THE BUDGETARY, ECONOMIC, AND ENERGY IMPLICATIONS OF ALTERNATIVE SYNTHETIC FUEL PROPOSALS

A Staff Working Paper

Natural Resources and Commerce Division
The Congressional Budget Office
September 7, 1979

PREFACE

This paper represents an overview of some of the budgetary, economic, and energy implications of synthetic fuel production in the United States. Due to time constraints, the paper is not a comprehensive analysis of all the issues associated with synthetic fuel production, and has not undergone the review customary for published Congressional Budget Office papers. The paper was completed at the request of the synthetic fuels task force of the Senate Budget Committee. In keeping with the CBO mandate to provide objective analysis, this paper makes no recommendations.

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September 1979

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SUMMARY

The Congress is currently considering several bills and proposals for federal action to stimulate a domestic synthetic fuel (synfuel) industry. The House of Representatives has already passed legislation, and several other bills are currently being debated by Congress. The various proposals raise a number of major energy, budgetary, and economic policy issues. These include the appropriate production goal for synfuels, the most effective financing mechanism (loans, loan guarantees, or price guarantees), the level and timing of federal expenditures, and the impact of synfuel production on the overall economy. Another issue is the creation of a large trust fund to finance synthetic fuel development and of an off-budget agency to administer that fund.

The Appropriate Production Goal for Synfuels

Most of the synthetic fuel bills under active consideration by the Congress have production goals of between 500,000 and 5 million barrels of oil equivalent per day by 1985 or 1990. The appropriate production goal depends upon whether the program objective is to develop an information base for planning the most effective long-run transition to synthetic fuels or to reduce oil imports significantly.

A certain production threshold is necessary to acquire the environmental, technical, and economic information needed to select what technologies and resources are most effective and should be developed over the long run. Although this threshold cannot be specified with precision, it probably falls between 200,000 and 400,000 barrels of oil equivalent per day. Such an output would require four to eight commercial-size plants; that is, two different technologies for each of several resources (oil shale, coal, and biomass). A strong case can be made for a program at this level on the grounds that the United States will eventually have to change to alternative fuels and that such a base of knowledge will assist in choosing those resources and technologies that will allow an effective transition.

Whether the production total should be set above this information threshold depends on two factors: first, the effectiveness in terms of oil import reductions per dollar of synfuel production as compared with alternative programs; and second, the level of oil imports considered acceptable from the standpoint of economic and national security risks.

Previous CBO analysis indicates that U.S. oil imports could be reduced from the approximately 12 million barrels per day expected in 1990 to 8 million more effectively through incentives to conserve energy, to use alternative sources such as unconventional gas or solar power, and to accelerate the replacement of oil and gas boilers with coal rather than through additional synthetic fuel production. Even if the decision is made to develop synthetic fuel production substantially above the information threshold, it would still be logical to have a two-stage program. The two stages would be: first, the construction of four to eight commercial-size plants in order to acquire information; and then, after three to five years, a more ambitious production program. The first stage would provide information about costs, technology, and environmental effects that would reduce the risks to both the private sector and the government in initiating a full-scale program.

Financing Mechanisms

The private sector has not as yet been willing to invest the approximately $2 billion necessary to build a synfuel plant large enough to take advantage of the economies of scale common to such processes. This is because they feel that the various risks involved are too high. Not only are there technological, cost, and regulatory risks, but there is also uncertainty about the future level of prices set by the Oil Producing and Exporting Countries (OPEC).

In developing a synfuels program, the Congress should consider choosing a financing mechanism--whether it be loans, loan guarantees, or price guarantees--under which the government would absorb the risk that future OPEC prices will not be as high as currently anticipated. Since the nation as a whole benefits from lower OPEC prices, the government could absorb that risk. On the other hand, the technological and cost risks could be absorbed by the private sector, which traditionally accepts these risks in making investment decisions. Such a separation of risks would provide the private sector with sufficient incentive to construct and operate synthetic fuel plants efficiently. In addition, in choosing a financing mechanism the Congress should consider whether its impact on the budget would be predictable and whether it would be considered in the normal budget process.

Given the size of the investment required, as well as the overall risk, it is very doubtful that federal government loans, even at subsidized rates, would provide sufficient stimulus for the private sector to construct the plants. Alternatively, if the federal government itself were to build these plants, it would then absorb all the risks--that is, the technological and the cost risks, as well as the risk associated with any future changes in OPEC

prices. Since private sector money would not be involved, overall efficiency would probably be lower.

Similarly, loan guarantees would shift much of the cost and technological risk of building plants from the private sector to the government, thus reducing the incentives for efficiency. From a budgetary standpoint, moreover, loan guarantees for large-scale projects are undesirable since they tend to obligate the federal government to a potential future outlay (because of a default) that may be considerably above the initial appropriation. Loan guarantees are more appropriately used for programs such as housing, in which the risk is spread over a large number of small projects and the default rates can be predicted with a reasonable degree of accuracy.

Price guarantees, whereby the federal government contracts to buy a given amount of synthetic fuel at a given price, would have a distinct advantage over other funding mechanisms in that the private sector would absorb the technological and cost risks and, therefore, would have a strong incentive to build cost-effective plants. The federal government, on the other hand, would absorb the risk that OPEC prices might fall in real terms or not increase as fast as expected. From a budgetary standpoint, price guarantees would have the advantage of being included in the budget resolutions, and the outlays would be more predictable over time.

The Budgetary and Economic Implications

A federal program to stimulate synthetic fuel production, which is to be funded from the receipts of the windfall profits tax, raises a number of budgetary and economic questions. These include both the level and the timing of federal costs, the issue of a large trust fund to finance synthetic fuel development, the existence of an off-budget agency, and the fiscal impact of a major synthetic fuel initiative.

Potential Federal Costs. The total costs to the federal government, as well as the timing of expenditures, of a synthetic fuel program would depend upon the production goal, the financing mechanism utilized, future OPEC prices, and the speed at which plants are actually constructed. There is considerable uncertainty with respect to all these factors and, therefore, the actual costs to the federal government are highly speculative. However, on the assumption that the federal government utilizes a price guarantee and that synthetic fuels average somewhat more than $9 per barrel above conventional oil over the next 15 to 20 years, the total cost to the federal government would be about $29 billion for production of 500,000 barrels per day over a similar time period. Given that it would likely take a minimum of seven years to plan, site, and construct these plants, few

expenditures would occur over the next several years, regardless of the financing mechanism utilized. Under the price guarantee mechanism, there would be no outlays until 1987.

Trust Fund Financing. In April, the President called for the creation of an Energy Security Trust Fund to receive the revenues from the proposed windfall profits tax. A large percentage of these revenues would be used to finance synthetic fuel production, while the remainder would be used for rebates to low-income consumers and for several transportation initiatives. Depending upon future OPEC prices and final action by the Congress, the total liabilities to oil companies from this tax could be between $200 billion and $340 billion over the next 10 years. The desirability of such a large trust fund is obviously an important budget issue.

The primary advantage of a trust fund as a financing mechanism is that it provides a built-in, self-adjusting device for channeling the revenues of a special tax into programs that are closely related to that tax. If the revenue source is steady, it also provides funding security for programs that require a lead time for state and local planning. A trust fund device may be less desirable, however, if uncertainty about the amount of revenues that will enter the fund in future years inhibits careful planning and leads to program inefficiency. This is a potentially serious problem for the Energy Security Trust Fund since its revenues are extremely sensitive to future OPEC prices, which are very difficult to project. This fact was demonstrated by the June 26, 1979, OPEC price increase, which almost doubled the estimates of trust fund revenues that prevailed only a few months earlier. Earmarking such an unpredictable source of revenues for long-term investments in energy programs could hinder Congressional decisionmaking.

Under the President's proposal, the synthetic fuel program to be funded from the Energy Security Trust Fund would be subject to the normal authorizing and appropriating processes. In principle, this would permit the Congress to adjust expenditures from the fund to fit with energy policy, fiscal policy, changing needs, and evolving legislative priorities. But by earmarking the revenues that enter the trust fund for specific program purposes, the Congress would reduce its flexibility to redirect revenues toward changing priorities. Consequently, decisions about yearly expenditures might be based on the amount of revenues available in the trust fund rather than on the importance of the synthetic fuel program.

On or Off Budget? The question of whether a federal synthetic fuel corporation should be placed on or off the budget depends primarily on the tradeoff between Congressional control and the cost effectiveness of the corporation. The major benefit of an off-budget agency is that the private sector might view it as less susceptible to the uncertainties of the annual

federal appropriation process and, therefore, more firms might be willing to enter into long-term contracts, perhaps even at a slightly lower subsidy per barrel. The establishment of an off-budget corporation would, on the other hand, eliminate the inclusion of the large outlays of a synthetic fuel program in the annual unified budget. This would reduce Congressional budget control since the expenditures would be outside the budget process. For example, under the President's initial proposal, $88 billion in borrowing authority would be available to the President in increments of $22 billion every 18 months at his request. Once the $88 billion of borrowing authority was appropriated, the Congress would have little control over how much of that money was spent or when the outlays occurred.

Fiscal Impact on the Economy. The synthetic fuel program, in combination with the windfall profits tax, would have varying effects on the economy over the next decade. Between 1980 and 1985, revenues from the windfall profits tax would accumulate fairly rapidly, while the stream of investment spending on synthetic fuels would increase slowly and probably peak in about 10 to 15 years. Therefore, in the years 1980-1985, the synfuels program and the tax would likely have a somewhat contractionary impact on production, employment, and prices; in the years 1985-1990, that combination would become slightly expansionary, putting upward pressure on output, employment, and prices. But if a large percentage of the trust fund revenues are used for additional transportation investment and rebates to low-income households, the impact would be modified.

CHAPTER I. INTRODUCTION

The intense interest in reducing the U.S. dependence on imported oil has recently generated a number of proposals for federal action to stimulate a synthetic fuel (synfuel) industry. The President's import reduction program announced on July 16, 1979, relies heavily on the development of synthetic fuel production. The House of Representatives has already passed one bill (S. 932), and three others S. 1409, S. 1377, and H.R. 4514 are currently being considered by the Congress. In addition, the Senate Energy and Natural Resources Committee is developing a proposal for a synthetic fuel program that will be considered in September.

The bills and proposals vary significantly in a number of ways. The production goals range from a minimum of 0.5 million barrels of oil equivalent per day by 1985 to 5.0 million barrels per day with no specific deadline. Initial funding in fiscal year 1980 ranges from $50 million to $25 billion. Additional provisions for borrowing authority are as high as $88 billion over the life of the program. Each of the bills allows the administrator to choose among several financing mechanisms: loans, loan guarantees, and price guarantees. In most cases, the administrator of the program would be a federal corporation. Under some proposals, the corporation would be an off-budget entity, and federal outlays would result only when the government purchased corporate stock; under others, the net receipts and expenditures of the corporation would be included in the federal budget. In general, the government would assume the liability for corporation borrowing and for loan guarantees granted by the corporation.

This paper summarizes the major energy, budgetary, and economic policy issues raised by the various proposals currently before the Congress. The major energy policy issue is the appropriate level of synthetic fuel production. Budgetary issues include the actual effects on revenues and outlays, as well as the issues of trust fund financing, the appropriate financing mechanism, and whether the synfuel corporation should be an on- or off-budget entity. The economic issue is the short-run and long-run impact of synfuel production on inflation and unemployment. This paper is not a comprehensive evaluation since it does not consider many associated issues such as environmental concerns and regional economic impacts.

Chapter II defines synthetic fuels and discusses the costs and benefits of producing them, while Chapter III examines the question of the appro-

priate production goals. Budgetary and economic implications are analyzed in Chapters IV and V. Financing issues are the focus of Chapter VI. The specific effects on the budget of each bill are summarized in Appendix A, while Appendix B comments briefly on the advantages and disadvantages of a regulatory approach to stimulating synthetic fuel production.

CHAPTER II. BACKGROUND

Synthetic fuels are fuels manufactured from coal, shale oil, or renewable resources (such as wood, grain, or food wastes), and used as a source of energy. The emphasis is on the material from which the synfuel is made, not on the final product. For example, methanol is not now considered a synthetic fuel, since the raw materials for its production are either natural gas or naphtha (a petroleum fraction). 1/ Methanol made from coal, however, is considered a synthetic fuel.

Synfuels are expected to become an important energy source in the future. The inevitability of this is suggested by a comparison of reserves of fuel minerals in the United States with U.S. consumption of fuel minerals. While only 5 percent of the country's energy reserves are petroleum, 47 percent of its energy consumption is drawn from that fuel. Only 6 percent of its energy reserves are natural gas, but natural gas accounts for 27 percent of its energy consumption. Only 19 percent of its energy consumption is based on coal, although coal constitutes 77 percent of its energy reserves. U.S. oil shale reserves, while very large, are not used at all.

Synthetic fuels are potentially quite numerous in the United States. Some of the more common synfuels are:

- Solid solvent-refined coal;
- Coal-derived liquids resembling petroleum crudes;
- Coal-derived liquids resembling refined petroleum products, such as gasoline or distillate;
- Low-Btu gas (125-150 Btu per cubic foot);
- Intermediate-Btu gas (300-350 Btu per cubic foot);

1/ Little or none of the methanol now being produced is used as a source of energy, but this fact is not relevant to the definition of synthetic fuels. When and if methanol is produced from coal (as it commonly was 30 years ago), it will be a synthetic fuel even though the chemical industry will consume significant quanitities of it as a feed stock.

- Synthetic gas;
- Synthetic natural gas (1,000 Btu per cubic foot);
- Shale oil;
- Methyl alcohol (that is, methanol or wood alcohol); and
- Ethyl alcohol (that is, ethanol or grain alcohol).

The various synfuels technologies differ widely in their maturity, uncertainties regarding the technologies, and cost risk. Low- and intermediate-Btu gases have been produced from coal for several decades and thus mature technologies are available for a wide variety of coals; the processes involved are relatively simple, and the process costs are well known. Since synthesis gas, a slight variation of intermediate-Btu gas, can be used to make methanol (by one of several processes), and since methanol is now made commercially (using natural gas to produce the synthesis gas), methanol is also a nearly risk-free technology for relatively small plants (approximately 10,000 barrels of oil equivalent per day). If very large plants (50,000 barrels of oil equivalent per day) are to be built, the sheer size of the plant would make its construction costs, start-up costs, and operating costs considerably less certain. The gains offered by construction of the large plants are, of course, potentially lower cost per unit of product.

The Fischer-Tropsch process, which is used at the Sasol plant in South Africa, also produces fuels from synthesis gas and, therefore, this technology also offers relatively low technological and cost risk. Similarly high-Btu gas, or synthetic natural gas, (SNG), although not as thoroughly risk free as the technologies discussed above, probably embodies a relatively low degree of risk.

The next most risk-free technology is probably shale oil produced by surface retorting. There is virtually no doubt that this process will work, but there are questions about how much the product will cost and about how reliable the plants will be initially. Surface retorted shale oil is far less reliable than the processes discussed above. In situ or modified in situ shale oil processes, while offering the potential of a lower cost product than the surface retorting processes, are less proven technologies and, in the absence of public information about them, must be considered only a partially demonstrated technology.

Several so-called direct liquefaction processes for coal, while showing considerable promise for the long term, must at present be rated as promising but basically experimental. The rapidity with which process and

cost risks will be eliminated varies greatly by process. This least-certain class of coal liquid technologies includes: the H-Coal process by Hydrocarbon Research, Inc., solvent-refined coal II by Gulf Oil Co., and the Exxon Donor Solvent process. All of these processes are in the large-scale pilot plant stage of development (250-600 tons per day coal input) or the demonstration process stage (6,000 tons per day coal input). 2/

POTENTIAL BENEFITS OF SYNFUEL PRODUCTION

The two principal benefits of a major synthetic fuel production program would be those of any program that would reduce oil imports. First, it would protect against future shortages or interruptions in the supply of oil such as occurred in 1973-1974 and again in 1979. Such shortages hurt the economy and, in extreme cases, could even affect national security. Second, synthetic fuel production might reduce the rate of future OPEC price increases, thereby improving the U.S. balance-of-payments position and providing some relief from inflationary pressures. The rate of future OPEC price increase might be reduced since synthetic fuel production would be substituted for OPEC oil, thereby decreasing the world demand for oil and, in turn, causing downward pressure on oil prices.

POTENTIAL COSTS OF SYNFUEL PRODUCTION

Synthetic fuels are likely to be more costly than conventional fuels at least in the near term. Thus, higher consumer prices or government subsidies will be required. In the longer term, their costs would probably decline relative to those of conventional fuels. Precise estimates are impossible, since the long-term prices of both are unpredictable. The price of conventional oil is determined largely by a cartel and reflects political as well as economic factors. The prices of synfuels would depend on the economies of large-scale production, environmental and technological unknowns, and the effects of future inflation on the construction costs of large plants. Consequently, a synthetic fuel program in the near term should be viewed as insurance against future supply shortages and OPEC price increases, rather than as an economically efficient investment. In the long term, however, it can reasonably be expected to be economically efficient.

The environmental costs of synthetic fuels would be high. While certain synthetic fuels, such as solvent-refined coal, might be commercially

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2/ Only solvent-refined coal II is in the demonstration stage, and it is in the design step in the demonstration stage.

viable under present environmental standards, the massive development of synthetic fuels would entail large public costs from environmental degradation. The most certain and immediately obvious of these would arise from extensive mining and from the disposal of large quantities of coal ash and shale oil tailings. Far less certain, although potentially more serious, are the potential consequences of a gradual buildup of carbon dioxide in the atmosphere. This could eventually cause warming of the earth, leading to changed weather patterns and even melting of the polar ice caps. In the opinion of some scientists, the environmental risks are so large as to make a massive synfuels program unwise.

The creation of a major synfuels industry would also involve economic and social stresses, particularly in the areas where the actual plants are sited. These are inherent in any transition, but particularly when the product involved is so basic to the economy and the unknowns of the technology are so high.

CHAPTER III. THE GOALS OF A SYNTHETIC FUELS PROGRAM

An important consideration in determining appropriate production goals is the objective of the synfuels program. If the program objective is to develop an information base for evaluating alternative synfuel technologies, the production goal could be limited to the output of those plants necessary to demonstrate alternative processes. If the immediate objective is to produce liquid fuels, then production should be maximized, subject to the availability of resources and environmental constraints.

Most of the synthetic fuel bills that are under active consideration by the Congress have production goals between 500,000 and 5 million barrels of oil equivalent per day by 1985 or 1990. This range will first be limited by the leadtimes required to construct commercial-scale synfuel plants; construction on plants slated to produce in 1990 must begin by 1982 at the latest. Environmental constraints may also exist, as spent shale disposal and air and water problems develop along with the synfuels industry.

INFORMATION GOAL

A certain production threshold is necessary to develop the critical technical, environmental, and economic information needed to choose the most efficient technologies and resources that should be developed over the long run. Although this threshold is difficult to estimate, it probably falls between 200,000 and 400,000 barrels of oil equivalent per day. This represents four to eight large-scale plants using different alternative technologies and resources.

This program would provide information about a variety of processes, which would increase the economic efficiency of subsequent generations of synfuel plants and would offer an improved basis for subsequent choices of processes and technologies. On the other hand, initially restricting synfuel production to this "learning" phase would defer the time at which synfuels could significally reduce oil imports.

This deferral could amount to about five years. Presuming that the first set of "learning" synfuel plants begin construction in 1980, information on comparative construction techniques, environmental effects, and ultimate plant costs should be available by 1985, at which point second

generation plants could begin construction. By 1990, when the first learning plants yield data on operating techniques and costs, second generation plants will be approaching the operating stage and will be able to utilize those data. This two-stage development strategy would reduce risk for both the government and the private sector, lower ultimate product costs, and allow time to increase understanding about how to accommodate synthetic fuel production to the environment.

OIL IMPORT REDUCTION GOAL

Whether or not the production goal for synthetic fuels should be set above the information threshold of 200,000-400,000 barrels per day depends on how additional synfuel production compares with alternative programs in terms of oil import reductions per dollar and on the overall oil import level that the United States considers acceptable in terms of economic and national security risks.

Assuming that oil prices are decontrolled and that consumption continues to grow as in the past, U.S. imports would be approximately 12 million barrels per day by 1990. If the United States wants to lower this dependence by about 4 million barrels per day, a number of alternative programs would do so more effectively than synthetic fuel production in terms of oil import savings per dollar. These programs include aggressive residential and commercial insulation programs, industrial conservation, accelerated retirement of oil and gas boilers in both utilities and industry, production of unconventional gas and heavy oils, the generation of electric power with low-head hydroelectric facilities, expanded use of solar hot water and space heating and cooling, and greater automotive fuel efficiency.

Residential Energy Savings. Slightly over 1.4 million barrels of oil per day are used in home space heating uses. Conventional conservation activities such as increasing attic insulation are believed to be capable of energy savings of 300,000 to 400,000 barrels per day. Additional savings of 100,000 to 200,000 barrels per day may also be possible if homeowners replace their home furnaces and water heaters with more energy-efficient ones.

While all of these activities are cost-effective to the homeowner, they require that consumers perceive the costs and returns correctly and can meet necessary front-end expenditures. This is obviously not always the case. Yet, added federal incentives and assistance could induce completion of these activities at a final delivered cost less than that of synthetic fuels.

Industrial Energy Savings. The largest reduction in industrial oil uses can be made through coal substitution. Four million barrels of oil and gas equivalent are currently used in the industrial sector. Half of this occurs in steam boilers, a use for which coal is nearly as economic. In a previous analysis, CBO estimated that 500,000 barrels per day could be saved though coal substitution by offering incentives equal to $5 per barrel. 1/ Similar incentives for the replacement of nonboiler oil and gas with coal could bring about a reduction of an additional 300,000 barrels per day.

Because of the great diversity in manufacturing processes, industrial conservation, through reductions in heat loss, cogeneration and changes in process design, are difficult to measure. The Department of Energy (DOE) estimates these savings at over 600,000 barrels per day in 1985. Analogy to European nations suggests that these estimates understate the possibilities for cogenerated electricity, but conservative DOE estimates are used here.

It would be difficult to realize all of these savings. Trained personnel and first-hand experience are frequently scarce, and easy adjustments, such as residential insulation, are less common than activities such as process redesign and changes in plant layout. Yet, the economc incentives are usually stronger in this sector. Thus, even the most moderate incentives are likely to be productive, making industrial conservation of 300,000 to 400,000 barrels a day possible. When combined with coal conversion programs, the realistic potential for oil demand reductions in the industrial sector approaches 1.2 million barrels per day.

Energy Savings in Electrical Generation. Over half of the oil used to generate electricity is used in the Northeast and California. Putting aside the question of clean air standards, it is frequently economically preferable for the individual utility to burn oil rather than coal.

Some installations once burned coal but switched to oil or gas. These can be "reconverted" to coal. Complete reconversion of all possible candidates could result in savings of up to 500,000 barrels per day. Further savings are possible if the replacement of existing oil and gas facilities with coal ones is accelerated. The majority of both of these savings would require subsidies of about $5 per barrel, less than that required for synfuel production. With this incentive, utility savings could total 1 million barrels per day by 1990.

1/ CBO, Replacing Oil and Natural Gas with Coal: Prospects in the Manufacturing Industries, August 1978.

Unconventional Sources of Natural Gas. There are several sources of what is often called "unconventional" natural gas--"tight" gas or gas produced from formations with poor permeability, gas from Devonian shale, pyrolysis gas, occluded gas in coal, and gas from geopressurized brine. Of these, by far the most important is "tight" gas. Next in importance is gas from Devonian shale. Section 107 of the Natural Gas Policy Act (NGPA) provides special incentives for production of gas from Devonian shale, from coal seams, or from geopressurized brine. As a result of current prices for distillate fuel oils, the NGPA is likely to permit prices of about $5 per thousand cubic feet at the well-head for these categories of gas. The prices under decontrol would not be appreciably different for these categories. For tight gas, the Federal Energy Regulatory Commission is proposing an incentive price of 150 percent of the price of "production" and development wells. This price would be $3.12 per thousand cubic feet and would be adjusted for inflation. As a result of these prices, production for 1985 and 1990 is forecast as being 300,000 barrels per day higher than it would have been under current policy.

Solar Applications. Given modest incentives, the potential contribution made by solar energy could reach or exceed 500,000 barrels per day by 1990. Financial incentives similar to those being proposed for the synfuels industry could induce a significant proportion of new residences to incorporate solar heating and hot water into their design. By 1990, solar could displace 150,000 barrels of oil per day in these uses. Commercial establishments offer larger potential savings because of their size and the fact that their peak energy use occurs during daylight hours. By 1990, 200,000 barrels of oil per day could be saved through solar uses in this sector. Finally, industrial and utility uses of solar to produce heat and steam, such as using solar to heat feedwater in steam cycles, could grow in the next decade to the equivalent of 150,000 barrels per day.

Automotive Efficiency. In the Energy Policy and Conservation Act (EPCA), the Congress mandated that the average milage of new cars sold by any auto manufacturer rise to 27.5 miles per gallon by 1985. Per-car penalties were to be imposed on manufacturers whose fleets did not reach this standard.

Earlier predictions by the CBO indicated that the auto manufacturers would not find it economical to comply with the standards in the mid 1980s. Other analyses have reached different conclusions, and the auto manufacturers have recently argued that they will meet the 1985 standards. They have also argued, however, that the standards for 1982 and 1983 would be difficult to meet by those years. Whether their difficulties in 1982 is a transition problem or an indication that the later standards will prove difficult to achieve remains an unanswered question. Either way, substantial further savings are possible.

If the standards would not be met, this would mean that the costs of further technological improvements outweigh their fuel savings and reductions in penalties levied for noncompliance with the standards. In this instance, increased penalties would shift the economic balance in favor of making additional technological improvements. The CBO analysis suggests that a guadrupling of the existing penalties would induce compliance with the existing set of standards and would yield fuel savings between 400,000 and 500,000 barrels of petroleum per day by 1990.

Alternatively, the 1979 Iranian disruption and the ensuring shortage of gasoline may change consumers' perceptions of the future price and availability of fuels, and alter their car purchasing patterns as a result. Should consumers reverse their preferences for larger cars, then the 27.5 standard could be met, and higher standards could be more appropriate in promoting additional savings than higher penalties. If the 1985 standard can be achieved, then further increasing the standard to 30.0 mpg by 1990 could produce savings in the 400,000 to 500,000 barrel range in that year.

Whether or not the existing standards are met, it nonetheless appears possible to generate substantial additional fuel savings. To allow for all possibilities, some combination of steps, such as increased penalties for the existing standards and creation of more stringent, post-1985 standards, possibly with lesser penalties, could prove to be the most effective approach.

CHAPTER IV. BUDGETARY IMPLICATIONS

Funds for many of the synfuel programs currently being debated by the Congress are expected to come from the proposed windfall profits tax following the decontrol of domestic oil prices. This chapter provides estimates of the potential revenues from the windfall profits tax as well as the costs of the various synfuel programs. It also examines the advantages and disadvantages of having the synfuel corporation on or off budget.

TAX REVENUES

The decontrol of domestic oil prices will mean a huge increase in the revenues of domestic oil producers. A windfall profits tax would channel a portion of these revenues to the federal government. The potential increase in producer revenues over the next five years depends primarily on what happens to the price of imported oil, while the potential federal tax revenues depend not only on the price of imported oil but also on the tax rate enacted by the Congress. Since neither can be predicted with certainty, CBO has estimated producer and federal revenues on the basis of two alternative assumptions about future world oil prices (see Table 1).

One assumption is that the OPEC price will remain at $20.12 per barrel through 1979, increasing afterward at an annual rate 1.5 percent higher than the rate of inflation between 1980 and 1985. On this assumption, producer revenues over this period would be about $135 billion in current dollars. The windfall tax liability incurred over the 1980-1985 period would be about $72 billion under the President's original proposal and about $86 billion under the bill passed by the House. Over the 1980-1990 period, the President's proposal would generate $153 billion in tax revenues, while the House bill would generate $186 billion.

The second assumption is that by the end of 1979 the OPEC price will rise to $23.50 per barrel--the ceiling allowed under the June 26 OPEC agreement--and then increase at an annual rate of 3 percent higher than the rate of inflation. With this steeper trend in prices, about $210 billion in additional producer revenues would be generated over the 1980-1985 period. The windfall tax liabilities over the 1980-1985 period would be about $113 billion under the President's original proposal and about $141 billion under the House bill. Over the longer 1980-1990 period, the President's proposal

TABLE 1. ADDITIONAL PRODUCER REVENUES FROM OIL PRICE DECONTROL AND TAX REVENUES FROM ALTERNATIVE WINDFALL TAX PLANS UNDER TWO ASSUMPTIONS ABOUT OPEC OIL PRICES: IN BILLIONS OF CURRENT DOLLARS a/

	Producer Revenues		Tax Revenues Under President's Proposal		Tax Revenues Under House Bill	
Calendar Year	Lower Price	Higher Price	Lower Price	Higher Price	Lower Price	Higher Price
1980	7.6	11.0	4.6	7.0	5.6	8.7
1981	19.3	28.8	10.3	15.4	12.2	18.9
1982	25.2	37.9	13.4	20.4	16.0	25.1
1983	26.4	40.7	13.6	21.5	16.6	27.1
1984	27.6	43.9	14.5	23.4	17.2	29.2
1985	28.3	46.4	15.3	25.3	18.1	31.7
Total	135.4	209.7	71.8	113.1	85.7	140.7

NOTE: The "lower" price assumes a current world oil price of $20.12 per barrel and a 1.5 percent real price increase per year. The "higher" price assumes a current world oil price of $23.50 per barrel and a 3 percent real price increase per year.

a/ The tax revenue estimates do not include any tax revenues which would accure to the federal government from the normal corporate profits tax.

would generate $259 billion in current dollar tax revenues, while the House bill would generate $338 billion.

POTENTIAL FEDERAL COSTS

The costs to the federal government and budget outlays of a synthetic fuel program would depend on the magnitude of the program, the funding mechanism utilized, and the program's timing. Should the program rely on price guarantees, the federal costs would be determined by the production level and the difference between the world oil price and the equivalent synthetic fuel production cost. If the program was based on the construction of government-sponsored synthetic fuel plants, the costs would be the actual capital investment required and the operating and maintenance costs once the plants were operating, less the revenues from the sale of the final products. While in theory the total costs to the federal government of these two alternatives should be similar, they may differ because of differences in timing and risk sharing. The potential costs to the federal government of using a subsidized loan would be the difference between the rate at which the government must borrow money and what it receives on the loan. The costs of using a loan guarantee would be the most difficult to project since it depends primarily on the default rate.

Timing would also affect the costs. A program designed to attain the synthetic fuel production goal in the shortest possible time would entail higher costs in the short term than a program designed to test several technologies before entering into a major commitment. Both approaches might attain the same production goals, but over different lengths of time and perhaps utilizing different technologies. Plants built later would cost more because of increases in the cost of labor and materials, but the increases might be partially offset by improved technologies and scale economies. If price guarantees were used, the costs might be expected to decline over time as the difference between the world price of conventional oil and the costs of synthetic fuel decreased.

Table 2 summarizes the estimated total capital costs necessary to build the plants. Such costs could be paid by the private sector, the federal government, or through a combination of the two. The table also provides an estimate of the potential federal costs if all plants are financed through price guarantees, whereby the federal government cost is equal to the difference between the cost of synfuels and OPEC prices over time. The total costs to construct the plants range from $15 billion for a 200,000 barrel-per-day program to $582 billion for a 5 million barrel-per-day program. If the federal government were to utilize a price guarantee, a

TABLE 2. TOTAL CAPITAL COSTS AND POTENTIAL FEDERAL GOVERNMENT COSTS UNDER A PRICE GUARANTEE FOR ALTERNATIVE PRODUCTION GOALS

Production Level (in millions of barrels per day)	Number of Plants Required a/	Year Production Goal Is Met (fiscal year)	Total Capital Costs		Federal Costs Under Price Guarantee (in billions of current dollars) c/
			Billions of Current Dollars	Billions of Constant Dollars	
0.2	5	1988	15	10	14
0.5	11	1990	35	22	29
1.0	22	1992	74	44	50
1.5	33	1994	121	66	67
2.0	44	1995	168	88	78
2.5	55	1997	223	110	89
5.0	111	2004	582	222	106

a/ It is assumed that plants with a capacity of 50,000 barrels per day will be built and will operate at about 90 percent of capacity.

b/ Each plant is assumed to cost $2.0 billion in fiscal year 1979 dollars. The costs are adjusted for inflation in future years. The figures given are the cumulative costs of all plants required to meet the stated production goals. These figures do not include operating and maintenance costs or production revenues.

c/ The price guarantee costs are derived from the projected differences in world oil prices and synthetic fuel production costs. The differential is assumed to be $16-$18 per barrel between fiscal years 1987 (the first year significant production is expected) and 1990, decreasing to near zero sometime after fiscal year 2000. The figures in this column are the sum of the differential subsidy payments made each year until the subsidy is no longer required.

cost of $14 billion for a 200,000 barrels-per-day program and $106 billion for a 5 million barrel-per-day program would be possible.

These estimates are based on the following assumptions:

- A 50,000 barrel-per-day plant costs $2 billion to construct in 1979 dollars. The cost per plant increases in future years at a rate of approximately 6 percent per year.

- Each plant operates at about 90 percent of capacity.

- Each plant takes seven years to plan and construct, and operations begin in the eighth year. It is assumed that no more than two plants will be started in fiscal year 1980, increasing to six plants per year by fiscal year 1984 and to eight plants per year by fiscal year 1990. The number of plants is determined by the production goal.

- The difference between the world price of conventional oil and the production costs of a barrel of synthetic equivalent is between $16 and $18 per barrel when significant production begins (fiscal year 1987). The difference narrows to near zero sometime after the year 2000.

Whatever the production goal selected and the financing mechanism used, total capital expenditures and outlays over the five-year period from 1980 to 1984 would be low relative to total program costs except, perhaps, for a small-scale test program consisting of no more than five or six plants. This is because only several plants could begin construction each year, and it would take several years to design and site the plants. As a result, the range of possible outlays over the 1980 to 1984 period would be limited. The greatest outlays would be incurred after 1985, in the period from 1985 to 2000, as plant construction and synthetic fuel production increased. For example, under a price guarantee program, no outlays would occur between 1980 and 1984 because no synthetic fuel production would occur until 1987. As shown in Table 3, costs over fiscal years 1985 to 1989 would be the same for all production goals because the number of plants in operation would be the same. The variation would increase over the next several periods. Costs for the programs with the highest production goals are projected to peak during fiscal years 1995 to 1999. They would decline after 1999 because the price differential between oil and synthetic equivalents is projected to approach zero shortly after 2000.

TABLE 3. COMPARISON OF ESTIMATED PRICE GUARANTEE COSTS BY SYNTHETIC FUEL PRODUCTION GOALS FOR FIVE-YEAR PERIODS: IN BILLIONS OF CURRENT DOLLARS

	Production Goal (in millions of barrels per day)						
Fiscal Years	0.2	0.5	1.0	1.5	2.0	2.5	5.0
1980-1984	0	0	0	0	0	0	0
1985-1989	3	4	4	4	4	4	4
1990-1994	6	12	22	28	29	29	29
1995-1999	4	9	16	24	32	37	41
2000 and after	1	4	8	11	13	19	32

INDIRECT COSTS

A major synthetic fuel program can be expected to entail costs to the government in addition to those of the program itself. Regulatory requirements, especially those concerning the environment and transportation, would result in additional costs. For example, additional government employees might be needed to assess the environmental impact of synthetic fuel plants and to review plans for fuel transport systems. A potentially more significant cost might be that of federal assistance to communities experiencing rapid growth because of the synthetic fuel program. Existing federal programs including those of the Economic Development Administration and the Farmers Home Administration would be likely to feel the impact. Several proposals before the Congress would establish a more comprehensive energy impact assistance program. It is very dificult to estimate the magnitude of these indirect costs. They should, however, be at least partially offset by increased state and local tax revenues in those areas where synthetic fuel plants are sited.

ON OR OFF THE BUDGET?

The question of whether a federal synthetic fuel corporation should be placed on or off the budget depends primarily upon two considerations:

- The desire for Congressional control of the budget.
- The impact on the financial effectiveness of the corporation.

The establishment of an off-budget corporation would mean that expenditures on the synthetic fuel program would not be included in the annual unified budget. This would reduce Congressional control since the expenditures would be outside the budget process. The Congress would retain control to the extent that appropriations for the purchase of capital stocks would be necessary and that borrowing authority would be subject to appropriations. It would not, however, have much control over the timing of outlays, especially if a significant portion of the program funds was appropriated initially.

An off-budget corporation might be able to operate more effectively than an on-budget corporation, particularly in dealing with the private sector. Business managers may view an off-budget corporation as less susceptible to the uncertainties of the federal budget process, and therefore may be more willing to enter into long-term contracts at even a somewhat lower subsidy per barrel.

Central to the question of on or off budget is the issue of up-front financing. As indicated previously, outlays would probably not be high relative to total program costs in the near term. A large initial appropriation would therefore result in large unobligated balances in the near term. Under these circumstances, the Congress would have very limited control over outlays whether the corporation was on or off budget. But there seems to be no legal requirement that funds sufficient to cover price guarantees be appropriated before the contracts are made. Price guarantees in this case may be interpreted as contingent liabilities of the government that do not require advance appropriations. Moreover, since the corporations under most of the current proposals would rely on their borrowing authority to finance their projects, the government would not necessarily enter into such agreements directly.

Nevertheless, up-front financing might be advisable for several reasons. First, it would provide a strong statement of intent by the federal government--important as an incentive for the private sector. Second, while price guarantees may only be contingent liabilities in the legal sense, there is something to be said for establishing a contingency fund for a program entailing such a high level of federal spending. It is important that the Congress recognize and consider the total level of funding necessary before beginning a major program, even though the funding is not necessary initially. This holds not only for price guarantees but for other funding mechanisms as well.

An alternative might be for the Congress to make an initial authorization covering a significant portion of program costs, and to choose either yearly appropriations or a large initial appropriation, but with language

limiting the amount of annual obligations. This would allow the Congress to make a major commitment to a synthetic fuel program while retaining some control over the rate at which funds would be spent.

CHAPTER V. ECONOMIC IMPLICATIONS

EFFECT ON OTHER ENERGY COSTS

The primary goal of a large synthetic fuel program would be to reduce petroleum consumption, especially that of imports. The effect of such a program on other energy prices would depend on the costs of switching from one energy source to another, and on U.S. ability to expand production of alternative energy sources. Given the fact that synthetic fuels will not be more than a few percent of total energy consumption, however, it is doubtful that it would have more than a negligible impact on other energy prices.

If the program succeeded in its objective, crude oil imports would decrease, thereby reducing the world demand for oil. This means that the world price for crude oil would likely be lower than without the program. But synthetic fuels would probably cost more than conventional oil in the short run, offsetting the reduction in the world price of oil. Thus, the program on average might have little impact on the domestic price of petroleum. There would likewise be an increased demand for coal for use as an input in the production of synthetic liquid fuels. This increased demand for coal would most likely place some additional upward pressure on coal prices over time.

In summary, a synfuel program might be expected to reduce the world price of oil and raise the price of domestic coal. On the whole, however, it would not have a significant impact on the relative cost of different energy sources.

EFFECT ON THE ECONOMY

The synfuel program, in combination with the windfall profits tax, would have varying effects on the economy as a whole over the next decade. In the period 1980-1985, revenues from the windfall profits tax would accumulate fairly rapidly, while the stream of investment spending on synthetic fuels would increase slowly and probably peak in 10 to 15 years. Therefore, in the years 1980-1985, the two programs combined would likely have a somewhat contractionary impact on production, employment, and prices. In the years 1985-1990, it would become slightly expansionary--

putting upward pressure on output, jobs, and prices. But if the difference between synfuel expenditures and the trust fund revenues was used for additional transportation investment and rebates to low-income households, most of the impact would be modified.

Given the fact that revenues from the windfall profits tax will be significant over the next several years and that only small expenditures on synfuels are likely since it takes several years to design and site these plants, there will be some restraint on the growth of total demand in the economy. 1/ If the net drain of funds from the economy was not offset in some way--for example, by an increase in net exports--then a cut in taxes or an increase in other government expenditures might be needed in order to maintain a high level of employment and output.

In the longer run, the synthetic fuel production program could put upward pressure on prices in general. Programs with a goal of 2.5 million barrels a day by 1990 call for an investment of more than $120 billion over 10 years. Capital investment of this size by the late 1980s could create bottlenecks in certain sectors of the economy, resulting in shortages of materials and skilled labor.

Given the fact that U.S. investment in total plant and equipment is in excess of $200 billion per year, the impact of the additional synthetic fuel investment on the capital market would be minimal. Nevertheless, financing needs of the synfuel program would likely attract capital away from other plant and equipment spending that would have added to the economy's productive potential. Thus, other things being equal, the growth in productivity and gross national product would probably be slightly lower with the synfuels program than without it, and the inflationary pressures higher. Slowdowns in productivity growth in recent decades have been associated with higher inflation. 2/

The overall inflationary tendency could be countered by policies to enhance supply. For example, investment tax credits and funding for research and development could encourage spending on plant and equipment.

1/ This ignores the features in the President's program, such as transfer payments, grants-in-aid to state and local governments, tax credits, and tax liability offsets, that would reduce the contractionary effect.

2/ For an analysis of this relationship see Congressional Budget Office, Inflation and Growth: The Economic Policy Dilemma, July 1978, Chapter 5.

helping to forestall potential bottlenecks. The size of the effects mentioned above would probably not be very large because the cost of the 1980-1990 synfuel programs under consideration would be a very small percentage of the total federal budget in those years. The private capital needs for the programs would also be a very small proportion of total investment in the national economy.

The effect of the synfuels programs on inflation and employment would be different in the 1980-1985 and the 1986-1990 periods. By the end of the first half of the next decade, all other things being the same, the unemployment rate might rise by as much as 0.1 of a percentage point, and the price level might be at most 0.1 to 0.2 of a percent high. 3/ During the last half of the decade, as the expenditures on the synfuels plants increased, employment in that sector would be boosted and upward pressures would be exerted on some raw material prices. Since this program is designed to reallocate resources from the private sector to the synfuels program, in the long run its impact on the overall economy would likely be small.

It is not realistic, however, to consider the synfuels program in isolation. For example, the President's program also includes incentives for energy conservation and the reduction of oil imports. Conservation measures could result in added personal savings that in turn could reduce some of the inflationary pressures in the late 1980s. Reductions in oil imports, and the resulting improvement in the trade balance, could initially offset the contractionary effects mentioned above. Eventually, improvements in the trade balance could strengthen the dollar and counteract some of the inflationary pressures developing toward the end of the next decade.

3/ Estimates of the impact of these programs on the economy over the next 5 to 10 years are highly uncertain. Those presented here are merely illustrative of the types of changes that could be expected.

CHAPTER VI. FINANCING ISSUES

A number of financial mechanisms to stimulate a synthetic fuels industry are available to the federal government, including loans, loan guarantees, price guarantees, and actual government construction of the plants. The advantages and disadvantages of each of these mechanisms is discussed in this chapter, along with the implications of having the funding made available through a trust fund with revenues from the windfall profits tax.

BACKGROUND

The private sector has not as yet been willing to invest the approximately $2 billion necessary to build a synfuel plant large enough to take advantage of the economies of scale common to such processes. This is because of the high risks involved. First, while there is little doubt that synthetic fuels can be produced, specific processes have not yet been demonstrated on a scale sufficient to offer businessmen the customary level of certainty as to costs and technology. Second, the problems of cost and technology are complicated by uncertainties over federal regulations. For example, synfuel plants commonly require 20,000-25,000 tons of coal per day for feedstock; a change in surface mining regulations, in severance taxes, or in Interstate Commerce Commission transportation rates could create havoc with the financial viability of a synthetic fuel project. Finally, it is possible that world oil prices will not increase in the future as rapidly as they have in the recent past; they may even fall in real terms, thus increasing the relative cost of synfuels.

In developing a synfuels program, a logical approach would be for the federal government to choose a financing mechanism that would allow the government to absorb the risk that future world oil prices will not be as high as currently anticipated. Since the country as a whole benefits from lower oil prices (or, in general, from increases in supply), the government could absorb that risk. The technological and cost risks, on the other hand, could be absorbed by the private sector, which traditionally accepts such risks in making investment decisions. The separation of the two classes of risks would provide the private sector with sufficient incentive to construct and operate synthetic fuel plants efficiently. In addition, in choosing a financing mechanism, the Congress should consider whether its impact on the budget

would be predictable and whether it would be considered in the normal budget process.

ALTERNATIVE FINANCING MECHANISMS

The financing mechanisms available to the federal government include loans, loan guarantees, price guarantees, or actual government construction of the plants.

Given the size of the investment required, as well as the overall risk, it is to be doubted that federal government loans, even at slightly subsidized rates, would encourage the private sector to construct the plants. If the federal government itself were to build these plants, it would then absorb all the risks--that is, the technological and the cost risks as well as the price risk associated with future changes in world oil prices. Since no private-sector money would be involved, overall efficiency would probably be lower.

Similarly, loan guarantees would shift much of the cost and technological risk of building plants from the private sector to the government, thus reducing the incentives for efficiency. From a budgetary standpoint, moreover, loan guarantees for large-scale projects are undesirable since they could obligate the federal government to a potential future outlay (because of default) that is considerably above the initial appropriation. Furthermore, the unpredictable nature of loan guarantees for large projects makes it difficult to consider them in the normal budget process. Loan guarantees are more appropriately used for programs such as housing, in which the risk is spread over a large number of small projects and the default rates can be predicted with a reasonable degree of accuracy.

Price guarantees, whereby the federal government would contract to buy a given amount of synthetic fuel at a given price, would have a distinct advantage over other funding mechanisms in that the private sector would absorb the technological and cost risks and, therefore, have a strong incentive to build cost-effective plants. The federal government, on the other hand, would absorb the risk that world oil prices might fall in real terms or not increase as fast as expected. From a budgetary standpoint, price guarantees would also have the advantage of being included in the normal budget process. The outlays involved would also be more predictable over time.

TRUST FUND FINANCING

In April, the President called for the creation of an Energy Security Trust Fund to receive the revenues from a windfall profits tax. A large

percentage of these revenues would be used to finance synthetic fuel production, and the remainder would go for rebates to low-income consumers and for transportation subsidies. The revenues of the windfall profits tax would thus be used to ease the hardships that higher oil prices would impose on low-income consumers and to diminish U.S. dependence on foreign oil through new domestic energy production and conservation.

The primary advantage of a trust fund as a financing mechanism is that it offers a built-in, self-adjusting device for channeling the revenues of a special tax into programs that are closely related to that tax. If the revenue source is steady, it also provides funding security for programs that require a lead time for state and local planning. Other funding mechanisms, such as advance appropriations, provide similar security without some of the disadvantages of trust funds.

A trust fund may be less desirable if uncertainty about revenues inhibits careful planning and leads to inefficiency. This is a potential problem for the Energy Security Trust Fund, the revenues for which would be sensitive to future world oil prices. This was demonstrated by the recent OPEC price increase, which almost doubled the estimates of future trust fund revenues that prevailed only a few months ago. The earmarking of such an uncertain source of revenue for long-term investments in energy could hinder Congressional decisionmaking in the future.

The Energy Security Trust Fund proposed by the President would be subject to the normal authorizing and appropriating processes. In principle, this would permit the Congress to adjust expenditures from the fund to fit the requirements of fiscal policy, other government programs, changing needs, and evolving legislative priorities. But by earmarking the revenues that enter the trust fund for specified program purposes, the Congress would reduce its flexibility to redirect revenues toward changing priorities. Future decisions about yearly expenditures might have to be based on the amount of revenues available in the trust fund.

Another disadvantage of the trust fund device is that placing expenditures for energy programs in a new trust fund would pose the problem of coordinating them with many other energy programs that are now funded through direct appropriations. Coordinating programs with several different financing mechanisms is not only difficult but causes program inefficiency.

APPENDIX A. COST ESTIMATES OF PROPOSED LEGISLATION

Review of Proposed Legislation

Four major synthetic fuel bills are currently before the Congress as well as the President's program which was announced in July. In addition, the Senate Energy and Natural Resources Committee staff is developing a synthetic fuel program proposal. Table A-1 summarizes the major components of the six major proposals. The proposals vary significantly in several ways, including the level of synthetic fuel production to be achieved, the level of funding, and the funding method. Each of the bills also permits the administering agent to choose from several financing mechanisms.

H.R. 4514. This bill was introduced by Representative Perkins and reported by the House Committee on Education and Labor. It establishes the Synthetic Fuels Reserve Corporation (SFRC) and directs the corporation to provide for the production of synthetic fuel equivalent to 5 million barrels of crude oil per day. The SFRC is authorized to own and operate production facilities, conduct research and development activities, enter into joint ventures with private companies, make grants and loans, guarantee loans, and use purchase or price guarantees in order to attain its goals. The government would be obligated to pay the corporation the difference between the costs of producing synthetic fuels and the prevailing market price for equivalent nonsynthetic fuels, if the costs of production are higher. Subject to Congressional appropriations, the corporation would be authorized to borrow up to $200 billion (less the amount of any loans and loan guarantees outstanding). The bill authorizes the appropriation of $5 billion per year for the purposes of the act, beginning in fiscal year 1980. The bill also provides a number of tax incentives for private investment. 1/

S. 932. The Defense Production Act Amendment and Extension, was passed by the House of Representatives on June 26, 1979. It directs the President to achieve synthetic fuel and synthetic chemical feedstock production equivalent to 500,000 barrels per day of crude oil by October 1,

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1/ H.R. 4514 has three other titles that do not address synthetic fuels. Cost estimates for these titles may be found in the CBO estimate for H.R. 4514 dated July 12, 1979 as transmitted to the House Committee on Education and Labor.

TABLE A-1. COMPARISON OF PROPOSED SYNTHETIC FUEL LEGISLATION

Bill	Synthetic Production Goals	Corporation Status	Authorization Levels	Funding Mechanisms
H.R. 4311	3 mmbd, no date set	Synthetic Fuel Reserve Corporation to establish. 7 member board. No date given on Corporation.	$3 billion/year $200 b. obligations limitation. The bill also provides for 3 terms of the Corporation.	The bill grants flexibility to the Corporation. The Corporation may use any combination of grants, loans, loan guarantees, purchase and price guarantees. Corporation can not issue bonds. Report language supports reliance on private capital markets.
S. 932 (as passed by the House)	0.5 mbd by 1987 2.0 mbd by 1990	President may establish Corporation subject to one house veto.	$3 billion authorized. Increases the loan guarantee ceiling by $18 billion (to $38 billion per guarantee) and the loan ceiling by $23 billion (to $44 billion per loan) available to the President for the assistance of production projects and loans of materials necessary for the national defense. These loans and guarantees are to be administered by the DOD, DOC, DOE, TVA and other agencies as designated by the President. Financing in excess of these ceilings is subject to a one house veto. Not all of the loan and guarantee funds are necessarily to be utilized for synthetic fuel production.	The President is given authority to enter into purchase agreements for synfuels utilizing authorization of $3 billion. No commitments after 1993. DOE, DOC, DOD, and TVA are to utilize loans and loan guarantees to promote production capability for smaller plants. The President may establish a corporation to promote production if the private sector will not be able to meet the production goals.
S. 1469	0.5 mbd by 1987	President may establish Corporation subject to one house veto.	$2 billion appropriated. Loan guarantee and loan ceiling increases are the same as for S. 932.	Except for the lower authorization level for purchase guarantees, the financing mechanisms allowed are identical to those of S. 932.
S. 1377	Production goals to be set by the Authority subject to veto by the Congress. Except that the following minimum goals are to be met: Oil shale 0.3 mbd by 1990 Coal gas 0.3 mbd by 1990 Coal liquids 0.3 mbd by 1990	Synfuels and Alternative Fuels Authority to established. 5-member board. Termination at the end of FY 1989, although President may extend life.	$20 billion appropriated to U.S. Treasury for purchase of Authority stock. Borrowing authority of up to $30 billion. Debt coverage and issues of the Authority are to be included in the U.S. budget.	The Authority has flexibility regarding financial mechanisms. However, loans and loan guarantees are to be given preference over purchase guarantees and actual projects. The Authority is to charge fees for guarantees and other commitments. No financial commitments are to be made after FY 1994 and no assistance is to be administered after FY 1999.
President's Proposal	2.0 mbd by 1990. Coal liquid and gases 1.0-1.5mbd Oil shale 0.4mbd Biomass 0.1mbd unconventional gas 0.3-1.0mbd	Energy Security Corporation to established for 12 years. 7-member board.	Total borrowing authority of $88 billion. Total revenues to be $22 billion, with additional revenues every 12 months. Authorization of $100 million for administrative expenses. $3 billion is to be funded from Energy funds. The remaining $83 billion is to be funded on the proposed Energy Security Trust Fund. Payment for Corporation notes ($100 million) will be on budget. Payments by the Energy Security Trust Fund will be on budget. Actual outlays and receipts of the Corporation will not be on budget. The President's proposal also includes several tax credits.	The Corporation has flexibility regarding financial mechanisms. Purchase agreements, loan guarantees, loans and actual plant construction can be utilized. The preliminary design proposals of DOE/OMB assumed reliance on purchase guarantees, although this is not binding on the Corporation. No more than 3 plants are expected to be constructed by the Corporation, however. Consequently, loans or loan guarantees appear the most likely alternative to purchase guarantees. Administrative expenses limited to $30 million per year subject to adjustment. The Corporation may contract loans for guarantees.
Senate Energy and Natural Resources Committee Draft Bill	1.0 mbd by 1993	The Synthetic Fuels Corporation is established.	Total borrowing authority of $88 billion. Only $20 billion, however, would be made available for the first stage of the program. The remaining funds would be made available subject to Congressional approval of the Corporation's plans for the second stage of the program. Authorization of $100 million for the purchase of corporation stock. An additional annual authorization of $30 million with appropriations for inflation in later years is also provided to cover the corporation's administrative costs.	The Corporation is granted flexibility in selecting financing mechanisms. Preference is stated for the use of price guarantees and purchase agreements followed by loans and loan guarantees. Government-ownership plants are to be owned upon only if necessary.

1984, and the equivalent of 2 million barrels per day by October 1, 1989. The President is authorized to enter into purchase agreements for synthetics (with an option to pay a price differential) and to construct or purchase facilities. Subject to Congressional veto, he may also organize wholly-owned government corporations to produce or acquire synthetic fuels. Various government agencies (including the Department of Energy) are authorized to make or guarantee loans to expedite production. The bill authorizes the appropriation of up to $3 billion for purchase agreements. In addition, the existing Defense Production Act includes an authorization for such sums as may be necessary, which would also cover the new synthetic fuels provisions.

S. 1409. This bill as introduced by Senators Riegle and Javits would also amend the Defense Production Act to provide for the production of synthetic fuels. The bill is very similar to S. 932 although it directs the production of only 500,000 barrels per day by October 1, 1984, and authorizes the appropriation of $2 billion for purchase agreements.

S. 1377. This bill as introduced by Senator Domenici, establishes the Syn-fuels and Alternate Fuels Production Authority and directs the authority to establish goals for the commercial production of synthetic fuels, subject to Congressional approval. The bill mandates minimum 1990 production targets for oil shale (the equivalent of 500,000 barrels per day of crude oil), coal gas (500,000 barrels per day), and coal liquids (500,000 barrels per day). The authority is empowered to provide financial assistance to business concerns, including loans, loan guarantees, price guarantees, purchase and leaseback of facilities, and equity purchases, in order to meet production goals. Under certain conditions, the authority may construct or acquire and operate its own synthetic fuel facilities. The bill requires that, to the extent practicable, financial assistance be in the form of loans and loan guarantees.

S. 1377 authorizes the appropriation of $25 billion to the U. S. Treasury to purchase capital stock of the authority. The authority is to pay dividends on its outstanding capital stock; these may be deferred under certain circumstances. These Treasury transactions are to be off-budget; only the net earnings or losses of the authority are to be included in the federal budget. The authority is also authorized to borrow up to $50 billion. No new commitments for financial assistance are to be made beyond fiscal year 1986, and no assistance is to be granted after fiscal year 1989. (Unless the President determines otherwise. The authority is to liquidate its holdings on or before September 30, 1989.)

President's Proposal. The key component of the President's oil import reduction proposal is the establishment of the Energy Security Corporation (ESC) to expedite the production of synthetic fuels. The corporation's goal would be to guarantee the production of 2.5 million barrels per day of synthetic fuels by 1990. Coal liquids and gases would account for 1.0-1.5

million barrels per day, oil shale for 0.4 million, biomass for 0.1 million, and unconventional gas for 0.5-1.0million. These goals would be met by providing loans, loan guarantees, and purchase or price guarantees to the private sector. The construction of production facilities could also be undertaken by the corporation. The Administration's preliminary proposal would result in a request for borrowing authority of $88 billion to finance the corporation's activities. The proposal calls for a request of $22 billion every 18 months. It is intended that the corporation's borrowing authority be funded out of the proposed Energy Security Trust Fund (based on revenues from the windfall profits tax currently before the Congress). The sale of energy security bonds is also proposed, to provide $5 billion to the corporation. The proposal also include the authorization of $100 million to the U. S. Treasury for the purchase of the corporation's capital stock, these funds would be used to cover the administrative costs of the corporation. The corporation would be on off-budget entity; its outlays and receipts would not be scored in the federal budget. The purchase of capital stock and payments from the Energy Security Trust Fund, however, would be on budget. The corporation would be chartered for 12 years.

The Senate Energy and Natural Resources Committee bill is not in final form at this writing. The bill presently calls for a two stage program. The first stage is designed to demonstrate several different technologies. The emphasis is on one-of-a kind projects. The second stage would aim at a production goal of 1.5 million barrels per day by 1995, based on the experience of the first stage. Preference is given to purchase guarantees or price agreements as the financing mechanism followed by loan guarantees, and loans. Government sponsored-contractor operated plants are to be used only if necessary.

The Synthetic Fuels Corporation is established to administer the program. The bill provides for borrowing authority of $88 billion. The corporation, however, is limited to $20 billion for the first, stage. Additional funding is subject to Congressional approval of the corporation's plans for the second stage. The bill also authorizes the appropriations of $100 million for the purchase of corporation stock and $35 million annually to cover the corporation's administrative expenses. The latter is to be adjusted for inflation in later years.

Estimated Cost of Proposed Legislation

Because of the wide discretion available to the administering agent under these bills, there is no certainty as to what mix of financing mechanisms will be used. Consequently, the following estimates include a range of possible costs. For each bill, the costs are estimated under the assumption that price guarantees are the financing mechanism utilized. A second estimate is shown for each alternative, to reflect the highest likely

cost to the government over the next 15 to 20 years (that is, substantial plant construction by the administering agent). All estimates are preliminary and, because of the variability of many key factors, are subject to great uncertainty.

While the bills differ in their production goals, entailing different costs, the largest differences in costs are not apparent until after fiscal year 1984. The costs diverge over the following 10 to 15 years, fiscal years 1985 through 1999. Given the state of production technologies and the significant amounts of materials, labor, and fuels required, it is projected that no matter which funding mechanism is utilized, no significant production will occur until fiscal year 1987. In the year 1980, planning might begin for at most two plants. Actual plant starts would reach no more than six per year by 1984 and a maximum of eight plants per year by 1990. The estimates assume that it will take seven years to complete each 50,000 barrel-per-day synthetic fuel plant. Production could reach 630,000 barrels per day by fiscal year 1990, 2.0 million barrels per day by fiscal year 1995, and 3.7 million barrels per day by fiscal year 2000 under these assumptions. This would mean 82 synthetic fuel plants by fiscal year 2000 operating at 90 percent of capacity.

Estimated Costs of Price Guarantee Program. Table A-2 summarizes the projected government outlays for each bill or proposal, assuming that price guarantees are the primary mechanism used.

TABLE A-2. OUTLAY ESTIMATES FOR PRICE GUARANTEE PROGRAMS: IN BILLIONS OF CURRENT DOLLARS

Fiscal Year	H.R.4514	S.932	S.1409	S.1377	President's Proposal	Senate Energy Committee Proposal
1980-1984	0.6	0.1	0.1	0.1	0.1	0.1
1985-1989	4.5	0.9	0.9	4.5	4.5	3.4
1990-1999	69.9	2.1	1.1	51.6 a/	64.0	36.4
Total	75.0	3.1	2.1	56.2	68.6	39.8

a/ Unless extended by the President, the authority is to terminate on September 30, 1989, with its assets sold or transferred to the public or to a government agency. This figure is based on the assumption that the program is continued under government auspices.

Significant outlays for price guarantees are not expected to occur before fiscal year 1987, because no significant private-sector production of synthetic fuels under these bills is projected until that time. The funding authorized by H.R. 4514 and by the President's proposal is sufficient to provide price guarantees for all plants projected to be producing by 1990. These would cost about $580 million in fiscal year 1987, increasing to $2.5 billion in 1989, and to $3.6 billion in 1990. This assumes 14 plants operating by 1990, producing the equivalent of about 630 million barrels per day of crude oil.

For H.R. 4514, price guarantee costs are estimated to increase to $8.4 billion in fiscal year 1999 assuming the completion of 72 plants. Funds available for the President's proposal would allow long-term price guarantees for only 50 plants, which would fall about 10 percent short of meeting the President's production goal of 2.5 million barrels per day. The estimated cost in fiscal year 1999 for these guarantees is $5.7 billion.

S. 932 authorizes a maximum of $3 billion for purchase agreements. Assuming that long-term agreements would be necessary, this authorization level is estimated as sufficient to guarantee payments for one 50,000 barrel-per-day plant for a 20-year period, beginning in 1987. Outlays would average about $275 million per year between 1987 and 1990, and $175 million per year over the following 10 years. The loan and loan guarantee authority provided in the present Defense Production Act would have to be used for the purpose of stimulating sufficient private sector investment to attain the bill's production goals, or else additional appropriations would be necessary.

S. 1409 authorizes a maximum of $2 billion for purchase agreements. Assuming that long-term agreements would be necessary, this authorization level is sufficient to meet guarantee payments for one 50,000 barrel-per-day plant for a 9-10 year period beginning in 1987. As with S. 932, additional appropriations or the use of loan and loan guarantee authority would be required to meet the production goal set by the bill.

S. 1377 authorizes capital stock of $25 billion for the Syn-fuels and Alternative Fuels Authority. The estimate assumes that this entire amount is used to provide price guarantees, which would cover long-term agreements for 10 plants or about 500,000 barrels per day of oil equivalent. This would result in outlays of about $580 million in fiscal year 1987, increasing to $2.6 billion by 1990 and to $1.1 billion by 1999. Additional funds would be necessary to meet the bill's production goal.

The Senate Energy and Natural Resources Committee bill authorizes borrowing authority of up to $20 billion, for the first stage of the program. A total of $88 billion in borrowing authority will be made available subject

to Congressional approval of the plans for the second stage. The above estimate is based on the provision of price guarantees to 5 plants through 1991, increasing to 33 plants by fiscal year 1996. This would result in outlays of $500 million in fiscal year 1987, increasing to $1.3 billion by 1990 and to $3.7 billion by 1999.

Assumptions Used in Cost Estimates

The projected price differential used in these estimates is $16 to $18 per barrel between 1987 and 1990. This estimate is based on the expected difference between the world oil price and the cost of an equivalent barrel of synthetic fuel. There is great uncertainty regarding this price difference, because it is subject to world oil price changes and to the highly uncertain costs of synthetic fuel production. While the costs of synthetic fuels appear to be well above the equivalent oil prices at the present time, technological developments and further OPEC price increases may narrow or even eliminate that gap. The projected price differential for this estimate is developed from currently observed differences across the various synthetic fuels processing technologies. This differential is projected to decline in later years, arriving at zero sometime after the year 2000. Guarantee payments for the most ambitious program, H.R. 4514, are estimated to peak at over $8 billion per year in the late 1990s, at a production rate of about 3 million barrels per day, with declining outlays thereafter.

The outlay estimates also include a sum for administrative costs, initially at $10 million per year for a staff of about 200, with increases in later years. Since H.R. 4514 also provides for research and development activities, outlays for that bill include an estimated $30 million in fiscal year 1980, increasing to $150 million per year in fiscal year 1984 and thereafter, for such activities.

Comparison With Administration Estimates

For comparison, the Administration's preliminary outlay estimates for price guarantees under the President's plan are shown in Table A-3. (These figures do not include funds for administration and plant construction.)

The Administration estimate is based on the production levels indicated, and a price differential of $12 per barrel for coal synthetics in fiscal year 1987, dropping to $9 per barrel by fiscal year 1990. The price differential for shale oil starts at $7 per barrel and drops to $3 per barrel by fiscal year 1990. The price differential for unconventional gas is $5 per barrel in fiscal year 1981, decreasing to $1 per barrel by 1990. Coal

TABLE A-3. COMPARISON OF ADMINISTRATION AND CBO SYNTHETIC FUEL PRODUCTION AND OUTLAY ESTIMATES

	Production Level (Barrels/Day)		Outlays (millions of current dollars)	
Fiscal Year	Administration	CBO	Administration	CBO
1980	---	---	---	---
1981	5,000	---	10	---
1982	15,000	---	30	---
1983	35,000	---	50	---
1984	65,000	---	160	---
1985	124,000	---	350	---
1986	775,000	---	4,430	---
1987	944,000	90,000	5,500	580
1988	1,163,000	225,000	6,450	1,400
1989	1,381,000	405,000	7,180	2,500
1990	1,500,000	630,000	7,430	3,600

synthetics account for approximately 70 percent of total production. The CBO production assumptions differ from the Administration in that no significant production from coal synthetics and oil shale is expected until the late 1980s. The Administration's figures are based on oil shale production by 1985 and coal synthetic production by 1986. In addition, unconventional gas production is assumed as early as 1981 by the Administration. The CBO estimates do not include unconventional gas production.

Estimated Costs of Government Sponsored Plant Construction. Table A-4 summarizes the estimated outlays for each of the bills or proposals should the construction of production facilities be undertaken to meet the synthetic fuel production goals. All outlays include operating and maintenance costs and are net of revenues resulting from the sale of synthetic fuel produced. Revenues are based on the production level and the projected world oil price. The average oil price in fiscal year 1987 (the first year of production in all cases) is projected to be $48 per barrel, rising to $62 per barrel by fiscal year 1990, and to $146 per barrel by fiscal year 1999.

In all cases, the cost per 50,000 barrel-per-day plant is assumed to be $2 billion at 1979 cost levels. Capital costs are inflated at approximately 6 percent per year. Each plant is assumed to take seven years to complete.

TABLE A-4. OUTLAY ESTIMATES FOR GOVERNMENT SYNTHETIC FUEL PLANT CONSTRUCTION PROGRAMS: IN BILLIONS OF CURRENT DOLLARS a/

Fiscal Year	H.R.4514	S.932	S.1409	S.1377	President's Proposal	Senate Energy Committee Proposal
1980 c/	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.4	0.3	0.3	0.3	0.3	0.3
1982	1.0	0.9	0.9	0.9	0.9	0.9
1983	2.3	2.2	2.2	2.2	2.2	1.6
1984	4.7	4.6	4.1	4.6	4.6	2.7
1985-1989	78.5	77.9	27.4	58.7 b/	62.5	30.3
1990 - 1999	221.1	-42.8	-35.2	-60.2	-62.3	-14.1
Total	308.0	95.1	-0.3	6.5	8.2	21.7

a/ The outlays are net of revenues resulting from the sale of the synthetic fuels produced. The price of a barrel of crude oil equivalent is projected to be $48 in fiscal year 1987, the first year of production in all cases, rising to $62 in fiscal year 1990, and to $146 per barrel by fiscal year 1999. This is based on an annual general inflation rate of 7 percent and an increase of approximately 9 percent per year for the price of oil imports.

b/ Unless extended by the President, the Authority is to terminate on September 30, 1989, with its assets sold or transferred to the public or to a government agency. These figures are based on the assumption that the program is continued under government auspices.

c/ Costs for fiscal year 1980 are estimated not to exceed $44 million for H.R. 4514 and $13 million for the other bills and proposals.

Estimated operating and maintenance costs (including fuel) are based on recent industry and academic studies. These costs are inflated at 7.5 percent per year.

The variation in outlays among the various programs results primarily from the different number of plants constructed in each case. For H.R. 4514, it is assumed that 58 50,000 barrel-per-day plants will be under construction or completed by fiscal year 1990. This will result in total production of about 2.6 million barrels per day by fiscal year 1997. An additional 53 plants at an estimated capital cost of approximately $340

billion would be necessary to reach the goal of 5 million barrels per day established by the bill. Fourteen plants will be in operation by fiscal year 1990 increasing to 74 plants by fiscal year 1999, and 111 plants by fiscal year 2004. This assumes that two plants are started in fiscal year 1980, three plants in 1981, four plants in 1982, five plants in 1983, six plants in each of the fiscal years 1984 through 1989, and eight plants in each of the years 1990 through 1996. An additional five plants would be started in 1997 in order to meet the bill's production goal. Given the assumed seven-year construction period, production in fiscal year 1987 would be 90,000 barrels per day, increasing to 630,000 barrels per day by fiscal year 1990, and 3.3 million barrels per day by fiscal year 1997. The production goal of 5.0 million barrels per day would be met in fiscal year 2004.

For S. 932 it is assumed that 44 plants will be required to reach the production goal of 2 million barrels per day. All 44 plants are assumed to be under construction or completed by fiscal year 1988. The same construction schedule assumed for H.R. 4514 through fiscal year 1989 is applied here. Two plants would be in operation by fiscal year 1987, increasing to 14 plants by 1990. The bill's production goal would be met in fiscal year 1995. This assumes funds are made available through the open-ended authorization provision of the Defense Production Act. The total capital investment is estimated to be $168 billion.

Eleven plants would be required to meet the 0.5 million barrel per day production goal of S. 1409. All 11 plants would be under construction by fiscal year 1983, and all would be completed by 1990. As for S. 932, it would be necessary to make funds available through the open-ended authorization provision of the Defense Production Act. The total capital investment is estimated to be $35 billion.

Based on the availability of borrowing or appropriations totaling $75 billion to the Syn-fuels and Alternative Fuels Authority under S. 1377, it is assumed that 22 plants would be constructed. The same construction schedule assumed for H.R. 4514 and S. 932 is assumed through fiscal year 1984, with two plants started in fiscal year 1985. Synthetic fuel production would be 90,000 barrels per day by fiscal year 1987 (two plants operating), increasing to 630,000 by 1990 (14 plants operating) and to a maximum of 990,000 barrels per day by 1992 (22 plants operating). A total of 33 plants would be necessary to meet the production goal of 1.5 million barrels per day. Consequently, 11 additional plants would have to be constructed at a cost of approximately $50 billion.

Twenty-four plants are assumed to be constructed by the President's proposed Energy Security Corporation based on the funding level of $88 billion. The same construction schedule is assumed here as for the

H.R. 4514 through fiscal year 1984, with only 4 plants started in fiscal year 1985 to reach the total of 24 plants. Synthetic fuel production would be 90,000 barrels per day in fiscal year 1987, increasing to 630,000 barrels per day by 1990, and to a maximum production level of approximately 1 million barrels per day in fiscal year 1992. This will be significantly below the President's goal of 2.5 million barrels by 1990. (Although production resulting from proposed tax incentives is not included here, the Administration's preliminary production estimate resulting from incentives is approximately 0.5 million barrels per day.) In order to meet this goal, another 33 plants would be required at an estimated cost of $137 billion.

A total of 22 plants is assumed to be constructed under the Senate Energy and Natural Resources Committee bill based on the authorization of $88 billion in borrowing authority. It is assumed, however, that eleven more plants, would be required to meet the production goal of 1.5 million barrels per day at an additional capital investment of approximately $51 billion. Although the number of plants is not specified by the bill, it is assumed that five plants are started by fiscal year 1981 to fulfill the first stage of the bill's program. No additional plants are started until fiscal year 1985 when the second stage begins. Six plants are started in both fiscal years 1985 and 1986. The final five plants are begun in fiscal year 1987. Based on the assumed construction schedule, 90,000 barrels per day would be available in fiscal year 1987 increasing to about 1 million barrels per day by 1994.

Estimated Cost of Loans and Loan Guarantees. Each of the bills, and both the Senate Energy Committee's and the President's proposals, would allow the administering agent to utilize loans or loan guarantees to stimulate synthetic fuel production (S. 1377, in fact, states a preference for these methods). Depending on the proportion of private investment financed by government loans, programs could result in outlays very close to those estimated for the construction of facilities alternative, because the same total investment costs would have to be incurred by the private sector. Assuming that a deferral of interest and principal repayment is provided in order to create an adequate incentive, the outlays over fiscal years 1980 through 1990 would be very similar. Outlays between 1990 and 1999 would be somewhat lower as loan repayments are made.

Loan guarantees would not result in outlays unless defaults occur. In view of the high risks involved in the use of new technologies and the volatility of the world oil price, some defaults are likely. The lack of reliable risk data at this time prevents an estimate of the magnitude of these defaults. It is also uncertain whether loans (particularly at market rates) or loan guarantees would provide sufficient incentive to stimulate significant private investment in synthetic fuels facilities.

Revenue Impacts

H.R. 4514 also amends the Internal Revenue Code to provide tax incentives for synthetic fuel production. The potential impact of these incentives on revenues is shown in Table A-5.

TABLE A-5. ESTIMATED REVENUE IMPACTS OF H.R. 4514

Fiscal Year	Estimated Revenue Impact (millions of current dollars)
1980	---
1981	-15
1982	-65
1983	-160
1984	-370
1985	-600
1986	-1,300
1987	-2,500
1988	-4,100
1989	-6,300
1990	-8,100
1991-2000	-121,490
Total	-145,000

The Internal Revenue Code is amended to provide a tax credit of up to $3 per barrel for synthetic fuels. The amount of the tax credit would be reduced if federal aid is involved in the production of the synthetic product. However, no direct federal aid is assumed in this estimate. This provision would result in an additional cost to the government in the form of a loss of tax revenues, estimated to be about $100 million in fiscal year 1987, $700 million in fiscal year 1990, and a cumulative total of $25 billion by fiscal year 2000.

The bill also amends the Internal Revenue Code to provide a 10 percent investment tax credit for synthetic fuel production. It is estimated that this provision will result in tax revenue losses of about $390 million between fiscal years 1980-1984. The total revenue loss through fiscal year 2000 may be as much as $50 billion. In addition, the Internal Revenue Code is amended to allow a five-year amortization period for synthetic fuel facilities for tax purposes. It is estimated that this provision will result in a tax revenue loss of approximately $190 million between fiscal years 1980 and 1984. The total revenue loss from this provision by fiscal year 2000 is estimated to be about $70 billion.

If these tax incentives were to be applied to a program with a lower synthetic fuel production goal than H.R. 4514, the revenue losses would be proportionately lower. For example, if the program goal was 2.5 million barrels per day as opposed to the 5.0 million barrel goal of H.R. 4514, the revenue losses would be approximately half of those estimated for H.R. 4514. This will be the case, however, only if program timing is similar.

These estimates of revenue losses represent the maximum potential impact of the tax provisions of H.R. 4514, because they assume private ownership of virtually all synthetic fuel plants and full realization of the tax credits by investors. Should the corporation provide grants to private industry or undertake substantial construction and operation of plants itself, tax losses would be less.

The availability of tax benefits may reduce the level of the price guarantee necessary to induce private-sector construction of synthetic fuel plants, thus reducing federal outlays. However, the extent of this impact cannot be estimated.

Because of the limited information available, no estimate can be made at the present time of the effects of the President's tax proposals. The President is estimating a cost of $2 billion for the oil shale and unconventional natural gas tax credits between 1980 and 1990.

APPENDIX B. THE REGULATORY APPROACH

Recently, there have been several proposals for the federal government to mandate that refineries produce a given percentage of their product output from synfuels. For example, legislation could require the industry to produce 1 percent synfuel by 1985, increasing to 5 or 10 percent of output by 1990. Firms would have flexibility concerning the resource and the final product; that is, products could be made from oil shale, coal, or biomass, and the products could run the spectrum from methanol and ethyl alcohol to gasoline from synthetic crude.

Such a proposal has the advantages that it would not be costly to the federal government and it would allow individual firms to choose the most cost-effective fuels. The major drawback, however, is that firms would most likely produce fuels from currently known technologies that do not necessitate large capital requirements. Using methanol and ethyl alcohol for gasohol are two likely candidates. While such a proposal would assist in reducing oil imports in the shortrun, it would most likely not help in the development of shale oil and coal derived liquids, which are expected to be the important synthetic fuels over the long-run. In addition, such a policy might put a hardship on small refineries.