

COMMERCIALIZATION OF SYNTHETIC FUELS:

ALTERNATIVE LOAN GUARANTEE AND PRICE SUPPORT PROGRAMS

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PREFACE

Commercialization of Synthetic Fuels analyzes and provides background information about incentives for the development of **commercial-scale** synthetic fuels from **coal, oil** shale, and other sources. The analysis was performed in response to a request from the Senate Budget Committee and to informal requests by staff of the House Budget **Committee** and of the House Committee on Science and Technology. In keeping with the Congressional Budget Office's mandate to provide non-partisan analysis of policy options, the report contains no **recommendations**. This paper was prepared by David Montgomery of CBO's Natural Resources Division under the direction of Douglas M. Costle and Nicolai Timenes, Jr.

CONTENTS

	Page
Preface	III
Contents	V
I. Summary	1
A. Syn fuels commercialization programs	1
B. Decisions facing Congress	1
C. Criteria for decision	2
1. Is synthetic fuel production needed?	2
2. Will private industry proceed without Federal intervention ?	2
3. What is the best mix of incentives?	3
4. Are the costs of the proposed incentives acceptable?	3
D. Other issues	3
E. Potential budget impact	4
F. Timing of decision	5
II. Introduction	7
A. Background	7
B. Proposals and issues	7
C. Decisions facing Congress	10
III. Criteria for decision	13
A. Is Synthetic fuel production needed ?	13
1. Economic costs and benefits	13
2. Noneconomic considerations	14
3. Environmental impact	15
4. Sensitivity of conclusions	16
B. Will private industry proceed without Federal intervention ?	16
C. What is the best mix of incentives?	18
1. Rationale for proposed incentives	18
2. Competitive bidding	19
3. Performance incentives	20
4. Utilities	20
5. Capital markets	20
6. Alternative incentives	21
D. Are the costs of the proposed incentives acceptable?	23
E. Other issues	23
1. Technology mix	23
2. Program level	24
3. Environmental considerations	25
4. Employment impact	25
IV. Potential impact on the Federal budget	27
A. Total budget impact	27
B. Authorization levels	30
C. Appropriations and borrowing authority	31
1. Loan guarantees	31
2. Construction grants and price supports	32
D. Five-year outlay projections	32
E. Off-budget expenditures	34
V. The timing of decision	35
Appendix: Alternative programs: Technology mix and budget estimates	37

I. SUMMARY

A. Synfuels Commercialization Programs

The President has proposed a program to bring synthetic fuels known as **synfuels** - oil and gas produced from coal, oil shale, and urban waste - **into commercial production** in the near future. The program would consist of price supports, loan guarantees, and **construction grants designed to achieve an interim synthetic fuel production target equivalent to 350,000 barrels of oil per day**, with an option of expanding the program to **1 million barrels per day by 1985** if the **initial phase were successful.** Projects eligible for assistance would include:

- Conversion of coal to oil or gas.
- Extraction of oil from shale.
- Production of oil or gas from urban wastes.

The Conference version of the fiscal year 1976 Energy Research and Development Administration Authorization bill (H.R. 3474), would have provided for guarantees of up to \$6 billion in loans, but did not contain the other **incentive** provisions. Authorization of \$6 billion in loan guarantees would enable ERDA to offer guarantees to synfuels projects with a total production capacity of approximately 350,000 barrels per day.

B. Decisions Facing Congress

Congress may decide to:

- Accept or reject a synthetic fuels **commercialization** proposal as a whole, independent of other actions related to energy production or conservation.
- Accept the goal of speedy **commercialization** but choose other target production levels, alternative mixes of production processes, or different levels or types of production incentives (e.g., **limit** incentives to the loan guarantees of H.R. 3474).

I 350,000 barrels per day of oil is about 1.3 percent of 1974 total U.S. consumption of oil and gas.

- Delay **decision** so as to consider the program in the context of the **proposed** Energy Independence Authority or other **broad energy policies**.
- Postpone **commercialization** and pursue instead further research, development, and demonstration **projects** relevant to **synfuels**.

C. Criteria for Decision

To make a **decision** to proceed with a program of incentives to **stimulate** synfuel production by **private** industry, answers to four questions are **required**: (1) **Will** synthetic fuel production be **justified before 1985?**, (2) Does private **industry require** government incentives to produce them **in that time frame?**, (3) What is the best package of incentives, considering program objectives and **cost?**, and (4) Are the costs of that package acceptable in light of the factors that **justify** synfuel production?

Answers to each of the four fundamental questions depend on a number of **considerations**.

1. Is Synthetic Fuel Production Needed? The **justification** of synthetic fuel **production** between 1975 and 1985 depends on economic and **noneconomic** factors. **Quantifiable** economic benefits **include** the value of the fuels themselves, a degree of embargo protection, and reduced cost of future synfuel production. Unless world **oil** prices rise **substantially** above their current levels, the economic costs of synfuel production would probably exceed those economic benefits. However, **nonquantifiable** and noneconomic **considerations** could tip the balance either way. Synfuel production **capability** could provide insurance against large increases in world **oil** prices and might **influence** OPEC nations to restrain price increases. A **small** program strictly limited to acquisition of **information** on commercial scale processes might be justified even on narrowly economic grounds.

2. Will Private Industry Proceed Without Federal Intervention? It is highly unlikely that private industry **will** produce significant quantities of synthetic fuels before 1985 without government support. Factors cited **include** lack of **profitability**, **technological** and economic risk, difficulty in raising capital, and constraints imposed by the government. It is clear that some synfuel production would be **unprofitable** at current oil and gas prices. If **profitability** were

achieved through use of government incentives, the remaining factors might still discourage investment.

3. What Is The Best Mix Of Incentives? An incentive program should address all significant constraints. The incentives proposed by the President are designed to make synfuel production profitable, to shift some risks from investors and producers to the government, and to alleviate shortages of capital. If these are not the real constraints to synfuels development, a different level and mix of incentives may be appropriate. For example, if risk of capital due to uncertainty about synfuel technology alone is the problem, loan guarantees might be relied on exclusively. If it is not, then loan guarantees might not be sufficient to induce development at the intended scale. An alternative program could include regulatory reform, tax incentives, government ownership, or measures to increase the cost of imported fuels. Although comprehensive evaluation of the costs and effectiveness of alternative incentive packages is beyond the scope of this report, examination of these candidates suggests that a program as effective as and substantially less costly than that proposed by the Administration may be difficult to design.

4. Are The Costs Of The Proposed Incentives Acceptable? A final decision on synfuels commercialization can be made only after an incentive program has been designed and evaluated. Then the costs attributable to the incentives themselves must be added to the previously estimated costs of synfuel production to determine if acquiring synfuel production capacity through government action is justified. Although potentially effective in achieving production targets, the Administration's proposed incentives could reduce competition, increase costs of producing synthetic fuels, and adversely affect private capital markets. However, the alternatives all have similar disadvantages.

D. Other Issues

If a decision to proceed with a commercialization program at some level is made, three other issues - the production target, the mix of processes to be encouraged, and protection of the environment - must be considered.

I. A program with a production target of 350,000 barrels per day by 1985 has substantially lower costs than one aiming at 1 million barrels per day, and would provide nearly as much information on technology, process economics, and environmental consequences.

The benefits of synfuel commercialization come in two broad classes -- production of energy and acquisition of information. If information is the primary goal, a program with a target as low as 125,000 barrels per day might be chosen.

2. Alterations in the emphasis given different processes can also alter program costs and benefits. H.R. 3474 provided that up to \$2.5 billion of the \$6 billion in loan guarantees would be used for high-BTU gasification processes,² and that funds may be used for solar, geothermal, and other unconventional processes. The Administration proposal contains no such provisions.

3. Major uncertainties concerning environmental impact cloud the synfuels decision process; their resolution could be an important objective of a small synfuels program. The principal known and potential impacts include large-scale land disruption from oil shale and coal mining, disposal of wastes from oil shale processing, consumption of water in water-short regions, air pollution from processing, potential carcinogen formation in the processes dealing with liquids, and the socioeconomic impacts of the influx of workers, their families, and associated developments on sparsely populated regions. Some such impacts may be mitigated, at the lower levels, by a strict environmental protection strategy (the Administration's proposal contains the outlines of such a strategy) and by grants or loan guarantees to impacted communities. Nevertheless, aggregate impacts of a larger, 1 million barrel per day, level could be severe.

E. Potential Budget Impact

For fiscal year 1976, the Administration requests borrowing authority of \$1.5 billion for loan guarantees and \$1 billion for price guarantees, and appropriation of \$.6 billion for construction grants.

Even if passed immediately, however, a synthetic fuels commercialization program would be unlikely to lead to federal outlays in fiscal year 1976. Rather, the extent and timing of outlays would depend on the program level, the mix of incentives, and the riskiness

² The BTU, or British Thermal Unit, is a common measure of heat.

of synfuels technologies pursued.

The total budget impact to 2005, when obligations to support prices will have expired, price supports and construction grants implicit in the Administration's 350,000 barrel per day program may range from net revenues of \$2.7 billion to net outlays of \$5.3 billion (in 1975 dollars). During the 1980s annual costs might reach \$250 million per year. Additionally, a maximum of \$2.6 billion in guaranteed loans would be outstanding in 1985. Costs would become higher -- possibly reaching \$26.6 billion over the life of the program -- if a decision were made to proceed to a 1 million barrels per day capacity by 1985.

F. Timing of Decision

If there were a decision to proceed on January 1, 1976, it would be at least the end of 1980 before there could be a year of operating experience with a synfuel plant. But ERDA has several second-generation synfuel processes ready for demonstration which, if successful, could make obsolete a synfuel plant based on current technology. Thus, delay in synfuel commercialization until second-generation process can be included could improve the economics of the program, although information gained about first-generation processes is expected to be useful in the second-generation.

Congress will determine whether an immediate decision is required. It has the option simply to defer decision possibly postponing production targets beyond 1985 -- or to rely upon research, development, and demonstration to lay the groundwork for an expanded synthetic fuel production capability after 1985. Whatever the decision, it should be made in the context of a larger perspective on the proper role of the Federal government with respect to the continuum of energy activities from research through development and demonstration to commercialization.

II. INTRODUCTION

A. Background

Synthetic fuels (synfuels) are so called because their production involves a basic transformation of the fuel from the way it is found in nature. The term is imprecise and general, but is usually considered to include gas and oil made from such sources as coal, oil shale, or urban or other waste. Production of synthetic fuels from these comparatively abundant domestic sources would permit the nation to reduce its reliance on imported oil and gas.

In order to stimulate their future production, the President has proposed a program to initiate commercial production of synthetic fuels. The Administration's program would use price supports, loan guarantees, and construction grants to attain, if successful, the capacity to produce the equivalent of 1 million barrels of oil per day by 1985.

An alternative proposal, limited to loan guarantees, was contained in the deleted Section 103 of the ERDA authorization bill (H.R. 3474). By itself, this program could only reach a lower target capacity, perhaps 350,000 barrels per day, and that only if world oil prices are high and certain enough to justify investment.

The purpose of this report is to describe the key decisions that Congress faces in regard to these proposals and to provide an analysis of the issues underlying those decisions.

B. Proposals and Issues

Technologies for producing synthetic fuels have long been known, and some synthetic fuel is produced in foreign countries. However, much of that production is subsidized, and the scale of production is considerably smaller than that envisioned for programs proposed in the United States.

ERDA conducts an extensive research program aimed at developing "second-generation" processes for producing synfuels that promise to be more economically attractive, efficient in use of resources, and environmentally acceptable. Nevertheless, such technologies are not yet available, and economics of existing processes have not, in the past, been sufficient to induce industry to produce synthetic fuels commercially in the United States.

To alter this situation, the Administration proposes three goals for 1985: (1) development of technical, environmental, and economic information on synfuel production processes; (2) accumulation of experience with synfuel production in American industry; and (3) production of significant quantities (the equivalent of at least 350,000 Barrels per day, and possibly as much as 1 million barrels per day) of synthetic oil and gas. The goals would be achieved by measures that would shift risks of synfuels development from private industry to the government and would involve net government subsidies to synthetic fuels production at least through 1985.

The proposal itself is reported in detail in a four-volume Interagency study recently made available to the Congress.³

The Administration's report examined five production levels:

- No program, with zero synthetic fuels production in 1985.⁴
- An "information" program, achieving production of the equivalent of 350,000 barrels per day of crude oil by 1985.
- A "two-stage nominal" program, initially targeted to reach 350,000 barrels per day before 1985, with a decision in the late 1970s whether to proceed to 1 million barrels per day by 1985. (This is the Administration's proposal.)
- A "one-stage nominal" program, achieving 1 million barrels per day by 1985.
- A "maximum" program, achieving 1.7 million barrels per day by 1985.

3 Report by the Synfuels Interagency Task Force to the President's Energy Resources Council, "Recommendations for A Synthetic Fuels Commercialization Program", November, 1975.

4 The Administration's report does not consider those alternative ways of achieving domestic energy balance objectives that do not involve synfuels.

It also examine several types of synthetic fuels:

- Fuels produced from coal:
 - gas with low to medium heat content compared to natural gas ("low to medium-BTU gas").
 - gas with approximately the same heat content as natural gas ("high-BTU gas").
 - synthetic crude oil ("syncrude").
- Crude oil extracted from oil shale.
- Gas and oil produced from urban waste or other biological materials.

The incentives recommended by the Administration are:

- For oil shale and syncrude, a nonrecourse loan guarantee⁵ and price support.
- For high-BTU gas, a nonrecourse loan guarantee.
- For low and medium-BTU gas:
 - for regulated industries, construction grants.
 - for unregulated industries, a nonrecourse loan guarantee and price support.
- For fuel from urban waste, a nonrecourse loan guarantee.

All incentive levels would be determined by competitive bidding. Choice of the mix of technologies to be supported would be left to the discretion of the program manager.

⁵ A "nonrecourse" loan would have as security only the assets of the proposed venture itself; in event of default, the government would have no recourse to the assets of larger corporations sponsoring the venture. The government would acquire any patents granted in the course of the project.

C. Decisions Facing Congress

The Administration's synthetic fuels commercialization program may not come before Congress as a single bill. Authorization for \$6 billion in loan guarantees appeared in Section 103 of the conference version of the ERDA authorization bill H.R. 3474, which was struck out by the House on December 9. The conference version of H.R. 3474 limited support for high-BTU gas to \$2.5 of the \$6 billion and included efforts to develop solar or geothermal energy as well as synfuel ventures. ERDA has suggested modifications to Section 103 that would make it an authorization of the first phase (350,000 barrels per day) of the Administration's loan guarantee proposal.

House hearings on Section 103 began during the week of September 29 and were concluded on October 27. Separate legislation draft authorizing construction grants and price supports, also to be administered by ERDA, was distributed by the Administration on October 22 and may be introduced in January.

Several related programs will also come before this session of Congress. The Administration's proposed Energy Independence Authority (EIA) would have assets of \$100 billion to assist private industry in financing energy investment, which could include synfuel investment. The Nuclear Fuel Assurance Act of 1975 (S. 2035 and H.R. 8401) would develop a privately owned uranium enrichment industry using some of the same devices as proposed for synfuel commercialization. ERDA appropriations will provide further opportunity for review of its program of energy research, development, and demonstration. Other energy policy issues, including oil and gas pricing, changes in federal leasing policies, stockpiling, and mandatory energy conservation, are also before the Congress. The proposed National Energy Production Board (S. 740) would have comprehensive authority to stimulate domestic energy production, and could consider synfuel investment in a context of total energy policy.

In deciding on synthetic fuels commercialization, Congress has several options:

- Accept or reject a synthetic fuels commercialization proposal as a whole, independent of other actions related to energy production or conservation.

- Accept the goal of speedy **commercialization** but choose other **target production** levels, alternative **mixes** of production **processes**, or **different** levels or types of **production incentives** te,,g, **limit incentives** to the loan **guarantees**).
- **Delay decisions** so as to consider the program in the context of the **proposed** Energy Independence Authority, which **is designed** to **carry out similar** programs, or other broad **energy policies**.
- Postpone **commercialization** and pursue **instead** further research, development, and **demonstration** projects aimed at solving **specific** problems of current technology or at **developing new technology**.

Decisions made by Congress **will** determine whether the government **will actively** encourage **production** of **synthetic** fuels, when production **will** take place, and what form the encouragement **will** take.

III. CRITERIA FOR DECISION

At issue before Congress is the appropriate federal role in the **commercialization** of **synthetic** fuels. In deciding this issue four **considerations** are of primary importance: the **desirability** of production of synthetic fuels, **now** and in the future; the **likelihood** that production **will** take place at the proper time and rate without government intervention; the proper **mix** of incentives to private producers; and the costs of the program through which development is encouraged. If a **decision** to proceed with some **commercialization** program is made, other **issues regarding** program level, technology mix, and **environmental** protection arise.

A. Is Synthetic Fuel Production Needed?

A synthetic fuels **commercialization** program can be justified if the production of some amount of synthetic fuel in an appropriate time frame is itself considered **worthwhile**. The two relevant time frames are **1975 to 1985** and beyond **1985**. Production of synthetic **fuels** would be worthwhile if their costs (at some point, presumably beyond **1985**) were lower than the costs of equivalent quantities of energy provided through alternatives such as energy conservation, increased nuclear capacity, or increased imports - where the costs of imports, for example, reflect the **possibility** of embargo or further price increases. Important **considerations** are economic costs and benefits, as **well** as **noneconomic considerations**, including potential environmental impacts.

I. Economic Costs and Benefits: Most projections of energy futures beyond **1985** continue to show the need for substantial imports, which could be displaced by synthetic fuels. The burden of the Administration's analysis, then, is on a comparison of costs and **benefits** of a program to **stimulate commercial production**. The benefits of the program would include the value of the information that would be developed and that would be necessary to **realize** the benefits of timely introduction of a synfuels industry.

If a mixture of **all** five production processes were pursued, production of any of the target amounts of synthetic fuels between **1975** and **1985** would probably be more costly than purchase of the same quantity of imported **fuel**. **However**, the experience that industry gained during that time would result in lower costs and greater production of synthetic fuels **after 1985** than would be the case if no commercial quantities of synthetic fuels were produced before then. **However**, even if these benefits and the **value** of a degree of embargo

protection were added, **economic costs** of synthetic fuels production at a scale of 350,000 barrels per day or more during the **1975-1985** decade would probably exceed **economic** benefits.

It is possible that many of the Information benefits attributed to a **commercialization** program with a target production of 350,000 barrels per day could be achieved with a **substantially** lower target, perhaps 125,000 barrels per day. If this be the **case**, the economic benefits of such a small program could exceed its economic costs. However, the Synfuels Interagency Task Force **concluded** that such a small program would probably **sacrifice** substantial Information.

The **expected economic costs** and benefits depend on a number of **uncertain** events, Different Judgments about the **cohesiveness** of the **international oil** cartel, the **cost** of producing synthetic fuels, and the **effectiveness** of the **commercialization** program in **reducing cost** in the future can result in markedly different conclusions about the **economic future** of **synthetic fuels**.⁶

2. **Noneconomic Considerations:** Other considerations could be weighed **against the probable** net economic cost of producing synthetic fuels. Among the **desirable consequences** of the **commercialization** program would be:

- Demonstration of U.S. **capability** to use **domestic** energy sources, which might **create** pressure on the cartel to limit **price increases**.
- Leadership of **and** benefits to other **oil consuming** nations.
- Provision of **insurance** against the **effects** of **oil** embargoes or **price** increases,

6 These **conclusions** are based on the analysis made by the Synfuels Interagency Task Force. They are very sensitive to the **probability** that the producing **cartel** will be able to maintain its cohesion, and hence keep world **oil** prices high, through 1985. If the **oil cartel** weakens, so that energy prices fall, and costs of producing synfuels turn out to be high, program costs will **substantially** exceed benefits. On the other hand, if the **cartel** continues to raise prices, and synfuels production costs fall, benefits of the program could exceed costs by **several billions** of dollars. For the program to break even, there must be **about** an 80 percent **chance** that the cartel will remain **cohesive** through 1985 and **continue** to reflect that cohesion in higher **oil** prices.

t **Confidence that the substantial benefits that might come from synfuel production have not been foregone.**

These same **considerations** apply to other programs to **increase domestic energy supply or reduce demand or vulnerability**. Such **alternatives could include additional emphasis on conservation, stockpiling, nuclear energy, and so forth**. Although **evaluation of alternative energy policies is beyond the scope of this paper** - and of the Administration's report -- a decision about the synfuels commercialization program should be based on comparisons with the economic and noneconomic benefits of such alternatives.

3. Environmental Impact: Production of synthetic fuels at a scale of 350,000 barrels per day or more would have a substantial impact on the environment. Problems of **air pollution** would arise from the large scale of synfuel plants and from **specific pollutants** they release. With current **emission control** technology, it might be **impossible to satisfy ambient⁷ air quality standards for particulates, sulfur oxides, nitrogen oxide, and hydrocarbons** if synfuel plants were located near to each other or to **existing major pollution sources**. In **addition**, suspected carcinogens would be released by synfuels plants.

Water **quality and supply** could also be problems. Although surface water quality could be **maintained** through environmental controls, underground water could be degraded in some regions. Water supply could be inadequate to support extensive coal and oil shale development in the Upper Colorado River basin - one of the major oil shale regions. **Wildlife** probably would be disturbed by large mining operations, especially in remote areas. Reclaiming the land disturbed by **mining activities** would be difficult in water-short regions in the West.

Finally, construction of synthetic fuel processing plants near small **communities** could cause **social disruption** and heavy demands on their ability to provide **social services**.

⁷ Ambient air quality standards state maximum permissible concentrations of pollutants measured in the air at a specified location.

4. **Alternative Conditions:** Changes in the mix of processes used might alter these conclusions. If fuels currently less expensive or environmentally damaging were emphasized, economic and environmental costs could be reduced. Whether economic benefits would exceed costs for some mix cannot be determined.

Overall, then, it appears that, although the quantifiable benefits in the most likely cases, judgments concerning the extent and importance of unquantifiable factors -- or the advent of situations now considered less likely-- could lead to the conclusion that production of synthetic fuels before 1985 is nonetheless justified.

B. Will Private Industry Proceed Without Federal Intervention?

If private industry will produce synthetic fuels at the proper time and rate without specific incentives, no commercialization program is needed. If synthetic fuel production is wanted but not expected to forthcoming, a first step in designing an incentive program is finding out what hinders private industry from producing synthetic fuels.

After 1985, some synthetic fuels ventures will probably become profitable and be undertaken by private enterprise. Hence a decision against immediate commercialization would delay, but not necessarily preclude, domestic production of synfuels.

Before 1985, private industry is not expected to produce more than minimal amounts of any synthetic fuels except those produced from urban solid waste. Four factors may be significant:

- Expected revenues are not large enough relative to expected costs to provide acceptable profits.
- Constraints are imposed on synfuel production by environmental, land management, and regulatory policies.
- Investment in producing synthetic fuels involves financial and technological risks.
- The large capital investments required by some fuels may be difficult for some potential producers to amass.

The analysis supporting the conclusion that economic costs **will** exceed economic **benefits also indicates** that private industry **could** not produce synthetic fuels profitably. However, even if such production appeared **profitable** at expected levels of prices and costs, risk and associated **difficulties** of raising capital might **still** prevent **development without** government action.

A single, **commercial-scale** plant for **producing** synthetic crude oil or a **substitute** for natural gas from coal could cost over **\$1 billion**: whether or not it would turn a profit depends on highly uncertain world energy prices and somewhat **uncertain** technological factors, including the **possibility** that a **superior** process could appear before the plant is amortized. Although corporate managements regularly take **significant** risks, the magnitude of the investment involved in synthetic **fuels could lead** them to **avoid** a **project** even if it were expected to make a profit that would be considered adequate for **smaller** or less risky ventures.

The **synfuel** Investment is large compared to the assets of most firms. Only **162** industrial corporations have assets greater than **\$1 billion**, and only **30** have assets over **\$4 billion**. Should the project **fall significantly**, it could have a major impact on corporate earnings, or even **threaten** survival. Joint ventures could, however, reduce these risks. Currently major **oil** firms and **utilities** are the most **likely** participants in **synfuel** ventures, although various manufacturing companies and **smaller oil** and coal companies have expressed **interest**.

For **similar** reasons, loans in the amounts needed for **synfuel** plants might be hard to obtain. Although many banks and other financial **intermediaries** have assets considerably above **\$1 billion**, individual institutions rarely make loans of such size to risky ventures. A major consortium would have to be assembled to spread **risk** adequately.

Moreover, some potential participants in **synfuel** development face **particular financial** constraints. **Electric utilities**, for example, are having difficulty raising capital for construction of new generating plants.

In summary, **unprofitability** appears to be the major factor preventing private Investment In synthetic fuel development. **If** **this** obstacle were removed, the problems of **risk** and **large** capital requirements associated **with** some processes might **limit** the extent of private **participation**.

C. What Is The Best Mix Of Incentives?

If production of **synthetic** fuels Is **justified** In the 1975 to 1985 **time** frame and If private Industry **will** not engage In that production, then a decision as to **appropriate** government action Is needed. That decision can be viewed as having two stages. The first stage Involves the design of a program that would remove obstacles to production by private Industry. The second stage Involves assessing whether **undesirable** consequences of the **incentive** program would outweigh the benefits of synthetic fuel production.

1. Rationale For Proposed Incentives: The proposed **commercialization** program addresses directly three obstacles to synfuel production: **unprofitability**, **risk**, and difficulties of capital formation. It does not explicitly consider **easing** governmental constraints, such as the length of **time** and uncertainty involved In **obtaining approvals** from regulatory agencies.

The proposed Incentives Include price supports, loan guarantees, and construction grants, **all competitively bid**.

Price supports would serve two purposes: to **subsidize** the production of fuels for which market prices are expected to be too low to cover costs and provide an adequate profit, and to shift the risks of changes In the fuels market from private Industry to the **government**.

Price supports could be provided through one of three mechanisms:

- Payment by the government of a differential when market prices **fall** below some predetermined support level.
- Payment by the government of a differential when market prices fall below the support level, **with** repayment of those outlays if market prices subsequently exceed the support **level**.

- Purchase by the government of a **specified** quantity of synfuel at a predetermined price.

The third **mechanism** gives the **synfuels** producer a guaranteed market and a certain price. All market risks, upside as **well** as downside, are borne by the government.

If the **first** mechanism were adopted and no provision were made for payments to the government when prices exceed the support level, **the** government could incur zero cost only if price supports were never required. However, a very good chance always remains that price support payments would be made, so that expected cost to government must be positive. Once **such** payments were made, a provision for **their** return to the government in the event that market prices exceed the support level subsequently could reduce expected cost to government. As long as synfuel producers prefer certain revenues to uncertain revenues **with** the same expected value, however, government purchase of synfuels at a **fixed price** minimizes expected cost to government.

Nonrecourse loan guarantees would serve to reduce risks stemming from unforeseen technical difficulties or economic conditions for both investors and lenders. While protecting both against the loss of that part of capital guaranteed by the government, loan guarantees do not remove the **risk** that changing market prices **will** make synfuel production **unprofitable**. Construction grants would provide **capital** to regulated utilities that they might not be able to obtain at any price from private lenders. Early in the debate on **commercialization** programs, the U.S. Treasury Department indicated that it **did** not **believe** the last two incentives to be necessary or desirable.

The recommended incentives might contain some hidden costs or unintended consequences arising from competitive bidding, erosion of performance incentives, behavior of regulated industries, and distortion of private capital markets.

2. **Competitive Bidding:** The Administration suggests using competitive bidding to **minimize** expected cost to the government and to reduce unnecessary **reliance** on incentives. Competitive bidding would tend to achieve these objectives, but might also create a synfuels industry dominated by a few large firms. Unless special arrangements for joint ventures among small firms were provided, large firms that have easier access to **financial** markets and greater capacity to bear risks would **systemmatically** tend to submit lower bids

than smaller firms, making participation by such firms difficult. Further concentration of the total energy industry might result. The Administration's plan to use multiple criteria in addition to the size of bids in evaluating proposals makes the encouragement of competition possible, but reduces the likelihood that incentives will be kept at a minimum level.

3. Performance Incentives: The task force recommendations include the possibility of basing price supports in part on cost of production and of making additional nonrecourse guaranteed loans available to cover a fraction of any cost construction cost overruns. Without extraordinary vigilance by program administrators, these provisions - which would insulate producers from the usual pressures to hold costs down - might increase the program costs.

4. Utilities: Many analysts have claimed that regulating the rate of return of electric and gas utilities leads them to choose technologies that do not minimize cost. When the cost of borrowing capital is less than the allowed rate of return, a regulated firm can increase its profits by choosing a production process with a greater ratio of capital to operating costs than would otherwise be optimal. Recently, however, the cost of capital has exceeded allowed rates of return for some utilities. In this case, to minimize their losses, utilities have an incentive to choose processes with low capital cost and excessive operating cost. In either event a utility would fail to employ a technology with least total cost. If this occurred in production of synfuels, involvement of regulated utilities might result in unnecessarily high costs.

5. Capital Markets: Loan guarantees would not increase the total amount in the economy of funds available for investment. Rather, they would direct investment into synfuels and away from other ventures.

The effect of introducing \$1 billion per year of government-guaranteed loans into private capital markets on those markets and on the other investment choices of private industry would be small. It is likely that the effect would be the same as increasing the federal deficit in an amount equal to the guaranteed loans. However, the Treasury Department has expressed concern that expectations of further subsidy and limited capital availability in the energy sector may lead to "crowding out" of other energy investments.

Others, while discounting this specific possibility, have argued that guaranteed synfuel investments would supplant investments of high social value but marginal economic viability. Investments in housing and small business appear the most likely to be "crowded-out." General revenue funds raised by increased taxation could be a more equitable source of financing than this reallocation of private investment.

Although further analysis may reveal that none of these concerns are sufficiently important to affect the commercialization program, they now stand as unresolved questions that need answers before final decisions are made.

6. Alternative Incentives: Even by the task force criteria, the proposed incentives did not fare better than all others on all counts. In choosing among incentives, the task force considered costs and risks to the federal government, likelihood of achieving production targets, administrative complexity and flexibility, and promotion of broad participation and competition. A different assessment of the relative importance of these or other considerations - or a different assessment of impediments to commercialization - could lead to a choice of different incentives.

Design of a complete alternative package of incentives - and critical assessment of potential disadvantages - is beyond the scope of this report. Some issues involved in designing and evaluating an alternative can be highlighted, however.

Other incentives might achieve production targets with lower government and economic costs. Alternatives include various tax incentives (investment tax credit and accelerated depreciation), direct loans, measures such as tariffs and import quotas that would increase the market price of competing fuels, and direct loans. However, each alternative also has drawbacks.

General tax incentives, such as increased investment tax credit or accelerated depreciation, could in principle provide adequate incentives if specifically aimed at synfuel projects. However, they would not help firms with low taxable income. It would be difficult to control program size with such incentives. Tax incentives and

programs that would rely on increasing all energy prices - deregulation of natural gas or oil prices, tariffs, or import quotas -- to increase synfuel production share a common drawback. They are indiscriminate, subsidizing investments that would be made anyway as well as those for which the program was conceived.

If a decision were made to restrict the scale of synfuel production to some minimal level while pursuing the information goal vigorously, direct government ownership of a small number of plants constructed and operated by private contractors might be desirable. Such an approach appears well-suited to dealing with environmental and socioeconomic consequences and to acquiring public knowledge of synfuel technology and economics. On the other hand, it would not foster creation of a private synfuels industry, but would put the government in the oil and gas business, (directly competing with private industry) if high production targets were chosen. In addition, the entire capital cost of the synfuel plants would have to come from the federal budget, as it would if direct loans were employed.

Shifting emphasis among the incentives proposed by the Administration could also be an approach to design of a superior package. Loan guarantees alone, as proposed in H.R. 3474, could aid in overcoming obstacles arising from the scale and riskiness of synfuel ventures. However, if industry believes that synfuel is likely to be produced at a net loss, or that risks of price changes are very large, little production could be expected in response to those guarantees. On the other hand, utilities which are allowed to pass costs on to their customers might find synfuel production attractive with loan guarantees alone. Price supports alone, or guaranteed government purchase of synfuels at specified prices could overcome unprofitability but might not reduce risks sufficiently to attract broad participation.

Reforming the regulatory process could also play a role in stimulating synfuel production. Many industry spokesmen urge streamlining the process by which approvals must be obtained from numerous government agencies before construction can begin. Relaxation of environmental protection standards could also make synfuel production easier and cheaper.

D. Are The Costs Of The Proposed Incentives Acceptable?

A final decision on synfuels commercialization can be made only after an incentive program has been designed and evaluated. Then the costs attributable to the incentives themselves must be added to the previously estimated costs of synfuel production to determine whether government action is justified. Although potentially effective in achieving production targets, the Administration's proposed incentives might reduce competition, increase production costs, and adversely affect private capital markets. However, the alternatives also have comparable disadvantages.

E. Other Issues

If a decision is made to proceed with a commercialization program, and an incentive package chosen, three issues of program management would arise. They relate to technology mix, program level, and environmental impact.

I. Technology Mix: The task force report analyzes, but does not recommend, a specific technology mix, preferring instead to leave such decisions to the program manager. The Congress may wish to constrain this choice. For example, some argue that the environmental impacts of mining and processing oil shale are relatively great, they would restrict the program to coal-based synthetics and urban wastes; others including the Office of Technology Assessment (OTA)⁸, contend that since oil shale and high-BTU gas are less expensive and more advanced in technology than other synfuels, they should play an important role. Some question attempts to produce oil from coal on the grounds that syncrude is unreasonably expensive and that the technology is not ready for commercialization. Some question or urge the appropriateness of including fuels from urban waste (recommended by the task force), and energy from solar, geothermal, and other sources. Solar and geothermal would have been covered by H.R. 3474, but the Administration argues that ERDA already has adequate authority to demonstrate solar and geothermal technologies. H.R. 3474 also provided that up to \$2.5 of the total \$6 billion in loan guarantees

⁸ Office of Technology Assessment, "An Analysis of the ERDA Plan and Program", October 1975 (GPO).

be available for construction of facilities to convert coal to a pipeline-quality gas.

2. **Program Level:** The President's original proposal called for production of 1 million barrels per day by 1985. As indicated above, the current Administration proposal envisions an initial phase of 350,000 barrels per day, with a decision later in the decade on whether to proceed to the million barrel level.

A further issue is whether the full 350,000 barrels per day would be required to realize the information benefits of the proposed program. That level could provide (in the task force example) two shale plants, one plant each for producing oil and pipeline quality gas from coal, five plants for producing industrial and utility fuels, and four smaller plants for treating urban waste. A somewhat smaller, lower-cost program could presumably yield much of the information provided by this option, but at some cost in diversity or redundancy.

Any scaling down of the commercialization program would decrease production of synthetic fuels between 1975 and 1985. Economic losses from producing fuels that cost more than their selling price would be avoided, but a smaller increment to domestic energy supply would be obtained. However, a smaller program could still provide substantial information and commercial experience.

Parts of the commercial production process are common to many approaches. Large-scale coal mining and transportation, materials handling at the plant, waste disposal, and social and environmental impacts are found in all processes which gasify or liquefy coal. Much of the equipment used in all those processes is technically similar. The approaches to above-ground oil shale processing share even more common features. In both cases, the differences are largely in basic chemical engineering technology.

The technology of all the processes ready for immediate commercialization is relatively well-understood. The largest uncertainties relate to the large-scale activities common to many approaches. Thus, a minimum information program could include as little as one high-BTU gas plant, one plant to provide fuel to an electric utility, and one oil shale plant. This program resembles that recommended by OTA in its analysis of the ERDA plan.

Since they are relatively small and now nearly profitable, perhaps two plants for converting urban waste to gas could be included. Alternatively, since such plants serve a function of waste disposal that is as important as the function of producing energy, they might be excluded entirely from this program. Separate large-scale support for such plants from the Environmental Protection Agency - along the lines of the grants for sewage treatment plants - as environmental measures could be an alternative.

No estimates of the value of information to be gained from a 125,000 barrel per day program are currently available, although the Synfuels Interagency Task Force believes they would be substantially lower than their estimates of the value of information gained from the 350,000 barrel per day program. No conclusive analysis of the desirability of a 125,000 barrel per day program can be made until quantitative estimates of the value of its information benefits are available.

Appendix A provides detailed comparisons of alternative program levels and mixes.

3. **Environmental Considerations:** The draft Environmental Impact Statement on the proposed program makes clear that major uncertainties exist with respect to potential environmental impact of synfuels. While the proposal includes provisions for an environmental protection strategy, no explicit standards governing air and water pollution or land use have been proposed, and there is not yet a design for research to resolve the uncertainties. There is also no request for funds for such research. Vigorous monitoring of environmental impacts and strict enforcement of air and water quality standards may be necessary to keep environmental damage to acceptable levels.

4. **Employment Impact:** Since the synfuels commercialization program is expected to shift investment from other areas into synfuels production, and is not claimed to increase total investment, any increase in employment resulting from the program would be balanced by decreases in employment elsewhere. The maximum on-site employment expected in the 350,000 barrel per day program would be 8000 to 13,400 person-years in 1985; in the two-phase 1,000,000 barrel per day program employment would be 20,500 to 34,200 person-years in 1985. The two programs would involve respectively \$6 billion and \$16 billion in cumulative total investment by 1985 (in 1975 dollars). Rough calculations indicate that if this investment should displace an

equal amount of Investment In housing construction, the reduction of **employment** In that Industry **would** be on the same order of **magnitude** as the **increased** on-site employment In **synfuel** production. However, unemployment In the heavy construction Industry **is relatively high** and Is expected to **remain** so for several years. **Shifting investment** expenditures Into **this** Industry **may**, therefore, be beneficial despite Its cost In Jobs **elsewhere**. . . ' !

IV. POTENTIAL IMPACT ON THE FEDERAL BUDGET

Congress must decide whether the desirable aspects of synthetic fuel production are worth the budgetary cost.

Congress must also decide how to appropriate funds for the program. Outlays would not come all at once: they would be spread over the years from 1976 to 2005. The timing and magnitude of outlays would depend on the program level, the mix of incentives, and the riskiness of synfuels technologies pursued. The two basic choices are:

- To appropriate now sufficient funds to cover all conceivable or expected outlays through the life of the program.
- To appropriate funds on a yearly or occasional basis to cover outlays as they occur.

Once a commitment were made to commercialization, and loan guarantee and price support contracts signed, required outlays could become large even if the option of annual appropriation were chosen.

A. Total Budget Impact

Total cost to the government would include direct payments (price supports, construction grants, and payments to redeem defaulted loans), administrative costs, and foregone taxes. These costs could be offset in part by receipts from loan guarantee fees and profit-sharing (if market prices exceeded the support level).

Costs and offsetting receipts are necessarily uncertain, since they depend on the market prices of oil and gas that compete with synfuels, the cost of producing synfuels, and the types of plants constructed.

Selections from the task force estimates of annual and total cost to government are shown in Table I. These estimates include outlays for price supports and construction grants, and offsetting receipts from profit-sharing. The task force concluded that there would be no foregone taxes, and assumed that the government would capture all profits which result from world prices exceeding the price support level. Without such recapture, all government costs would be positive (representing net outlays). The figures in Table I do not reflect the cost of any loan guarantees.

Budget implications are clear from the table.

- Annual costs in 1975 dollars for even the 350,000 barrels per day program would amount to about \$90 million by 1981, and could reach \$300 million from about 1985 through 2001, when they would begin to decline. The total cost to the government could range from net receipts of \$.2 billion to costs of \$6.4 billion over the life of the program.
- Annual costs of the larger "two-phase nominal option" could reach \$1.4 billion per year by 1987, and remain near that level until the end of the century. Total cost to the government of that program would be \$3.2 billion to \$29 billion, depending again on cost of coal and price of competing fuels.⁹

Administrative costs not included in the task force estimates are expected to run \$10 million to \$15 million annually. They could add \$300 million to total cost of the 350,000 barrel per day program. Receipts from loan guarantee fees of one percent of outstanding loan guarantees could reduce the total cost of the 350,000 barrel per day program by about \$800 million; costs of the larger program would be reduced by a proportionately larger amount, perhaps over \$2 billion.

Other costs to government would include expenditures on environmental research and monitoring activities that are expected to proceed in pace with synfuel commercialization to form a basis for mitigating its environmental impact.

The figures in Table I do not reflect the cost of any loan guarantee provisions. While total technical failure of a significant number of plants is unlikely, the possibility of default must be considered. The task force estimates of the maximum total federal loan liability outstanding at any one time are about \$2.6 billion for the information program and \$6.2 billion for the larger two-phase case (in 1975 dollars). The maximum liability would be reached in 1985 and decline thereafter.

⁹ The wide range in potential program costs is due to much smaller changes in the critical variables, since expenditures reflect the extent to which costs of synfuels differ from product prices set by the market, rather than being proportional to the costs or prices themselves.

TABLE I

EXPECTED ANNUAL COST TO GOVERNMENT
(CONSTANT 1976 DOLLARS IN MILLIONS)

YEAR	Information Program (350,000 barrels per day)		2 Phase Nominal Case (350,000; then 1 million barrels per day)	
1975		0		0
1976		7		7
1977		14		14
1978		29		29
1979	49	49	56	56
1980	77	75	102	102
1981	92	87	137	137
1982	26	255	104	334
1983	62	292	147	414
1984	-7	271	135	402
1985	-5	308	105	688
1986	-9	308	172	1235
1987	-17	308	239	1430
1988	-20	308	223	1430
1989	-27	308	196	1430
1990	-34	308	172	1430
1991	-35	308	157	1430
1992	-41	308	135	1430
1993	-47	308	115	1430
1994	-45	308	98	1430
1995	-48	308	91	1430
1996	-50	308	78	1430
1997	-46	308	70	1430
1998	-47	308	70	1430
1999	-10	318	64	1430
2000	-11	317	58	1429
2001	-49	307	53	1426
2002	-7	67	91	1189
2003	-7	67	106	1194
2004	0	0	90	1122
2005	0	0	30	614
TOTAL	-206	6,467	3,204	28,985

- Range based on purchase price of coal and selling price of synfuels.
- Includes outlays for price supports and grants.
- Assumes no project failures (i.e., no default of guaranteed loans).
- Minus sign indicates government receipts exceed expenditures.
- Task Force estimates are corrected to eliminate government receipts from regulated low BTU gas and biomass plants.
- Proposed plant mixes are described in Appendix A.

SOURCE: Interagency Synfuels Task Force Report, Vol. III; Appendix D, (GPO) pp. D-26, D-29, D-30, and D-33.

B. Authorization Levels

The Administration has proposed funding authorizations at a level that would be adequate to cover loan guarantees, price supports, and construction grants even if events resulting in extremely high program costs occurred. Funding authorization required over the life of the program depends on the same factors that affect the total cost to government. It would be particularly sensitive to the mix of plants chosen.

The Administration estimates authorization levels for its recommended plant mix and 350,000 barrel per day goal by assuming that all prices and costs rise at 7 per cent per year, and that no revenues accrue to the government if market prices exceed the support level. Under these assumptions, and rounding up to the nearest \$500 million, the incentive program and plant mix proposed by the Administration would require a maximum of \$6 billion in loan guarantees, \$4.5 billion for price supports, and \$.6 billion for construction grants, as shown in Appendix A.

CBO estimates of authorization levels required by other mixes and program levels are also shown in Appendix A. Authorization levels for loan guarantees and construction grants are estimated by the same methods used by the Administration, but are not rounded up. Authorization levels for price supports are estimated differently, assuming a constant, low price of oil and including offsetting receipts. Estimated on that basis, price supports for the Administration's program would require authorization of \$6.4 billion in 1975 dollars.

In a draft report issued in June 1975 the synfuels task force analyzed a 350,000 barrel per day program which included one syncrude plant. Outlays for that single plant could total \$5.6 billion (in 1975 dollars) by 2001. Overall, with the plant mix assumed by the task force in the draft report, outlays for price supports could total \$11.6 billion by 2005. The draft task force program and that currently proposed would require the same authorization level for loan guarantees and construction grants.

A minimum information program, with a target of 127,000 barrels per day, would require at most authority for \$1.5 billion in loan guarantees, \$.25 billion for construction grants, and \$1.7 billion for price supports.

A full 1 million barrel per day program could require as much as \$9 billion in loan guarantees, \$1.15 billion for construction grants, and \$28.1 billion for price supports.

C. Appropriations and Borrowing Authority

To begin its commercialization program the Administration is requesting borrowing authority of \$2.5 billion (which would cover \$1.5 billion in loan guarantees and \$1 billion in price supports) and an appropriation of \$.6 billion (for construction grants).¹⁰

I. Loan Guarantees: The Administration now estimates that a maximum of \$2.6 billion in loan guarantees would be outstanding at any one time in the 350,000 barrel per day program. Accumulated loan guarantee fees would be collected in a fund which may be used in addition to appropriated funds to make price support, grant, or default payments. Borrowing authority equal to less than the maximum amount of outstanding guarantees is requested.

If there were no defaults, no actual outlays would be required. It is alleged, however, that lenders are wary of waiting for Congress to appropriate funds so that defaulted loans could be repaid, since during the time between default and repayment lenders would find their liquidity reduced. For this reason the Administration requests borrowing authority in advance.

The Task Force concluded that lenders would be confident of prompt repayment even if borrowing authority did not equal the total of outstanding obligations. However, it is conceivable, although unlikely, that defaults would occur at such inconvenient times that the entire borrowing authority would be exhausted while loan guarantees were still outstanding. At that point additional borrowing authority or appropriations would be needed to cover future defaults. A disastrous - though very unlikely - chain of events could result in defaults requiring the government to redeem the entire \$6 billion in guaranteed loans for which the Administration requests authorization.

¹⁰ The President's Budget for fiscal year 1977 assumes, however, that only \$0.5 billion in borrowing authority would be required in fiscal year 1976, and that all projects and authorities would be transferred to an off-budget Energy Independence Authority in fiscal year 1977. This analysis assumes that all expenditures would be on-budget as originally proposed.

2. Construction Grants and Price Supports: The entire \$.6 billion in construction grants would be awarded if the Administration's program were approved. Appropriations in that amount would be required.

Borrowing authority, rather than appropriation, is requested for price supports. The \$1 billion requested would not be sufficient to cover all price support payments through the life of the program if world energy prices fall. Hence further borrowing authority as well as appropriations to repay the funds raised through exercise of borrowing authority could be required.

D. Five-Year Outlay Projections

Actual outlays during the first five years of a commercialization program depend on a number of factors:

- The order in which plants of various types were constructed.
- The date on which construction of the first plant began.
- Estimates of administrative costs and receipts from loan guarantee fees and profit sharing.
- The course of world energy prices.

The Administration proposal detailed in the November fact book assumes:

- Outlays on construction grants in 1977.
- Construction beginning in 1977.
- Outlays for administrative costs.
- Receipts from loan guarantee fees.

Receipts from profit sharing are excluded. The Administration's five-year outlay projections are presented in Table I I .

The loan guarantee program of H.R. 3474 contained no provisions likely to result in outlays before 1980.

TABLE II

PROJECTIONS OF OUTLAYS FOR PRICE
SUPPORTS AND CONSTRUCTION GRANTS

(CONSTANT 1975 DOLLARS IN MILLIONS)

Fiscal Year	Gross Outlays	Loan Guarantee Fees	Net Outlays
1976	2.5	(1)	1.5
Transition Quarter	1.5	—	1.5
1977	17	(5)	12
1978	38	(12)	26
1979	57	(20)	37
1980	86	(30)	55
1981	130	(39)	91

SOURCE: Estimates are from "Recommended Synthetic Fuels Commercialization Program Fact Book", Interagency Task Force on Synthetic Fuels Commercialization, November, 1975, Tab F (mimeo).

E. Off-Budget Expenditures

In addition to the **expenditures** that would **appear** in the federal **budget**, there could be additional federal expenditures. Whether or not there would be "**off-budget**" expenditures depends almost exclusively on whether the guaranteed loans were made by the Federal Financing Bank (FFB) or by private lenders directly. The FFB, an "off-budget" agency, is authorized to purchase **bonds** guaranteed by any agency of the federal government.

The funds used by FFB to purchase those bonds are raised through the sale of FFB bonds, either to private lenders or to the U.S. Treasury. Although FFB outlays and borrowing does count as part of the public **debt**. If the FFB borrows from the U.S. Treasury, the U.S. Treasury **will** in turn **sell** bonds on the private money market. Treasury outlays and **borrowing** also do not appear on the budget, although again the **public** debt is increased by the amount of borrowing.

Such a series of transactions could reduce the cost of synfuels, and hence the level of price supports, since industry would pay lower **interest** rates to the FFB than to private lenders. However, **off-budget** expenditures equal to the amount of loan guarantees could also result, thus converting loan guarantees into direct loans in **all** but name. Congress could write provisions into **the** law that would exclude the FFB from making **loans** to synfuels producers **if** such off-budget expenditures appear undesirable.

V. THE TIMING OF DECISION

The timing of Congressional decision on synfuels issues is of interest. The principal questions are immediacy of need and relationship to other proposals.

The lead times in any such program would be long. Although a draft environmental impact statement on the Administration's program has been prepared and is almost ready to be issued, a final programmatic statement and smaller statements on individual projects would be needed. Staffing, contracting procedures, and other matters are also time-consuming. Thus it is likely that, even if authorized immediately, the first guarantees could not be issued before fiscal year 1977. Construction of a synfuel plant would require three to four years; hence, the first production cannot be expected much before the end of the decade. A year of operation could be required before major information on operating characteristics would be available. If such information is to be useful in building a second, larger wave of synfuels plants by 1985, the program should begin soon. If, on the other hand, Congress determined that full information and a lower level of production (e.g., 350,000 barrels per day) would suffice by 1985, then considerable delay in initiating the program could be tolerated.

Congress may wish to delay decision so as to consider the synfuels program not in isolation, but in the context of other, closely related proposals. Debate has yet to begin on other proposals for financing energy development, which could also include loan guarantees and price supports.

Finally, regardless of when it reaches a decision, the Congress may wish to consider synfuels in the context of a larger policy with respect to the continuum of energy research, development, demonstration, and commercialization. ERDA is developing several advanced synfuels processes that could improve the economics, reliability, and environmental impact of synfuel processes. Pilot plants for several second-generation processes are under construction or operating, and a preliminary design contract has been let for a demonstration-scale plant to produce synthetic boiler fuels from coal. One issue is whether synfuels plants might become obsolescent before operation, yet need subsidies for their entire life.

Another issue is the appropriate federal role with respect to stimulation of research on synthetic fuels, as well as its commercialization, and with respect to risk-sharing at each stage of development.

In many cases adequate private investment in research is not forthcoming without government support since the enterprise which bears the costs and risks of research cannot share in its full social benefits. In the commercialization stage the rewards to private enterprise may more closely approximate the social benefits. If these considerations apply in the case of synthetic fuels, Congress may find it appropriate to emphasize federal involvement in support of research while giving more responsibility for commercialization to private enterprise.

APPENDIX A

ALTERNATIVE PROGRAMS: TECHNOLOGY MIX AND BUDGET ESTIMATES

This appendix provides a tabular comparison of five alternative programs that differ in technology mix, program level, and, in one case, incentives. The information is used at various points in the text in discussion of these alternatives.

The five alternatives are:

- The loan guarantee program of H.R. 3474.
- The 350,000 barrel per day information program, as Interpreted by the Synfuels Interagency Task Force.
- The program implied by the most recent OMB estimates, which is equivalent to a first-phase 350,000 barrel per day program.
- A minimum program, which is obtained by applying the task force's recommended incentives to a one-of-a-kind philosophy.
- The task force's estimate of the ultimate (1 million barrels per day) composition of a two-phase program which begins at 350,000 barrels per day.

The quantities entered in the table include:

- Under "loan guarantees," the total amount of loans that would be guaranteed over the life of the program (using the task force estimates of total capital cost and assuming that loan guarantees cover 75 percent of the cost of constructing urban waste and high-BTU gas plants, and 50 percent of the cost of oil shale and unregulated utility and Industrial fuel plants). Loan guarantees would result in outlays only in the event of default.
- Under "construction grants" and "price supports," the total outlays to be made over the life of the program. (Estimates for price supports shown are derived under the assumptions about the price of competitive fuels and costs of inputs which give rise to the maximum credible outlays.)

Not all estimates in the Table are directly comparable to one another.

- Loan guarantees and construction grants for all programs are estimated on the basis of the estimates of requirements for single plants presented in the synfuels fact book. An annual inflation rate of 7 percent is assumed.
- Price supports in the fact book information are estimated assuming a 7 percent annual rate of increase in energy prices from \$7 per barrel for oil and \$9 per barrel (equivalent) for natural gas, and excluding government receipts from profit sharing.
- All other price supports are estimated using constant \$7 oil prices and include receipts from profit-sharing.

ALTERNATIVE PROGRAMS AND BUDGET ESTIMATES

	High BTU Gas	Low to Medium BTU Gas		Syn-crude	Shale Oil	Urban Waste	Other Energy Sources	Socio-Economic Aid	Contingency	Total
		Regulated	Unregulated							
Unit Plant Capacity" (bbl/day)	40,000	25,000	1 25,000	50,000	50,000	6,000				
HR 3474										
No. of Plants	up to 4									
Loan Guarantees (\$/mm)	up to 2500				3,500					6,000
Construction Grants	--				--					
Price Supports	--				--					
Task Force Draft Information Program (350,000 bbl/day)										
No. of Plants	1	3"	2*	1	2	4	0			10
Loan Guarantees (\$/mm)	650	--	600	600	1,000	680	--			3,530
Construction Grants (\$/mm)	--	--	690	--	--	--	--			690
Price Supports (\$/mm)	--	--	2,600	5,600	3,400	--	--			11,050
Fact Book Information Program (350,000 bbl/day)										
No. of Plants	3	.2	2	0	2	5	0			14
Loan Guarantees (\$/mm)	2,000	--	650	--	1,050	900	--	350	1,050	6,000
Construction Grants (\$/mm)	--	300	--	--	--	--	--	--	100	600
Price Supports (\$/mm)	--	--	3,600	--	900	--	--	--	--	4,500
Minimum Program Using Recommended Incentives (127,000 bbl/day)										
No. of Plants	1	1	0	0	2	2	0			
Loan Guarantee (\$/mm)	650	--	--	--	500	340	--	--	--	1,490
Construction Grants (\$/mm)	--	230	--	--	--	--	--	--	--	230
Price Supports (\$/mm)	--	--	--	--	1,700	--	--	--	--	1,700
2-Phase Nominal Program (1,000,000 bbl/day)										
No. of Plants	7	5	5	2	6	2	0			33
Loan Guarantees (\$/mm)	4,550	--	1,500	1,200	3,000	11,400	--	--	--	8,950
Construction Grants (\$/mm)	--	1,150	--	--	--	--	--	--	--	1,150
Price Supports (\$/mm)	--	--	6,500	11,200	10,400	--	--	--	--	28,100

*CBO Assumption — Task Force did not specify division between regulated and unregulated.