of domestic price controls. In contrast, the low import approach, which involves a similarly rapid phaseout of price controls, contains some production subsidies that further stimulate domestic production and thereby further diminish the demand for imports. As noted in the next chapter, however, the low import approach is more costly in terms of the federal budget.

A continuation of present policies generally has fewer adverse macroeconomic effects than either the environmental or the low cost to consumer approaches. Because it relies less heavily on imported petroleum, a continuation of present policies will cause less of a drain on domestic purchasing power.

As noted in Chapter II, the discussion of macroeconomic impacts is somewhat artificial because it ignores the potential for fiscal and monetary policies that could be used to offset new energy policy initiatives. Although it is generally difficult to design policies that offset the inflationary impacts of new energy policies, it is quite possible to offset the recessionary impacts of such policies with the judicious use of macroeconomic instruments.

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Although energy-related expenditures in the federal budget have grown rapidly during the last four years (from $623 million in fiscal year 1974 to an estimated $4.9 billion in fiscal year 1977), direct federal spending on energy-related activities still represents less than 1 percent of the federal budget. But the share of the budget understates the significance of the federal activities in the energy area for three main reasons.

First, the impact on the economy as a whole of federal regulations is far greater than might be indicated by the expenditures for regulatory activities. By its very nature, regulatory activity may affect the prices paid by consumers, the volume of the product produced and sold, the profitability of various aspects of the business, and the amount and timing of research and development carried on in the private sector. None of these expenditures is reflected in the federal budget.

Second, some energy-related activities and initiatives are either not carried on the budget or else involve relatively small commitments of current resources. However, these activities could possibly require large expenditures in future years. For example, the operations of the Ford Administration's proposed $100 billion Energy Independence Authority would be determined by a board of directors, and would not appear on the budget. Only the net profits or losses--losses estimated at $42 million for fiscal year 1978--would appear. Plans for petroleum storage involve offsetting revenues from the Naval Petroleum Reserves so that only net expenditures (or surpluses) would be reported on the federal budget. Similarly, receipts generated by ERDA for providing uranium enrichment services are used to offset expenditures and only net expenditures are reported in the federal budget. The Ford Administration's proposals for the Energy Independence Authority, the private operation of new uranium enrichment facilities, and federal support for the commercialization of synthetic fuels each requires relatively

low expenditures in fiscal year 1978 but might have required significant outlays in the long term.

Third, expenditures for research and development (R and D)--which have absorbed some four-fifths of federal energy outlays in recent years--can have a large impact by preempting private R and D, particularly for those technologies for which research is extremely expensive. Thus future technological options available to the private sector may be heavily influenced by federal actions.

Although the federal budget does understate the economic impact of federal activities in the energy area, it is nonetheless useful to examine the effects on the budget implicit in the alternative policy packages outlined in Chapter V.

Federal energy expenditures (budget subfunction 305) currently support research and development programs, general operating programs such as uranium enrichment and energy conservation, and regulatory agencies including the Federal Power Commission and the Nuclear Regulatory Commission (NRC). The petroleum storage program and various production subsidies are also to be included in subfunction 305. This chapter analyzes the impact that the various energy policy packages outlined in the previous chapter would have on budget subfunction 305. In addition, the impact on tax expenditures and on various policies aimed at correcting market imperfections are discussed.

ANALYSIS OF POLICY PACKAGES

For purposes of this paper, federal outlays for energy (subfunction 305) are listed as follows:

(1) general operating programs,

(2) uranium enrichment,

(3) regulation,

(4) research and development,

(5) petroleum storage, and, to the extent they may be enacted,

(6) subsidies for production.

Operating programs include activities of the Federal Energy Administration (FEA), which administers conservation grants to states and grants that provide housing insulation to low-income families. Uranium enrichment involves processing natural uranium to increase the proportion of the critical material used in nuclear reactors. Three urnaium enrichment plants, all owned by the Energy Research and Development Administration, are currently in operation in the United States. Regulation includes the Federal Power Commission and the Nuclear Regulatory Commission. Over 90 percent of federal research and development funds are administered by ERDA, with most of the remainder divided among the NRC, Department of the Interior, and EPA.

FEA is charged with planning for a national petroleum reserve that was authorized under the EPCA of 1976. The actual fill is scheduled to begin in fiscal year 1977.

No major direct energy production subsidy programs currently exist, although small loan guarantee and demonstration programs have been authorized for a number of technologies, including geothermal and solar heating and cooling. A proposed synthetic fuels commercialization program was considered by the 94th Congress (H.R. 12112), and synfuels commercialization initiatives are reflected in certain of the budget alternatives as representative of subsidy programs in general. It has been suggested that other technologies--such as the breeder reactor and nuclear fuel reprocessing--may also become candidates for commercialization subsidies at a later date.

Table 5 contains the projected budget impacts of the alternative policy packages, from fiscal year 1977 through fiscal year 1986, in constant 1977 dollars. The estimates for new initiatives are based on projections made in a series of CBO background papers, as described in the notes to the table.

Continuation of Present Policies

Table 5 shows that under a continuation of present policies expenditures, in real terms, for operating pro-

TABLE 5. PROJECTED BUDGET IMPACTS OF ALTERNATIVE ENERGY POLICY PACKAGES, 1977-1986, MILLIONS OF 1977 DOLLARS, FISCAL YEARS (BUDGET AUTHORITY)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Continuation of Present Policies										
General Operating Programs a/	570	570	570	570	570	570	570	570	570	570
Uranium Enrichment (Net) b/	828	421	5	(101)	(512)	(190)	(223)	254	158	614
Regulation c/	190	190	190	190	190	190	190	190	190	190
Research and Development d/	3329	3766	4014	4199	4445	4364	4510	4664	4824	4904
Petroleum Storage (Net) e/	48	1083	(127)	338	336	(13)	(661)	(643)	(537)	(448)
Subsidies f/	--	--	--	--	--	--	--	--	--	--
Total	4965	6030	4652	5196	5029	4921	4386	5035	5205	5830
Environmental Protection										
General Operating Programs	570	580	590	600	610	620	630	640	650	660
Uranium Enrichment (Net)	828	421	5	(101)	(512)	(190)	(223)	254	158	614
Regulation	190	190	190	190	190	190	190	190	190	190
Research and Development	3329	4011	4627	5034	5387	5858	6340	6967	6379	6110
Petroleum Storage (Net)	48	1083	(127)	338	336	(13)	(661)	(643)	(537)	(448)
Subsidies	--	--	--	--	--	--	--	--	--	--
Total	4965	6285	5285	6061	6011	6465	6276	7408	6840	7126

TABLE 5, Continued

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Low Imports										
General Operating Programs	570	580	590	600	610	620	630	640	650	660
Uranium Enrichment (Net)	828	421	5	(101)	(512)	(190)	(223)	254	158	614
Regulation	190	190	190	190	190	190	190	190	190	190
Research and Development	3329	4426	5720	6611	7452	7468	7845	8147	7665	7493
Petroleum Storage (Net)	48	1083	(759)	(1210)	(1083)	(912)	(766)	(643)	(537)	(448)
Subsidies	--	60	60	109	147	111-357	157-443	144-430	112-736	184-1321
Total	4965	6760	5806	6199	6804	7287-7533	7833-8119	8732-9018	8238-8862	8693-9830
Free Markets										
General Operating Programs	570	570	570	570	565	560	555	550	545	540
Uranium Enrichment (Net)	828	399	(78)	(163)	(629)	(513)	(774)	(785)	(1109)	(982)
Regulation	190	190	190	190	175	175	175	175	175	175
Research and Development	3329	4406	4929	5491	5430	5468	5625	5557	5190	5046
Petroleum Storage (Net)	48	1083	(127)	338	336	(13)	(661)	(643)	(537)	(448)
Subsidies	--	--	--	--	--	--	--	--	--	--
Total	4965	6648	5484	6426	5877	5677	4920	4854	4264	4331

TABLE 5, Continued

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Low Cost to Consumer										
General Operating Programs	570	580	590	600	610	620	630	640	650	660
Uranium Enrichment (Net)	828	421	5	(101)	(512)	(190)	(223)	254	158	614
Regulation	190	190	190	190	190	190	190	190	190	190
Research and Development	3329	4426	5720	6611	7452	7468	7845	8147	7665	7493
Petroleum Storage (net)	1530	(616)	633	1333	3081	2847	14	(568)	(537)	(448)
Subsidies	--	31	52	75-82	93-98	28-273	66-312	(-7)-290	(-5)-329	(-9)-329
Total	6447	5032	7190	8708-8715	10,914-10,919	10,963-11,208	8522-8768	8656-8953	8121-8455	8500-8838

SOURCE: Internal, Congressional Budget Office.

a/ Estimates derived from CBO, Five Year Budget Projections: Fiscal Years 1978-1982, December 1976. Annual additions of $10 million per year beginning in 1978 for "Environmental Protection", "Low Imports" and "Low Cost to Consumer" Policy Packages reflect additional spending for conservation. Annual reductions of $5 million per year beginning in 1978 for "Free Markets" reflects reduced spending for conservation.

b/ Estimates for uranium enrichment reflect the offsetting of revenues against costs. These estimates are based on the budget authority provided for fiscal year 1977. For future years estimates are the sum of (1) estimates of costs and revenues from existing plants and from the proposed expansion of the Portsmouth plant, as provided by ERDA and (2) the costs, if born by the government, of further additions to capacity. The options, including government ownership of future centrifuge plants, are those detailed in CBO, Uranium Enrichment Alternatives for Meeting the Nation's Needs and Their Implications for the Federal Budget, Background Paper No. 7, May 18, 1976. It is assumed that individual future facilities start up in 1978, 1989, 1992, and 1998. For further detail, see CBO, Energy Research, Development, Demonstration, and Commercialization, Budget Issue Paper, January 1977.

c/ Estimates derived from CBO, Five Year Budget Projections; Fiscal Years 1978-1982, December 1976. A reduction of $15 million beginning in 1981 for the "Free Markets" Policy Package reflects a reduction of government regulation of the private sector.

d/ Estimates for research and development are based on Energy Research: Alternative Strategies for Development of New Energy Technologies and Their Implications for the Federal Budget, Background Paper No. 10, July 15, 1976, Congressional Budget Office. "Continuation of Present Policies" corresponds to "Base Program Completion," "Low Imports" and "Low Consumer Costs" correspond to "Full Funding," "Environmental Protection" corresponds to "Nonfission Emphasis," and "Free Markets" is based on new CBO calculations.

e/ Estimates for petroleum storage reflect the offsetting of revenues from the Naval Petroleum Reserves against the cost of building the Strategic Petroleum Reserve. They are drawn from CBO, Petroleum Storage: Alternative Programs and Their Implications for the Federal Budget, Background Paper No. 14, October 28, 1976.

"Continuation of Current Policies," "Free Markets" and "Environmental Protection" Policy Packages assume a target of 500 million barrels; the "Low Cost to Consumer" Policy Package assumes a target of one billion barrels; the "Low Imports" Policy Package assumes a target of 150 million barrels. All estimates have been inflated to 1977 dollars.

f/ Estimates drawn from Interagency Synfuels Task Force Report, Vol. III; Appendix D, (GPO) pp. D-26, D-29, D-30, and D-33 converted to 1977 dollars. For further discussion see also Commercialization of Synthetic Fuels: An Analysis of the Senate's Loan Guarantee Program and the Administration's Proposal, Congressional Budget Office, Background Paper No. 3, January 16, 1976, pp. 27-34.

The "Low Cost to Consumer" Policy Package assumes a subsidization program for 350,000 barrels per day of Synthetic Fuels. The "Low Imports" Policy Package assumes subsidization for one million barrels per day. All other cases assume no subsidies.

grams and regulatory activities would not change during the next ten years, R and D would rise gradually from its fiscal year 1977 level of approximately $3.3 billion to $4.9 billion by fiscal year 1986. These estimates are based on a strict interpretation of present policies, and allow for no major new initiatives beyond those currently enacted. Net costs, after taking account of revenues, associated with uranium enrichment services are projected to be $821 million in fiscal year 1977. (See Appendix B for details.) Because of year to year variations in the fill rate for the petroleum storage program proposed by FEA, the annual costs of a 500 million barrel reserve could vary considerably over the ten-year period of these projections. There is no allowance for subsidies for synthetic fuel programs, since none have yet been enacted.

Environmental Protection

Under the environmental protection approach, budgets for regulatory functions, uranium enrichment, and petroleum storage subsidies are projected to be approximately the same as those under the present policy alternative. The budget for operating programs is projected to rise by $10 million each year beginning 1978 to reflect the added expenditures for energy conservation. The R and D budget is projected to be considerably higher than that for continuation of present policies with total ten-year outlays (not discounted) running a full 25 percent above those shown in the present policy package, reflecting further emphasis on the environment and on long-term technologies.

Low Imports

The low imports policy package calls for heavy federal investment on reserach and development of new technologies, with outlays (not discounted) a full 50 percent above the levels called for in the present policy approach. The synthetic fuels program required by a low import strategy is the most ambitious of those considered here, with a production target of 1 million barrels per day by 1985. However, because of the dramatic reduction in import levels, the required petroleum reserve would be

relatively small (150 million barrels). Because the receipts from the NPRs exceed the costs of such a storage program, it is projected that the budget would record a large surplus (not discounted) for the combined storage/NPR programs over the period fiscal year 1977 to fiscal year 1986. Regulation and uranium enrichment are projected to be the same as under present policy. The budget for operating programs rises by $10 million each year to reflect the increased emphasis on conservation.

Free Markets

The free market package would require a slight decrease in federal efforts in conservation and regulation beginning in 1981. The R and D budget is projected to rise somewhat more rapidly than under the continuation of present policies. In accordance with the free market approach, new uranium enrichment facilities (after the already begun expansion to the Portsmith plant) will be owned and operated by the private sector. This is reflected in the budget by decreased federal outlays for construction of new facilities beginning in fiscal year 1976. Reflecting identical policy assumptions, the budget entry for petroleum storage is the same as that projected for the continuation of present policies. Similarly, no subsidies are assumed.

Low Cost to the Consumer

The low cost to the consumer package involves considerably higher levels of federal expenditures than under present policies in R and D, subsidies, petroleum storage, and conservation, reflecting broad federal initiatives designed to keep costs to consumer down, both in normal times and in the event of an embargo. The R and D budget is projected to rise a full 50 percent above the present policies approach. Support of the 350,000 barrel per day synthetic fuels program called for by this strategy will likely require considerable federal outlays. The Interagency Synfuels Task Force has projected that by 1981 such a program would require a federal outlay of approximately $90 million a year. After 1981 the estimates are subject to much more uncertainty and range from an actual surplus to the federal government of $9 million

in 1986 to outlays of up to $329 million in that year. Because of the necessity of purchasing considerable quantities of high priced foreign oil to build the large petroleum reserve required for this low consumer cost policy package, it is estimated that even after the offset of the NPRs, federal expenditures for storage would be quite high, rising to almost $3 billion each year in fiscal years 1981 and 1982. Federal expenditures for conservation are projected to rise by $10 million each year, as indicated in the budget category "general operating programs."

COMPARISON OF BUDGETS

Keeping in mind the illustrative nature of these alternatives and the many uncertainties in the budget estimates, it is nevertheless possible to draw several overall observations from Table 5. First, all budgets are likely to grow somewhat even under a strict interpretation of present policy. Even in its most expensive year (1982), the costliest strategy (low cost to consumer) would require outlays slightly more than twice that required by a continuation of present policies. By the end of the projection period, those differences would have narrowed somewhat, due to completion of even the largest petroleum storage program.

Further, these relationships are relatively insensitive to the mix of policy instruments employed in the different strategies. Except for the R and D design, the budget effects of alternative strategies are the result of adding programs, not changing their composition. While there are differences in the R and D strategies employed in the continuation of present policies, free market and environmental protection alternatives, the low import and low consumer cost alternatives employ the same full funding strategy for R and D.

TAX EXPENDITURES AND MARKET IMPERFECTIONS

In addition to the direct expenditure programs, the federal tax code contains various provisions intended to stimulate energy production. The major provisions permit (1) exploration and development costs to be expensed

(that is, these costs may be deducted from income as they are incurred, rather than as revenue from them is realized), and (2) except for the largest oil companies, deduction of a fixed percentage of sales receipts as a depletion allowance, regardless of the amount invested. Together these expenditures are estimated to reduce federal revenues in fiscal year 1976 by roughly $2.45 billion. 1/ These amounts do not appear on the budget. If the tax credit for home insulation, as proposed in the last session of Congress (H.R. 6860) and most recently by the Ford Administration were enacted, additional revenues would be lost. For the Ford proposal, for example, tax expenditures are estimated to be $195 million in fiscal 1978.

Other programs, designed exclusively to correct financial market imperfections could, in principle, be carried out without any long-run budget impacts. A significant financial market imperfection might arise because the scale of the project, for example, is such that private lenders would be unwilling to make the required loan at a rate of interest that accurately reflects the risks involved. In such a case the government could either make the loan itself or else offer a guarantee of repayment to a private lender.

Such guarantees have been suggested for synthetic fuels and uranium enrichment. In either event, the government could charge an interest rate or a fee that reflected the true risks involved. Thus, while the government might be required to cover defaults that might occur on any single project, over the long run the fees imposed for the loans or the loan guarantees would equal the required outlays.

It is appropriate to distinguish between such cases of market imperfections and those in which the financial markets may be capable of functioning effectively but a particular project may simply be unprofitable. In the

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1/ The investment tax credit has not been included in these estimates. In fiscal year 1976, the revenue loss allocable to natural resource activities from this provision was about $1.4 billion.

latter case a subsidy would be necessary to cause the project to go forward. Such subsidies might be provided in the form of price supports. Subsidies might also be provided in the form of loan guarantees for which the fee would not be expected to cover defaults--resulting in net outlays from the federal budget.

In other loan guarantee programs--such as for small businesses or single-family dwellings--the individual loans are small enough that it is possible to apply statistical techniques to estimating the default rate--and hence to calculate required fees or outlays. For many energy programs, the unit investment is so large--$1 billion or more--that such techniques are inapplicable, leading to considerable problems in deciding the proper budgetary treatment of contingent liabilities. 2/

2/ For a fuller discussion of this issue, see Federal Energy Financing: Financial and Budgetary Implications of Government Guarantees," Staff Report of the Task Force on Energy of the Committee on the Budget, U.S. Senate, August 30, 1976. Also, see Testimony of Richard D. Morgenstern before a joint hearing of Committee on Banking, Currency and Housing; Committee on the Budget; Committee on Ways and Means; U.S. House of Representatives, November 10, 1976.

APPENDIXES

APPENDIX A TRENDS IN THE ENERGY SECTOR

Energy markets change continually. A new resource is discovered; new technologies are developed to exploit that resource; market penetration increases, perhaps to the point of dominance; then, the resource is perceived to be finite: the less costly deposits are depleted, and the importance of the resource declines. So it was with wood and hydroelectric power, so it is with oil and gas, and so it will be, ultimately, with coal and with nuclear technologies based on uranium.

Thus it is important to look at trends when considering either the past or the future; it is also important to understand that no particular energy situation is inherently stable, and that an energy policy should be viewed as a mechanism for dealing with change, rather than as a means of achieving some enduring condition.

PRODUCTION

Figure A-1 presents trends over the last 15 years in domestic production of oil, gas, and coal. The resources on which this production is based are finite--though their extent and location are not known for certain. Oil production peaked in 1970, and has declined since. Although production of oil from Alaska is expected to reverse the current trend and result in increases in total production, depletion of the most accessible and economic oil reserves will eventually cause oil production to decline again. When the decline will begin depends, in part, on how quickly Alaskan reserves are exploited.

Natural gas production peaked in 1973, and has declined since. Although, as will be discussed below, increases in natural gas prices recently granted by the Federal Power Commission (FPC) may stimulate additional gas production--perhaps even reversing the downward trend--the limited domestic resources will eventually result in a return to declining gas production.

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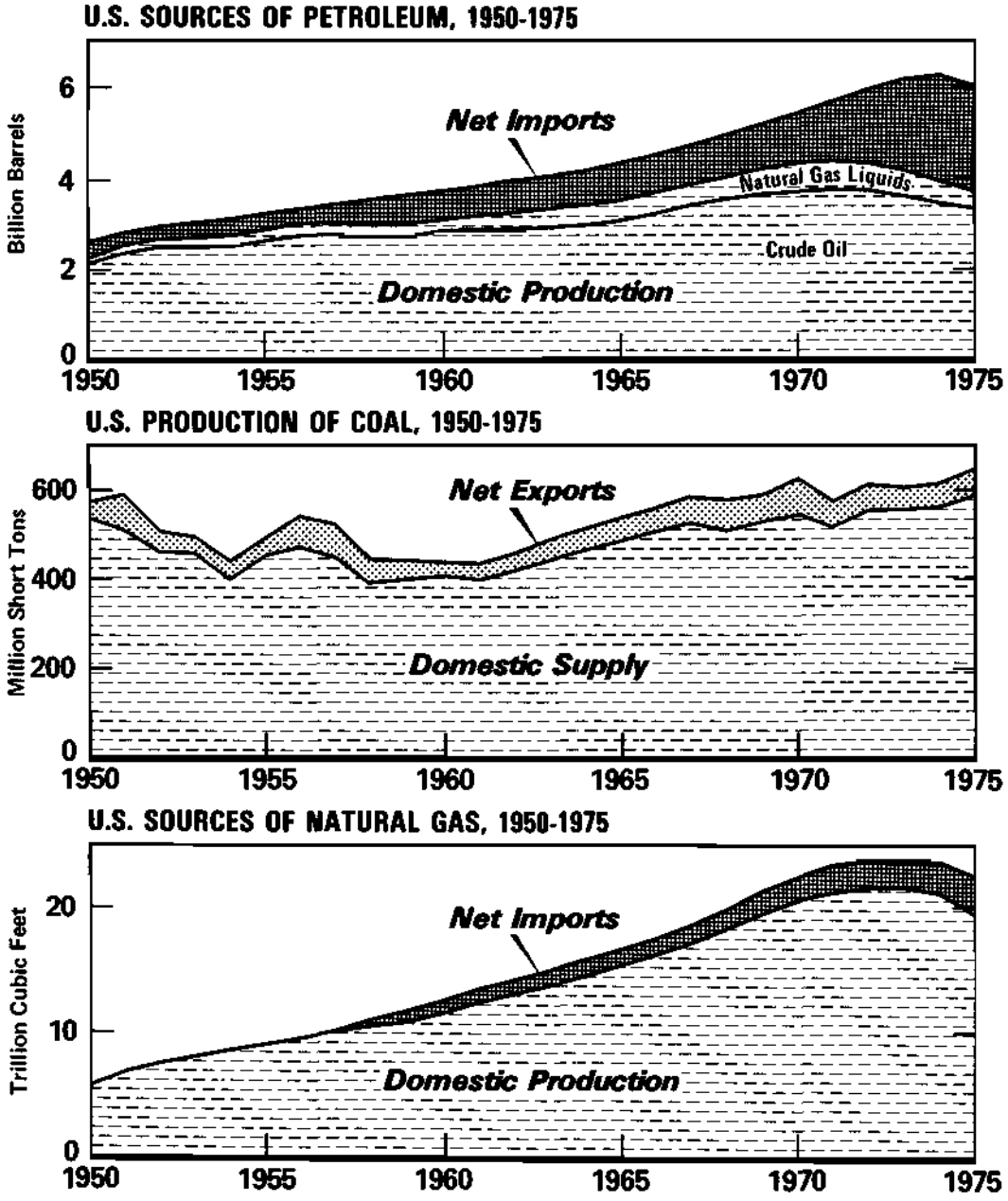
Figure A-1

Trends in the Domestic Production of Fossil Fuels



Source: Bureau of Mines, U.S. Department of the Interior (Based in part on data from U.S. Bureau of the Census, Federal Energy Administration, and Federal Power Commission)

Domestic coal production has increased, albeit irregularly, over the last 15 years. The large size of domestic coal reserves would permit coal production to increase until well into the next century.

Production of energy from nuclear sources (not shown) began in the 1960s and has increased since. Although the uranium resource is limited, and resource availability for current-generation technologies could become a problem before the end of the century, new technologies for producing energy from uranium fission--as well as nuclear technologies using other sources of fuel--could make possible further increases in the contribution of nuclear energy well beyond those currently planned. Energy resources that are not depleted by use, such as solar energy, do not now contribute significantly to domestic energy production, but could become dominant sources of energy at some future time.

Figure A-2 displays the changing mix of energy derived from various sources. The relative contribution of nuclear energy has increased since 1970, as has the contribution of domestic and imported oil and gas, while coal's contribution has declined. However, the contribution of imported oil and gas has increased rapidly, while that of domestic oil and gas has declined.

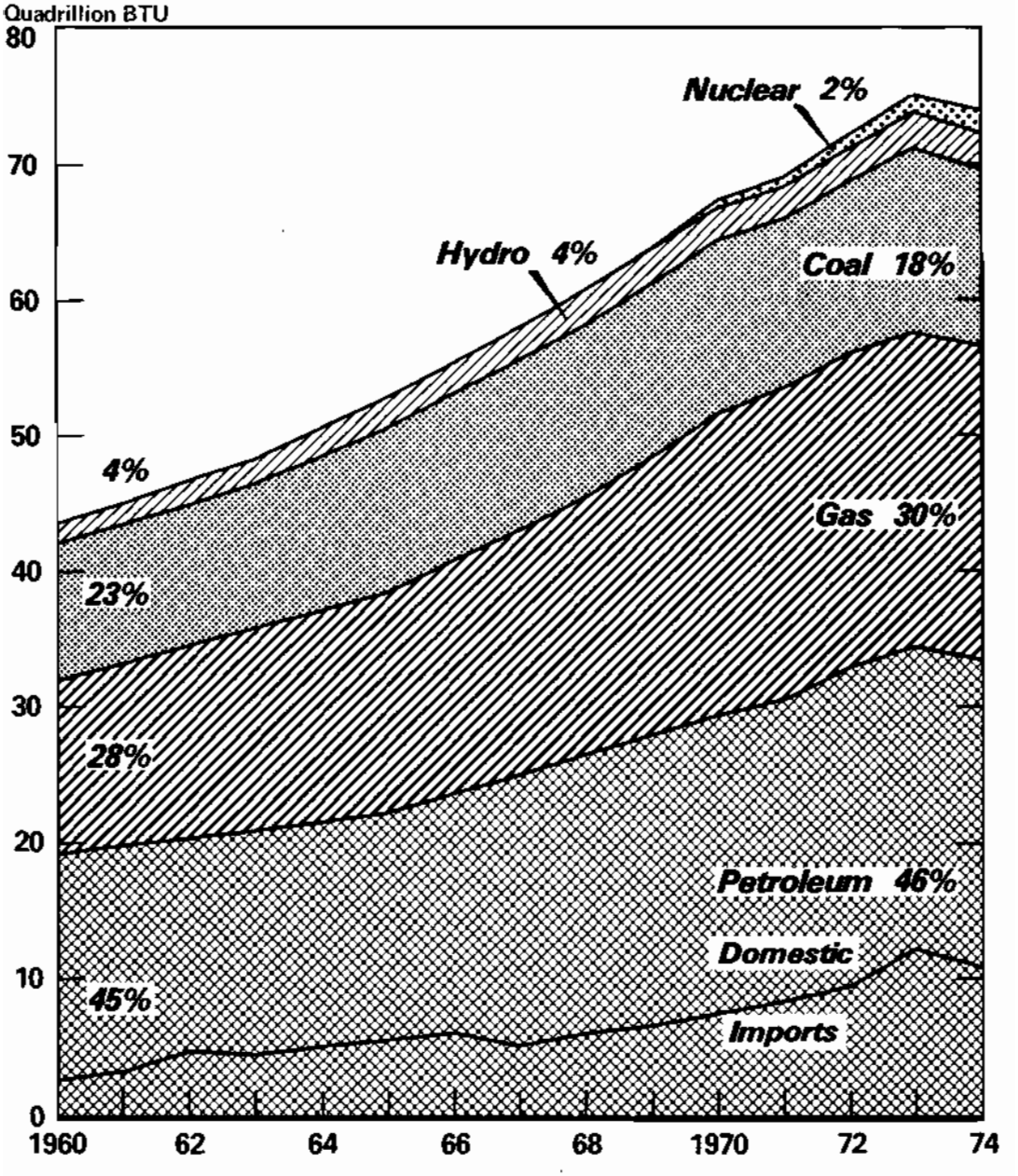
PRICES

Figure A-3 shows the trends of domestic fossil fuel prices over the past 15 years. The slow upward drift of the 1960s (which was lower than the national inflation rate) accelerated dramatically for all sources of energy in 1974 at the time of the embargo.

Since 1954 the price of natural gas sold to interstate pipelines has been regulated by the Federal Power Commission. Since the late 1960s the regulated price has been below the price that would have existed in the absence of regulation. Since 1971, crude oil prices also have been controlled, first by the Cost of Living Council and now by the Federal Energy Administration. Without those controls, the price of domestically produced oil would have been about the same as the price of imported oil. (Prior to 1973, when imported oil prices

Figure A-2

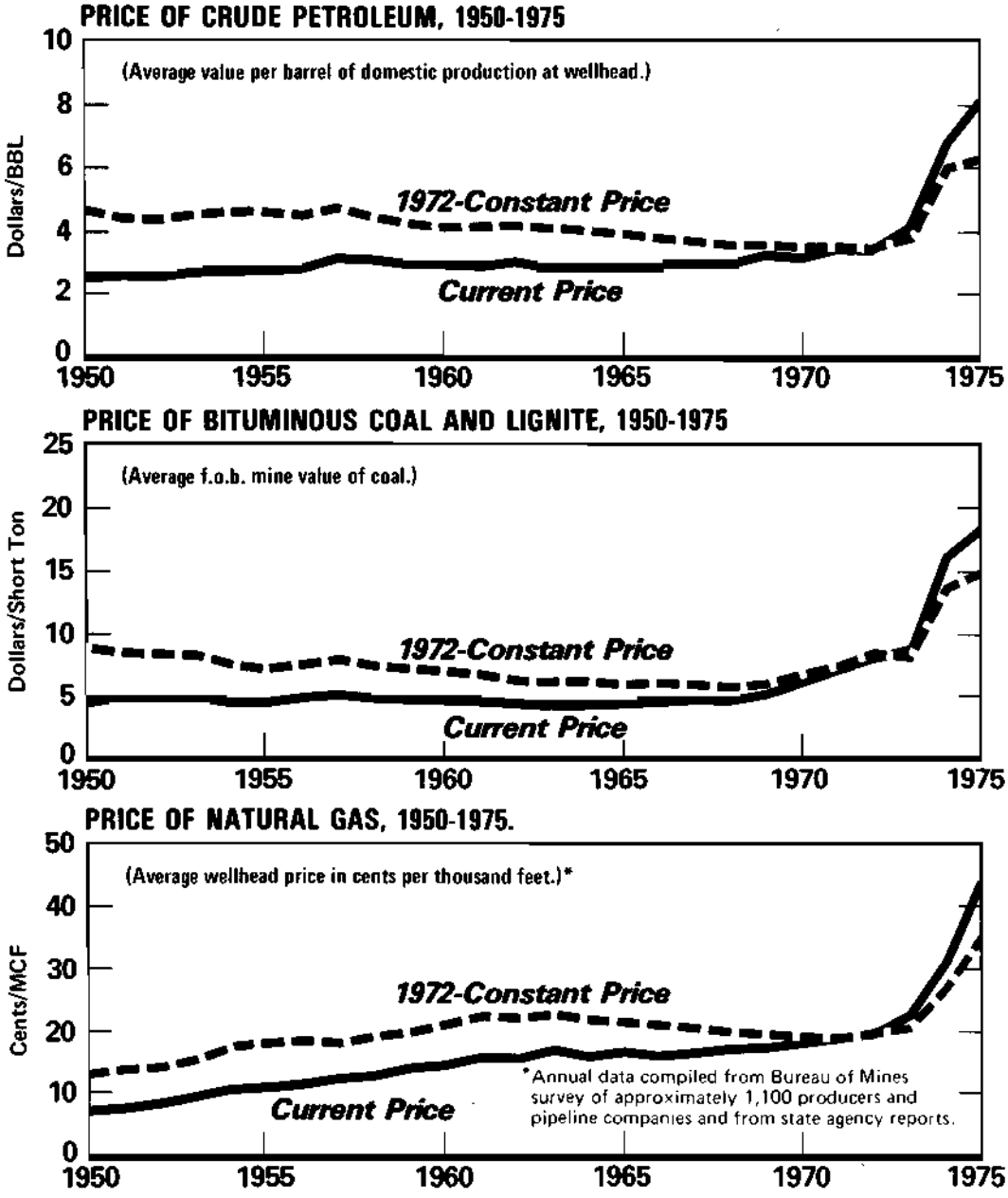
U.S. Energy Consumption Patterns By Source, 1960-74



Source: *Energy Facts II*, Prepared for the Subcommittee on Energy Research, Development, and Demonstration of the Committee on Science and Technology, U.S. House of Representatives, Ninety-Fourth Congress, First Session, by the Science Policy Research Division, Congressional Research Service, Library of Congress, August 1975, p. 52.

Figure A-3

Trends in Domestic Prices of Fossil Fuels



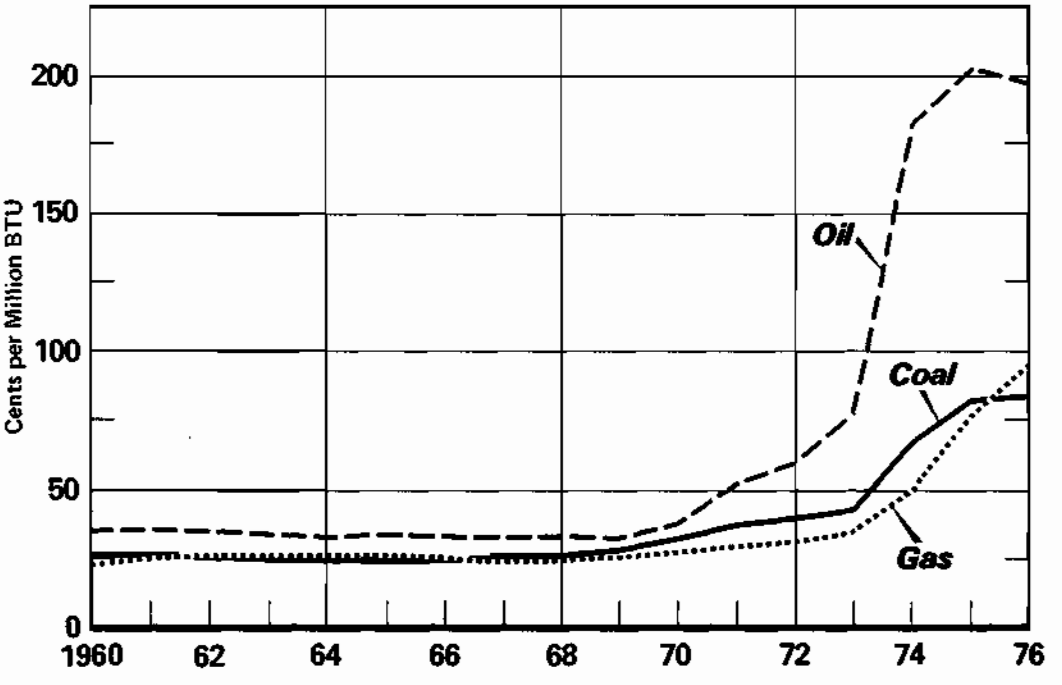
Source: Bureau of Mines, U.S. Department of the Interior (Based in part on data from U.S Bureau of the Census, Federal Energy Administration, and Federal Power Commission)

were lower than domestic, oil imports were curtailed through the oil import program, without which the lower price of foreign crude oil would have made imports considerably more attractive to purchasers than domestic oil.)

Figure A-4 presents prices of alternative fossil fuels sold to steam electric plants (electric utilities) on a comparable basis, cents per million BTU. 1/ Note that these figures represent only the direct cost of fuel. Because they do not take account of different capital or fuel storage costs associated with the various fuels, they may not reflect actual differences in the cost of generating electricity. However, two patterns are significant: (1) the gap between controlled and uncontrolled prices has been increasing, and (2) coal, despite rapid price increases, has the lowest cost per million BTU of all fuels, regulated and unregulated.

Figure A-4

Trends in Prices of Fossil Fuels Sold to Steam Electric Plants Cents Per Million BTU, 1960-1976



Source: Federal Power Commission.

1/ The BTU, or British Thermal Unit, is a measure of energy.

DEMAND

Energy demand grew at an annual rate of 3.6 percent in the 20 years before the 1973 embargo. (Electricity consumption grew at approximately twice that rate.) The rapidly increasing prices, the recession, and the conservation measures adopted in the aftermath of the embargo dramatically slowed the growth in demand. As Figure A-2 indicates, however, energy demand continues to grow faster than domestic energy production, with the result that imports of oil and gas are growing to fill the gap.

THE PUBLIC ROLE IN ENERGY MARKETS

Federal and state governments strongly influence energy production, consumption, and price. The influence is felt principally in four areas: (1) regulation, (2) ownership of resources, (3) development of technology, and, recently, (4) mandatory conservation practices.

Regulation

Oil imports have long been the subject of federal concern. An oil import program was initiated in 1959 to restrict importation of foreign crude oil; that program continued, with some alterations, until 1973, and gave a considerable stimulus to domestic oil production. Import fees were imposed in 1974 and removed in December 1975. Special tax treatment of oil and gas also provided strong incentives to domestic oil production. (Some of the tax incentives to oil and gas production were removed in the Tax Reform Act of 1974.) The Texas Railroad Commission has regulated the sale of crude oil produced in Texas (about 40 percent of domestic production) in a fashion that maintained stable and profitable crude oil prices. Finally, as mentioned earlier, price controls in various forms have been imposed on domestic crude oil production (and on petroleum products) since 1971.

Since 1938, the FPC has regulated the rates charged by interstate pipielines for delivery of natural gas, and since 1954 the wellhead price of natural gas sold in interstate commerce. State regulatory commissions regulate the prices of natural gas and electricity sold to

final users. Those commissions also control construction of facilities and extension of service by gas and electric utilities.

Over the past ten years regulation of the environmental consequences of energy production and use has become an increasingly important part of the federal presence in energy markets. Air and water quality, oil spills, strip mining, and the safety of nuclear reactors are perhaps the most important concerns affected by energy production and use. Increasingly stringent standards in these areas are often cited as contributing to the increasing cost or decreasing availability of energy.

An important consideration is the effect of regulatory activity on the stability of the investment climate. Uncertainty as to future actions by regulatory agencies with respect to energy pricing, handling and disposal of nuclear materials, and air quality standards, for example, can deter investment, particularly if that uncertainty is reflected in the possibility that a project, once constructed, cannot obtain a license to operate, or that controls more stringent than those in force during project design might be imposed retroactively.

Ownership of Resources

The federal government is a major owner of energy resources: large amounts of oil, gas and coal reserves lie under federally owned land. New sources of energy such as geothermal heat are also found in large quantities under federal land. The policies of the U.S. government in exploiting resources under its direct control can thus significantly affect domestic energy production. Leasing of oil fields on the Outer Continental Shelf, leasing of federal coal lands and regulation of mining thereon, and exploitation of Naval Petroleum Reserves are three examples of current actions to utilize federal energy reserves.

Development of Technology

The U.S. government has also been a prime mover in the development of new technologies for energy production and use. Nuclear technologies have been developed

entirely under the sponsorship of the Atomic Energy Commission and its successor, the Energy Research and Development Administration (ERDA). ERDA is also supporting the development of new technologies in three important areas: extraction of oil and gas; extraction, conversion, and use of coal; and utilization of solar and other inexhaustible sources of energy. Such new technologies are of particular importance in the transition from declining energy sources to new and less limited sources of energy. Under certain circumstances--particularly in the case of technologies whose development is expensive and whose implementation is capital-intensive--federal initiatives may preempt technological choices, and thus have a dominant effect on the shape of future markets.

Conservation Measures

Since 1973, there has been increasing concern with energy conservation. A number of conservation measures have been mandated or encouraged by a series of recent acts. Although, strictly speaking, many such measures are regulatory in nature, the specific focus on reducing demand for energy is a recent thrust in national policy.

APPENDIX B PROJECTIONS OF OUTLAYS AND RECEIPTS OF ALTERNATIVE PETROLEUM STORAGE AND URANIUM ENRICHMENT PROGRAMS

TABLE B-1. ALTERNATIVE URANIUM ENRICHMENT PROGRAMS USED FOR POLICY PACKAGES: OUTLAYS AND RECEIPTS (MILLIONS OF 1977 DOLLARS)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Free Markets										
Outlays	1,488	1,437	1,448	1,422	1,445	1,609	1,652	1,623	1,617	1,603
Receipts	660	1,038	1,526	1,585	2,074	2,122	2,426	2,408	2,726	2,585
Net Outlays (Surplus)	828	399	(78)	(163)	(629)	(513)	(774)	(785)	(1,109)	(982)
Continuation of Present Policies, Low Cost to Consumers, Environmental Protection, Low Imports										
Outlays	1,488	1,458	1,561	1,613	1,800	2,180	2,381	2,801	3,023	3,337
Receipts	660	1,037	1,556	1,714	2,312	2,370	2,604	2,547	2,865	2,723
Net Outlays (Surplus)	828	421	5	(101)	(512)	(190)	(223)	(254)	(158)	(614)

SOURCE: Letter from M. C. Greer, Controller, Energy Research and Development Administration, January 5, 1977.

TABLE B-2. ALTERNATIVE PETROLEUM STORAGE PROGRAMS: OUTLAYS FOR STORAGE AND RECEIPTS FROM NAVAL PETROLEUM RESERVE (MILLIONS OF 1977 DOLLARS)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
150 Million Barrel a/										
Outlays	448	2,353	511	60	60	60	60	60	60	60
Receipts	400	1,270	1,270	1,270	1,143	972	826	703	597	508
Net Outlays (Surplus)	58	1,083	(759)	(1,210)	(1,083)	(912)	(766)	(643)	(537)	(448)
500 Million Barrel b/										
Outlays	448	2,353	1,143	1,608	1,479	959	165	60	60	60
Receipts	400	1,270	1,270	1,270	1,143	972	826	703	597	508
Net Outlays (Surplus)	48	1,083	(127)	338	336	(13)	(661)	(643)	(537)	(448)
1 Billion Barrel c/										
Outlays	1,980	654	1,903	2,603	4,224	3,819	840	135	60	60
Receipts	400	1,270	1,270	1,270	1,143	972	826	703	597	508
Net Outlays (Surplus)	1,580	(616)	633	1,333	3,081	2,847	14	(568)	(537)	(448)

SOURCE: Estimates derived from Petroleum Storage: Alternative Programs and Their Implications for the Federal Budget, Background Paper No. 14, October 28, 1976.

a/ 150 Million Barrel Storage Program was assumed for Low Import Policy Package.

b/ 500 Million Barrel Storage Program was assumed for Continuation of Present Policies, Environmental Protection and Freek Market Policy Packages.

c/ 1 Billion Barrel Storage Program was assumed for Low Cost to Consumers Policy Package.