

9/12/79 [2]

Folder Citation: Collection: Office of Staff Secretary; Series: Presidential Files; Folder: 9/12/79 [2]; Container 130

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ENERGY SECURITY CORPORATION (ESC)

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A. The President's Energy Security Program

The Challenge of Reducing Oil Imports

America today faces an unprecedented threat to its national security and to its economic and political future. The threat comes from our continued and growing dependence on costly and insecure foreign oil supplies. We have not dealt effectively with this problem over the last decade. In fact, since the oil embargo of 1973-1974, U.S. oil imports have increased more than 25%, from 6.3 million barrels per day to 8 million barrels per day. Working together, however, we can respond to this threat in a way that will provide energy security and a renewed sense of confidence about our future by reducing our dependence on imported oil.

The President's Program

Altogether, the President has proposed a series of initiatives designed to reduce by about 6* million barrels of oil each day the amount of oil we will need to import by 1990. This amounts to reducing our projected future dependence on foreign oil sources by at least 50%. In order to achieve this, all opportunities to reduce imports must be pursued aggressively. No single program and no single technology by itself can eliminate our dependence on foreign oil. The President's program proposes to cut foreign oil dependence by conserving oil where oil must be used, by encouraging switching away from oil use where feasible and by accelerating the development and use of our abundant domestic energy resources, such as coal, solar energy, and unconventional sources of oil and natural gas.

Some of the President's previous proposals have been enacted into law by the Congress and others are still being considered. On July 15, additional initiatives were announced in which the President proposed that:

- An Energy Security Corporation be established to help private industry finance the development of 1.75 million barrels per day of oil substitutes from coal, oil shale, biomass, and unconventional gas by 1990. Appendix 1 at Tab I summarizes the total expected oil reductions from the President's July 15 proposals.
- New initiatives be undertaken for the development of heavy oil resources, unconventional gas, and oil shale which will save an additional 1.25 million barrels of oil per day. Tax credits will be offered to producers of oil shale and unconventional gas and heavy oil will be permitted to be sold at world oil prices and will not be subject to the Windfall Profits Tax.
- A three-member Energy Mobilization Board be established to expedite the issuance of permits and the construction of critical energy facilities.
- Utilities be required to cut current oil consumption by 50%, saving 750,000 barrels of oil per day.

* See Appendix 1 Tab I, for a summary of the estimated oil savings. The 6 million barrels per day figure is the sum of the savings associated with the President's April 5 initiatives, the June Solar energy initiatives and the July 16 Presidential initiatives.

- A major new residential and commercial conservation program be undertaken which is designed to save 500,000 barrels of oil per day by 1990.
- \$2.4 billion annually be provided to low-income families in the United States to help cushion their incomes from the sharply higher costs of energy.
- A total of \$16.5 billion be provided over the coming decade to improve the nation's mass transportation systems and increase automobile fuel efficiency.

The President proposed that these programs be funded from the taxes that oil companies would pay under the proposed Windfall Profits Tax. The Windfall Profits Tax would provide funds to the Federal Government from the rising prices paid by oil consumers for existing domestic oil. If this tax is not passed by Congress massive profits would flow to the oil companies.

The actual amount of funds available for these programs will depend upon the windfall profits tax that Congress enacts and upon future world oil prices. Current estimates are that the windfall profits tax proposed by the President should generate approximately \$160 billion over the 1980-1990 period. If the Windfall Profits Tax that Congress passes fails to provide enough funds, the programs will have to be cut back to avoid new burdens on taxpayers.

The Energy Security Corporation

One of the major proposals of the President's program to reduce oil imports is the creation of an Energy Security Corporation that will stimulate the aggressive development of synthetic fuels and unconventional gas in the private sector. The Corporation's independence will assure it the discretion necessary to develop synthetic fuel resources on a very rapid and efficient schedule. The following sections describe the need for the development of these new fuel resources, the reasons why an independent corporation is needed to do this and the details of how this corporation will work.

B. Why Do We Need Synthetic Fuels?

The President has proposed major initiatives to increase our conservation efforts, to increase the production of domestic oil and gas and to make solar energy a more important source of energy in the U.S. Congress has passed some of these proposals, but even with successful efforts in these areas, the Nation will eventually need to replace foreign oil with new domestic energy supplies in order to reduce pressure for higher world oil prices and reduce our dangerous dependence on imported oil from insecure sources. In particular, we need new energy supplies that can be used to meet U.S. transportation needs for gasoline and aviation fuels.

In addition, U.S. efforts to reduce our dependence on imported oil are an essential part of our recently announced agreement with other large consuming countries to restrain oil use. Through this agreement the impact of U.S. oil reductions on decreasing pressure for higher world oil prices will be magnified by similar efforts to reduce oil use by the other oil consuming countries.

To reduce total U.S. oil use and provide new transportation fuel sources the President has proposed a major effort to help private industry produce synthetic fuels and unconventional gas from our abundant domestic coal, oil shale and unconventional gas resources. The President has proposed establishing the Energy Security Corporation to carry out this effort.

How We Became Dependent on Foreign Oil and What Must be Done to Reduce this Dependence

The U.S. has large energy resources, including oil, gas and coal. Domestic coal, nuclear and hydropower resources are adequate to meet our growing electricity needs. But in their present form these resources cannot meet our future need for liquid fuels and since the 1960's our proven oil and gas reserves that have in part met this need have steadily declined.

During the 1960's and 1970's the U.S. increased its consumption of domestic oil and gas in part because of very low prices--real energy costs actually fell by 30 percent between 1950 and 1970. When domestic production began to decrease, however, the U.S. increased its imports of cheap foreign oil.

This reliance upon foreign producers increased their bargaining power and in the early 1970's OPEC first exercised its leverage and exposed the weakness of our petroleum dependency by arbitrarily reducing oil production and increasing oil prices.

Many geologists believe that most large oil and gas fields have been found. As oil production continues to decline it is unlikely that successful discoveries will occur at the rate necessary to meet our needs and prevent large future price increases. As a result we must take firm actions now to increase our domestic supplies of liquid and gaseous fuels.

Three major actions are proposed by the President for achieving this: First, the stimulation of additional production of oil from known domestic oil fields; second, the acceleration of new synthetic liquid and gas production from our vast domestic coal and oil shale resources; and third, the encouragement of new gas production from unconventional gas resources.

I. Increasing Conventional Oil Production

Early energy efforts focused on energy conservation and natural gas deregulation. Those efforts sought to bring U.S. oil prices up to the level of world oil prices in order to promote production and to end artificially low oil prices which tended to encourage oil consumption.

At the President's initiative, domestic oil is gradually being deregulated. This deregulation will encourage the discovery and production of new oil. In most instances, over two-thirds of the oil in existing fields is left in the ground following production. It is too expensive to get. Some of it will be recovered as prices rise and as new technologies develop. One particularly large deposit of this expensive oil is called heavy oil. Heavy oil is a highly viscous, almost tarlike substance which, therefore, is more difficult and costly to produce than lighter crudes. However, there may be over 10 billion barrels of heavy oil available domestically.

To increase the production of this more costly oil, the President has removed artificially low prices on heavy oil and has recommended that it be exempt from the proposed Windfall Profits Tax. The President's action is expected to produce 500,000 barrels per day of new domestic heavy oil by 1990.

II. Accelerating New Synthetic Liquid and Gas Production

This heavy oil initiative along with the President's other oil reduction proposals for Residential and Commercial Conservation, Mass Transit, increased auto efficiency and converting utility oil plants, are expected to provide an additional 2 to 3 million barrels per day of energy production, but these initiatives alone will not be enough to achieve our goal of reducing, by half, our dependence on imported oil by 1990.

- ° In 1978 the United States imported 8 million barrels per day of petroleum at a cost of \$42 billion--equal to 13% of total world oil production and 42% of total U.S. oil consumption. The recent Iranian oil production shut-down and the June 50% increase in world oil prices by OPEC have again demonstrated the vulnerability that results from such a large dependence on imported oil.
- ° If all measures other than the synthetic fuel and unconventional gas measures ESC and proposed by the President are enacted by Congress, United States imports will still reach 6.5 to 7.5 million barrels per day in 1990 (see the Table summarizing 1990 import projections on the following page). These imports would equal about 10% of the entire world's oil production in 1990.

1990 Import Projections

	<u>1978</u>	<u>1990</u>	
		<u>All Proposals Less Synfuels</u>	<u>Includes Synfuels and Unconven. Gas</u>
U.S. Imports (MB/D)	8.2	6.5 to 7.5	4 to 5
U.S. Imports as Percent of Global Production	13%	10%	7%

Why Synthetic Fuels are Needed to Help Further Reduce Imports

As indicated in the chart, with success of all conservation proposals and initiatives to increase conventional energy supplies, the U.S. would still have to import about 6.5 to 7.5 million barrels of oil per day. More must be done to (1) ensure against the failure of these other programs to reduce oil to this level; and (2) provide additional energy supplies to further reduce imports and increase our economic and political independence from foreign oil sources.

To do this the President has proposed that we aggressively pursue the development of synthetic fuels. The development of synthetic fuels (or synfuels) will significantly reduce the amount of oil we must import over the long term which will:

- Provide a supply of liquid fuels that cannot be cut off and is not directly subject to OPEC's price increases.
- Reduce our massive dollar payments to OPEC countries. This will relieve our balance of payments problems and the downward pressures on the dollar in the world currency markets.
- Improve our national security and reduce our vulnerability to political pressures from oil producing countries.
- Slow down world oil price increases because of the decrease in world oil demand.

The President's synthetic fuels program could reduce our oil imports to 4.5 million barrels per day or ___% of domestic oil consumption by 1990.

Why we Should Develop Energy Sources in Addition to Conservation

Improving the efficiency of our use of energy is a priority objective of the President's national energy policy. In recognition of this, the President's proposals include major conservation initiatives. However, the U.S. should not rely on conservation alone to solve our future energy problems because:

- Even with success of our aggressive conservation programs eventually additional energy supplies will be needed. Synthetic fuels have the potential for providing significant amounts of our future energy supplies.
- The U.S. will need large amounts of new liquid fuel sources as the world oil reserves are depleted. Since there is no practical substitute for our present transportation system it would not be prudent to delay now the development of new liquid fuel sources.
- The possibility exists that the expected levels of oil savings from conservation may not be reached. The efforts to increase the efficiency with which we use energy may not result in all of the savings projected. In addition, millions of individual decisions by consumers of energy are required to achieve any conservation objectives. Even with substantial financial encouragement there is no guarantee that these decisions to conserve more will be made. Recognizing these factors, other approaches should be pursued simultaneously to reduce the risk that we may attain our oil reduction goals.

Why the Federal Government is Needed to Help Synthetic Fuel Development

At the present time and for the next several years, few synthetic fuel technologies will be economically competitive with oil we can import. Private industry motivated only by pure market incentives has not moved and is not likely to move aggressively to undertake deployment of synthetic fuels plants because:

- Expected economic competitiveness does not occur until the 1990's and, therefore, private firms will wait until the mid-80's before taking action on their own.
- Because the national security benefits of synthetic fuels do not improve shareholders returns, private industry has not begun to invest in these plants. Part of the need for the United States to develop synthetic fuel is the desire to provide for our national security by insulating the United States from foreign political pressures and to slow down increases in world oil prices. Private firms have different priorities. They seek to make profits for their shareholders. The national security benefits that are associated with moving to develop synfuels now will not accrue directly to private firms.
- There are major uncertainties associated with synthetic fuels that private corporations face; the possibility that future oil prices will not increase as rapidly as projected; future increases in world oil and gas production levels, and the technical risks of developing these new processes into large size plants.
- The immediate financial costs are extremely large since each plant will cost billions of dollars and for most companies this would be putting a large part of their assets at risk. Private (profit making) firms are reluctant do this. Federal involvement is a means of "pooling risk" for the nation as a whole.

- There are long and costly procedures which must be followed in order to satisfy all Federal, state and local regulatory requirements. These further increase the risk of project failure and large financial losses to private firms.

If the United States must replace large amounts of imported oil in the 1990's, we must begin to build synthetic fuels plants immediately since:

- It will take between four and seven years to plan, design and build each commercial-size synthetic fuels plant. We will need between 20 to 40 large synthetic coal and oil shale plants to produce enough synthetic fuel to achieve our goals and to begin to make significant reductions in oil imports. We must, therefore, begin immediately to lay the foundation for the expansion of the synthetic fuels industry so that we will have this new energy source available in the 1990's.
- An accelerated effort now can reduce the large costs of a program that is delayed and must, therefore, be pursued on a crash basis. Shortly after the end of this century, the supply of world oil will start to decrease rapidly. Higher prices will not bring more production. Before that time, the cost of synthetic fuels should be below world oil prices. If we wait until that time to develop synthetic fuels, we will have to pay whatever price is demanded for oil while we wait for synthetic fuel plants to be constructed on a massive scale.

III. Encouraging Gas Production from Unconventional Resources

Unconventional gas is natural gas produced from low permeability and other "atypical" geologic formations. Development of unconventional gas has the potential to slow down the decline in our domestic gas production and to replace scarce oil that is used in homes, industrial boilers, etc. Unconventional gas can provide energy at costs as low as any alternative energy source. To accelerate unconventional gas development, therefore, the President has proposed that:

- The Federal Energy Regulatory Commission (FERC), which is part of the Department of Energy, permit a higher price for unconventional gas.
- If the FERC fails to act, the National Gas Policy Act be amended to deregulate such gas.
- Congress enact a \$.50 per thousand cubic feet tax credit in order to accelerate unconventional gas production.
- The ESC provide additional incentives if they are needed to meet our 1990 production target from this promising energy source. (Producers receiving assistance from the ESC would not, however, be eligible for the tax credit.)

C. Why Do We Need A Corporation?

As was indicated previously, we cannot significantly reduce the amount of foreign oil that we import and we cannot significantly increase the amount of energy that is available to provide for our national security by reliance upon any single approach to the energy problem. We must continue to encourage the production of those energy sources that occur naturally, we must accelerate attempts to use energy more efficiently and we must develop alternative energy supplies, especially for liquid fuels. Conservation efforts are important but there are limits to the savings from this source. Conservation makes our energy go farther, but it does not produce energy. Consequently, the development of synthetic fuels and unconventional gas must be a necessary part of our overall energy program for the future.

However, development of significant amounts of synthetic fuel and unconventional gas production in the 1990's requires the establishment of a large, new, multi-faceted industry over a very limited period of time, i.e. ten years. For example, the development of a synthetic fuel and unconventional gas production capacity of 1.75 million barrels per day will require capital investments in excess of \$110 billion (in current dollars). The total value of the proposed Federal price or purchase guarantees, loans or loan guarantees to these plants will amount to \$88 billion). This would be a massive undertaking. A large reduction in petroleum imports in ten years cannot be achieved through small scale pilot and demonstration plants--it can only be achieved through building many large capacity pioneer plants.

- ° The synthetic fuels component of this 1.75 million barrel per day* will involve the construction and operation of between 20 to 40 large coal synthetic or oil shale plants--most of which are likely to produce 50,000 barrels of oil or oil equivalent per day, consume about 6 million tons of coal per year, employ thousands of laborers in construction and operation and cost well in excess of \$2 billion each.

Recognizing the risks to private firms attempting to develop large synthetic fuels plants on their own, some Federal Government financial assistance is necessary as was described in Section B.

Recognizing the massive and complex nature of the task of establishing a new synthetic fuels industry, the President has proposed that the Energy Security Corporation be established to undertake the responsibility of providing the Federal assistance necessary to encourage the deployment of large-scale synthetic fuels plants. The Energy Security Corporation will have four essential attributes not existent in executive branch agencies which are needed to accomplish the goal of establishing a large synthetic fuels industry:

- ° Focus. It will have the resources and charter to mobilize the broadest range of industrial resources toward the very specific goal of replacing 1.75 million barrels per day of imported oil with synthetic fuels and unconventional gas.

* See Appendix 1 at Tab I for a summary of the distribution, by synthetic fuel type, of this projected oil reduction of 1.75 million barrels per day which would result from the activities supported by the Energy Security Corporation.

- The ESC will have the authority at its establishment to sign contracts without seeking Congressional approval of each individual contract. This will enable the ESC to focus on expeditiously negotiating with firms in order to get the best technical and economic terms and conditions from the best qualified firms interested in undertaking synthetic fuel projects.
- ° Independence. The ESC will be outside the Federal bureaucracy and thus free of the restrictions that tend to impede slow down governmental organizations.
 - The Corporation will be able to recruit and retain some of the best economic, financial and technical talent in the world to conduct its business. Individuals with proven industrial track records with knowledge of markets, technology and how to make a profit will be devising strategies, assessing risks, negotiating contracts and overseeing progress. As a result the best talent in the nation will be focused on getting this new industry built.
 - Because of encumbering legislation and mandated procedures, DOE has, on the average, required 2 to 3 years to complete a major procurement.
- ° Flexibility and Accountability. The ESC will be able to offer a wide variety of market-oriented incentives--loans, loan guarantees, price guarantees and purchase guarantees--to supplement market signals but not to supplant them. Despite its independence and flexibility, the ESC will have strong accountability requirements. The ESC would be established with a good balance between flexibility to act and the accountability that it must have because of the Federal funds provided to it:
 - This flexibility will enable the ESC to select the best package of incentives on economic and market grounds tailored to each individual technology and corporate financial situation. This tailoring in such a complex financial setting would be impossible if each project were required to have its financial package approved by legislative action.
 - The history of our previous Government corporations provides the groundwork for the accountability and safeguards established for the Energy Security Corporation. Like its predecessors, the Directors of the Corporation would be appointed by the President. Their appointment would be with the approval of the United States Senate.
 - The amount of money that is available to the Corporation for investment would be provided to it in phases (the initial phase would be about \$22 billion) and would be subject to whatever review Congress might determine is appropriate.
 - The financial transactions of the Corporations would be subject to an annual audit and the Attorney General would be authorized to take the Corporation to court, if necessary, to ensure that it followed the law and its charter.

- Business Perspective. The ESC will have the independence and stability to act in a business-like manner. It will rely almost exclusively on private industry for actual deployment and operation of synthetic fuel plants (government ownership is limited to only three synthetic fuels projects).
 - The ESC will be able to choose the most economic and expeditious approach to achieving its goal of establishing a new synthetic fuel industry considering the complex market conditions in which such an industry will have to exist. It will not be needlessly hampered by other policymaking and policy implementing demands as would an executive branch agency.
 - The ESC would leave to the efficiency and problem solving ingenuity of private industry job of actually producing the synthetic fuels, i.e. private firms will be relied on to plan, construct and operate the plants. Even in the situations where the ESC would own a plant it would be constructed and operated by private firms under contract to the ESC.

Previous Government Corporations Similar to the Energy Security Corporation

The establishment of a Government corporation to address the problem of establishing a new industry is not unique in our history. Previous Presidents have proposed and prior Congresses have enacted law establishing corporations to meet other urgent national needs. For example:

- Immediately prior to the entry of the United States into World War I, the Congress established a corporation to construct and operate a fleet of ships to meet the serious shortages caused by wartime shipping needs and by the losses of ships to submarine attacks. The United States Shipping Board Emergency Fleet Corporation was appropriated over \$2.5 billion by Congress from _____ to _____ to carry out one of the largest national programs to that time.
- In 1918, Congress created the War Finance Corporation to furnish credit to industries necessary to the war effort. Following the War, the War Finance Corporation was also authorized to use its finance authority to promote foreign commerce.
- In 1932 Congress created the Reconstruction Finance Corporation to handle the credit and financial problems arising out of the economic depression of the 1930's. The Reconstruction Finance Corporation also financed a substantial portion of the costs of the preparation for and the conduct of World War II.
 - The Reconstruction Finance Corporation expired in 1959. Between 1932 and 1954, the Corporation borrowed from the Treasury and from the public a total of \$54.4 billion to provide financial assistance to agriculture, commerce and industry and later to aid the war effort. This \$54.4 billion would be about \$190 billion in today's dollars. The Corporation also established other short-term corporations to develop synthetic rubber; procure, stockpile and dispose of critical metals minerals; finance industrial facilities; and provide insurance protection against war risks.

- More recently, the Congress has established corporations to develop hydro-electric energy facilities, flood control, industrial development and navigations improvements (the Tennessee Valley Authority); to intercity railroad passenger service and to reorganize certain bankrupt railroads (AMTRAK); and to promote the commercial use of earth satellites (COMSAT).

The Energy Security Corporation that the President has proposed would be similar in structure to these other corporations; would have similar broad national goals; and would have funds available to accomplish its mission, eventually \$88 billion will be required, which is not an unprecedented amount.

Despite the Size and Independence of the ESC, It Will Not Result in the Government Dominating the Energy Industries

The massive effort that will be required of the ESC is not as large as the activities of some previous Government Corporations and will not be large enough to result in the Government's domination of the energy industry.

The funding of the ESC over its 12 year lifetime--the initial phase will be about \$22 billion and the total will eventually be \$88 billion--must be viewed in the context of the Nation's total spending on energy production and conservation, as illustrated by the following estimates:

- \$47 billion was spent in 1977 alone by the Nation's energy producing industries on investments in new plant and equipment to find, produce and deliver energy more efficiently.
- Some \$2 billion per year was being spent by homeowners in the same year for insulation, storm doors, and windows and other investments to conserve energy.

As this illustrative data indicates, when viewed in the context of the overall economy, the planned Government expenditure over 12 years will be only a small part, __%, of the national spending on energy during that period.

D. ESC Establishment, Structure and Powers

Establishment -- The Corporation will be an independent, government-sponsored, Congressionally chartered enterprise. It will be located outside the Executive Branch and will be independent of any government agency. It will, however, in accordance with the chartering statute, have certain powers and will be subject to certain limitations not typical of private corporations.

Structure

- A seven-person Board of Directors will govern the Corporation. Four of the Members of the Board shall be appointed by the President, subject to Senate confirmation. The Chairman will be designated by the President from among the four public members. The Chairman serves as full-time Chief Executive Officer of the Corporation and shall hold no other compensated position.
- The other three members of the Board shall be ex officio members. These are the Secretary of Energy, the Secretary of the Treasury, and the Secretary of the Interior, or their respective designees. These ex officio members shall have full voting rights.
- The Chairman and the other three public members serve staggered five-year terms. The Chairman serves at the pleasure of the President. The three other outside members are subject to removal only for cause.
- The power of the Corporation to act is vested in the Board except for such powers assigned to the Chairman by law. The Board will delegate substantial authority to the Chairman subject to its policy mandates. Certain major actions, as determined by the Board, would be reserved to the Board, including the approval of annual operating plans.
- The Board will adopt by-laws of the Corporation consistent with provisions of its legal charter.
- Public Directors and officer are subject to financial disclosure and to divestiture of investments or financial interests in conflict with their position with the Corporation.

Powers and Limitations (non-financial)

As an entity outside the Executive Branch, the powers and limitations established by law or Executive regulations governing Federal agencies do not apply to ESC except as specifically provided in the legislation, e.g., Civil Service, procurement, records management, administrative procedures, printing and distribution, etc. The Corporation has the power to:

- Establish offices or facilities (other than corporate headquarters) anywhere in the U.S.
- Make agreements and contracts with individuals and private or governmental entities.
- Represent itself or contract for representation in any judicial or other legal proceeding.
- The Corporation may seek the advice or recommendations of and information or data maintained by any Federal agency; provided that the Corporation agrees to protect any such data under the same terms of confidentiality agreed to by the agency.
- Title to any invention made in the course of the Corporation's activities shall vest in the Corporation. The Chairman may waive title and may reserve to the Corporation a royalty-free, non-exclusive license to use any such invention. The Corporation shall be deemed to be an agency of the United States for purposes of the patent laws.
- The Corporation shall require recipients of financial assistance to make a plan satisfactory to the Corporation for maximum feasible participation by small and disadvantaged businesses.

General -- The Corporation shall not be deemed to be an agency of the U.S. with respect to Federal law except as expressly provided, and shall be an agency of the U.S. with respect to all non-Federal law.

Financing Mechanisms

The financing mechanisms for the ESC are as follows:

- The Corporation may make direct loans. Interest bearing will be at a rate determined by the Corporation.
- The Corporation may commit to or enter into loan guarantees up to 75 percent of estimated total cost.
- The Corporation may commit to price guarantees on the basis of a sales price estimated at the time of commitment. It may be renegotiated if this is determined to be in the best interest of the Corporation.
- The Corporation may commit to purchase agreements at a price which could exceed the market price for imported oil if the Corporation finds that this is necessary to achieve the goals of the Corporation.

Each agreement or contract will specify, when it is signed, the maximum amount of payments that can be made under that contract. Open-ended contract liabilities are not authorized. All contracts of the Corporation to provide financial assistance, however, are general obligations of the U.S., backed by its full faith and credit.

Non-Financing Mechanisms

Other mechanisms available to the ESC are:

- The Corporation may construct, own and operate up to three projects. Any such projects will be built and operated by private firms under contract to the Corporation.
- The Corporation may construct, own and operate additional projects if the Chairman determines that the Corporation financing mechanisms would not be adequate to assure construction of a project determined to be necessary to meet the purposes of the Act.
- The Corporation may contract for the construction or operation of a project, sell the products of the project, and dispose of the project upon the terms and conditions as it may determine.
- The Corporation may acquire interests in real property necessary for its purposes by the exercise of eminent domain.

E. Summary of Available Synthetic Fuel and Unconventional Gas Technologies

Synthetic fuels can be produced from the Nation's vast resources of coal, oil shale, and biomass using technologies that are presently available. Many of these technologies have evolved from proven pre-World War II processes.

Synthetic fuel technologies available for deployment in the 1980's include:

- ° Production of coal-derived liquids by indirect liquefaction (gasification followed by liquefaction) using:
 - Fischer-Tropsch synthesis which is presently commercial in South Africa.
 - Methanol synthesis and its possible conversion to gasoline from coal gas using commercially available processes.
- ° Production of coal liquids by direct liquefaction technologies, such as the Solvent Refined Coal, H-Coal or Donor Solvent systems. Large direct liquefaction pilot and demonstration plants will be completed in the early 1980's.
- ° Biomass conversion to ethanol fuels via presently available fermentation-distillation processes and ultimately, to methanol via gasification.
- ° Extraction of oil from shale by surface retorting and modified in-situ retorting. These have been demonstrated at pilot plant scale and are ready for scaleup to commercial size.
- ° Production of natural gas from unconventional gas sources such as western "tight" sands and Appalachian Basin shales.

With minor exceptions, these technologies are not economic today. In addition, there are both technical and institutional risks that have prevented large-scale commercial application of these technologies in the past. With a national commitment the institutional risks can be minimized. The technology related risks that occur with the scaleup and deployment of any new chemical technology are certainly within our capability to solve in the time frame necessary to meet the President's goal.

A more detailed description of each technology, its history and the present state of its development is presented in Appendix 2: "Description and Status of available Synthetic Fuel and Unconventional Gas Technologies."

F

F. Budget Authorities, Corporation Financing and Cost Estimates

To encourage the development of domestic production of synthetic fuels, the Energy Security Corporation will be authorized to make direct loans, enter into loan guarantees, provide price and purchase guarantees, and construct as many as three synthetic fuels plants.

The Energy Security Corporation will be financed by the Energy Security Trust Fund. The Energy Security Trust Fund was proposed by the President to ensure that the proceeds of the Windfall Profits Tax would be used to reduce our dependence on imported oil by funding programs to improve the energy-efficiency of the American economy and to increase our capacity to supply energy needs from domestic resources.

Role of the ESC

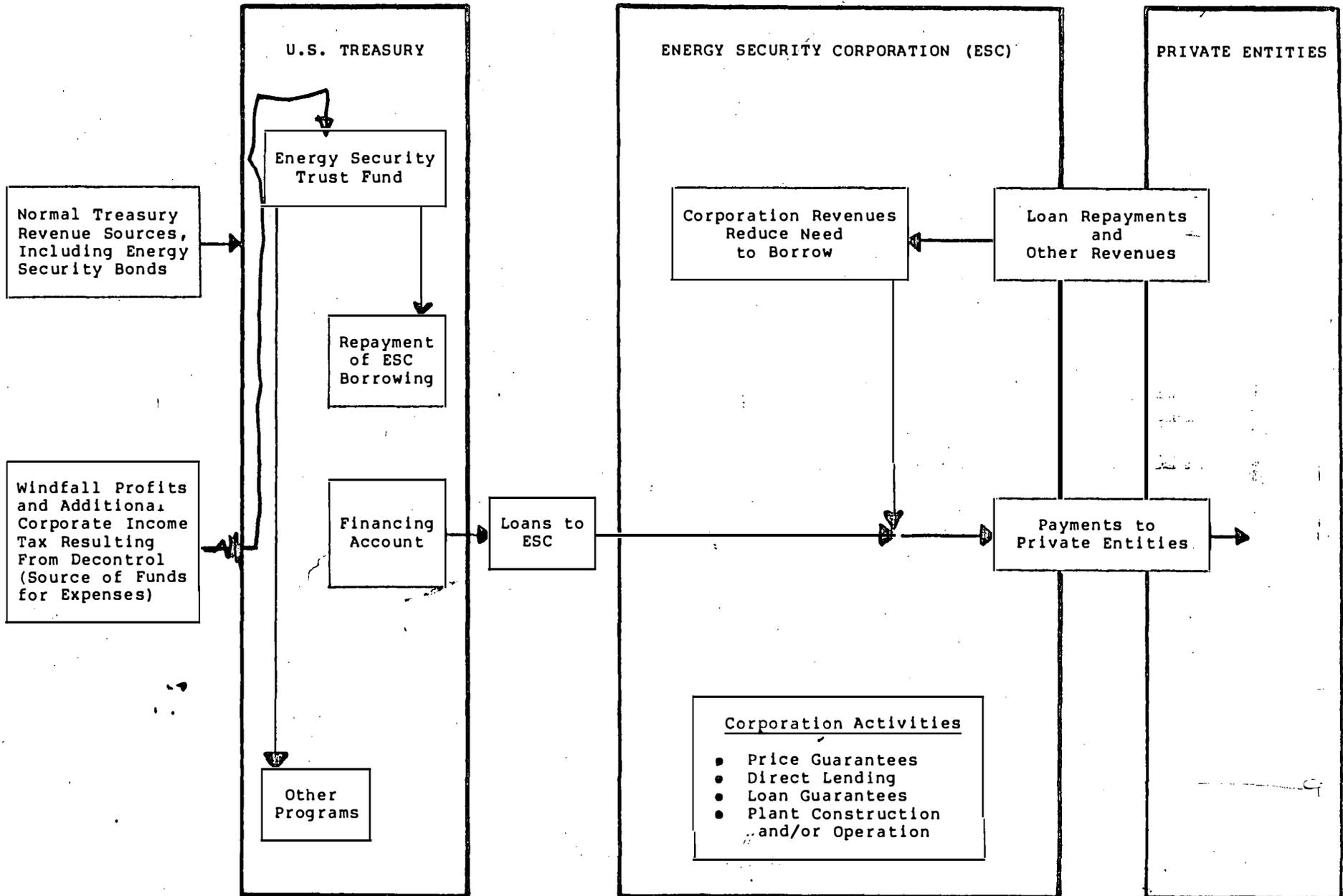
The major financial characteristics of the Energy Security Corporation are:

- The Corporation will be outside of the Executive Branch to permit it to act quickly and decisively and to work freely with the private sector to accomplish its objectives. However, as explained later, when loans are made from the Treasury to the ESC outlays will be recorded on the Federal Budget. Over time, the budget will reflect all of the payments made by the ESC.
- The Corporation will enter into contracts with and make payments to private sector entities that will engage in the production of synthetic fuels. The exhibit on the next page titled "Energy Security Program Financing Plan" displays the basic flow of finances between these private entities, the Energy Security Corporation, and the Federal Government (The U.S. Treasury).
- Any defaults on loans and obligations incurred under price guarantees or purchase agreements would be backed by the Corporation's ability to borrow from the Secretary of the Treasury up to the levels of funds appropriated by Congress.
- When the Corporation needs cash for payments, it may borrow (up to \$87.9 billion) from the Secretary of the Treasury--referred to on the exhibit as "Loans to ESC."
- Some of the Corporation's activities may generate revenues for the Corporation, shown on the exhibit by a flow of funds from private entities into the Corporation. The Corporation's need to borrow from the Treasury will be reduced by the amount of revenues received by the Corporation.

The Role of the U.S. Treasury

A total of \$88 billion will be appropriated to the Secretary of the Treasury at the time of establishment of the Corporation for the purpose of making loans to the ESC to cover ESC payments to private entities. Of this amount

ENERGY SECURITY PI AM FINANCING PLAN



\$21.9 billion will be made available in 1980 and \$22 billion will be made available in fiscal years 1981, 1982 and 1984. The President can decide whether it might be more productive to defer the \$22 billion increments beyond 1980.

- In addition, \$100 million will be appropriated in FY 1980 for the purchase of equity in the Energy Security Corporation and would be paid to the Corporation as it is requested. This will provide the ESC with available cash so that it can immediately begin operation.
- The remainder of the financial authority of the Corporation (\$87.9 billion) would be loaned to the Corporation by the Secretary of the Treasury when it is required to make payments to private entities.

The Role of the Energy Security Trust Fund

Loans to the Corporation from the Treasury will be repaid, with interest, by the Energy Security Trust Fund, as shown on the exhibit. A financing account will be established in Treasury to record the flow of funds to the Energy Security Corporation. When the lending from the Treasury to the Corporation occurs, budget outlays will be recorded.

The Energy Security Trust Fund will receive its funds from the windfall profits tax and additional corporate income taxes resulting from phased decontrol of oil prices. Funds received by the Energy Security Trust Fund will be reserved in amounts up to the limit of the funds appropriated to the Treasury for the ESC (proposed to reach a total of \$88 billion) to be available to repay the Corporation's borrowings from Treasury.

As the Corporation incurs contingent and noncontingent obligations as a result of signing contracts for price guarantees, purchase agreements, loan guarantees, and GOCO's, reservations will be recorded both on the Corporation's records and against its borrowing authority in the Energy Security Trust Fund in amounts equal to the maximum ESC liability under each contract. Funds in the Energy Security Fund will also be reserved, as available, in amounts equal to this maximum liability.

- The ESC will be required by the terms of the enabling statute to include in each contract a fixed liability limit, in an absolute dollar amount. This limit may be in the form of a "buy-out" clause, or such other forms as the ESC may select. The fixed limit from each contract, e.g., maximum liability, shall be deducted from the Corporation's total appropriated financial authority in order to calculate remaining resources available for further contracting.

Budgetary Treatment of ESC Activities

The Corporation itself will be considered outside of the Federal Budget. For that reason financing authority, outlays and receipts of the Corporation will not be shown directly in the totals of the President's Budget. However, all lending by the Secretary of Treasury to the Corporation and the purchase of corporate stock will be shown as costs, obligations and outlays in a budget account established by the Secretary of Treasury. As a result over time the

Federal Budget will reflect the total amount of Federal funds used by the ESC to encourage the development of synthetic fuels and unconventional gas. All necessary financial authority to cover the ESC activities would be provided to the Secretary of the Treasury in the form of an appropriation and advance appropriations at the time of establishment of the Corporation.

Energy Security Corporation Responsibilities and Limitations

The accountability and safeguards measures which the ESC will be subject to have been described in Sections C and D. However, some pertinent financial responsibilities of and limitations on the Corporation include:

- Reporting to the President and the Congress on its financial operations on an annual basis or more frequently, if necessary. This report shall be audited by the General Accounting Office and include an assessment of the accuracy of the financial records and reasonableness of the estimates of the Corporation's operations, assets, liabilities and use of Federal funds.
- An annual limitation on administrative expenses of \$35 million, adjusted for inflation. Administrative expenses would include personnel, space, consultants, computers, etc. Government-owned production facilities are not included in this limitation.

Finally, when the Corporation's charter expires, all of its assets will revert to the U.S. Government.

Budget Authority Estimates

The Administration believes that, based on conservative estimates, a maximum of \$88 billion will eventually be required by the Corporation to cover all of the liabilities the Corporation will incur in order to assist the development of synthetic fuels and unconventional gas. As indicated this would be provided by an advance appropriation and allocated in phases over a four year period. This total was arrived at based on an evaluation of:

- Future world oil prices.
- Estimated production costs of each fuel type.
- The construction of hypothetical schedules for design, construction and production of projects.
- Future inflation rates.

A great deal of uncertainty exists about the next 10 years and how each of the above variables will change.

The \$88 billion is estimated to be adequate to achieve the goal of 1.75 billion barrels per day of new production by about 1990. Another .75 million barrels per day of production will be achieved through tax credits for shale oil and unconventional gas.

Hypothetical Synthetic Fuels and Unconventional Gas Program

A program was developed to show the level of capital investment required for a hypothetical but plausible technology/capacity mix that would achieve 1.75 million barrels per day based on current estimates of plant costs and inflation rates of 8.1% in 1980, declining to 5.6% in 1984 as forecast in the mid-session review, and continuing thereafter at 5.6%. The total estimated capital at completion of all plants is \$110.4 billion in current dollars. The following shows the breakdown by fuel sources for this example:

<u>Capacity by Fuel Type</u>	<u>1990 Volume (MB/D)</u>	<u>Estimated Investment (Thousands of 1979 \$ per daily barrel of capacity)</u>	<u>Total Capital Invested (Billions of Current \$)</u>
Coal liquids	1.00	\$ 45	\$ 75.0
Biomass	0.10	25	\$ 75.0
Coal Gases	0.25	45	18.1
Oil Shale	0.15	25	5.9
Unconventional Gas	<u>0.25</u>	30	<u>11.4</u>
Total	1.75		\$110.4

The same program was priced out assuming price guarantees for each fuel based on current price per barrel estimates needed to encourage the production. Assuming 2.4% per year real oil price growth, the guarantees total about \$88 billion in current dollars. In 1979 dollars or real terms the estimate is _____ billion. The price per barrel of production assumptions are shown below:

	<u>Estimate Guarantee Price (1979 \$ per barrel)</u>
Coal liquids biomass	\$ 38
Coal gasification	36.50
Shale oil	32
Unconventional gas	30

The plant/capacity development schedule is shown as follows:

ENERGY SECURITY CORPORATION

HYPOTHETICAL DEPLOYMENT SCHEDULE
(THOUSAND BARREL PER DAY CRUDE OIL EQUIVALENT)

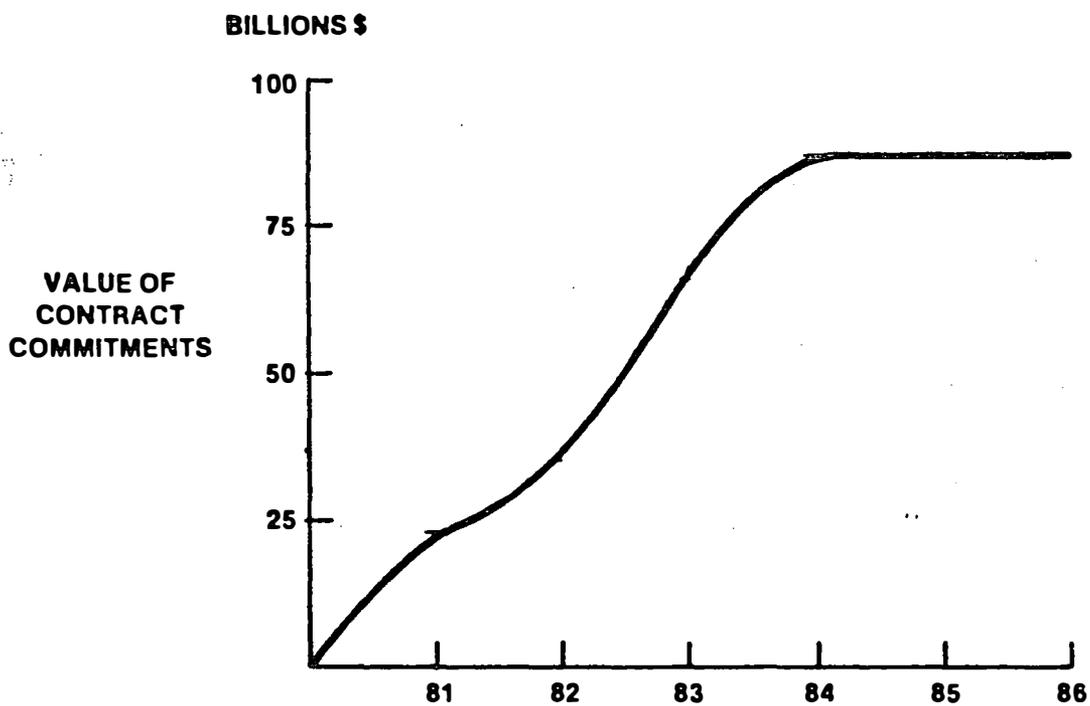
YEAR	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
COAL LIQUIDS	—	—	—	—	—	25	50	150	250	750	1000
SHALE OIL	—	—	—	—	—	—	50	50	50	50	150
COAL GASIFICATION	—	—	—	—	20	20	40	80	120	200	250
UNCONVENTIONAL GAS	—	25	50	75	100	125	150	175	200	225	250
BIOMASS	—	8	10	15	22	30	44	58	72	88	100

The Corporation must sign contracts well in advance of actual deployment. Shown below are estimates of when contracts would have to be signed by plant and the rate at which the \$88 billion would have to be obligated under the illustrative deployment schedule:

<u>Fuel Type</u>	<u>Contractual Agreement Number of Plants</u>		
	<u>80-81</u>	<u>82</u>	<u>83-84</u>
Coal liquids	3	2	15
Coal gasification	2	1	3
Shale Oil	1	-0-	2
Biomass	8	2	10*
Unconventional gas	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Total Corporation	<u>14</u>	<u>5</u>	<u>30</u>

* 13 additional biomass plants would be contracted after 1984.

CONTRACT COMMITMENT OF BUDGET AUTHORITY



The budget authority and outlays by fiscal year would be as follows:

Energy Security Corporation
Budget Estimates
(in billions of dollars)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>FY 1983</u>	<u>FY 1984</u>	<u>FY 1985-90</u>	<u>Total to 1990</u>
<u>Budget Authority</u>							
ESC Financing.....	21.9	22.0	22.0	-0-	22.0	-0-	87.9
Treasury Stock Purchase.....	<u>0.1</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>	<u>0.1</u>
Total B/A.....	22.0	22.0	22.0	-0-	22.0	-0-	88.0
<u>Budget Outlays</u>							
ESC Financing.....	-0-	0.1	0.1	0.2	0.3	24.2	24.9
Treasury Stock Purchase.....	<u>0.1</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>	<u>0.1</u>
Total B/O.....	0.1	0.1	0.1	0.2	0.3	24.2	25.0

Estimating the budget impacts of the Energy Security Corporation presents two unique difficulties:

- The ESC program is inherently undefined since a key feature of the proposal is the independence that the ESC will have in selecting-- in response to private sector proposals--the mix of technologies and financial mechanisms needed to achieve the 1.75 MB/D goal and to build a sound viable private sector industry by 1990.
- The obligations to be undertaken by the ESC will be sensitive to oil prices, production costs and inflation rates. The outlays associated with a price guarantee, for example, are extremely sensitive to oil prices that are not known now, and will not be known at the time of contracting. Production costs will depend on capital required to construct the plants and future operating costs.

Two features of the ESC proposal are important in evaluating the effects of these uncertainties.

- The ESC will be required to include in each contract a limit on contingent and noncontingent obligations which in the aggregate will not exceed, the ESC's total authority to borrow from the Treasury (\$88 billion). Under these circumstances, the ESC's private contractors will be assured that the ESC's obligations will be met, since the contractual liability limit will be appropriated in advance to the Secretary of the Treasury to cover loans to the Corporation.
- The ESC will not be able to undertake commitments (sign contracts) in excess of the \$88 billion, thereby effectively limiting the liability of the U.S. Government.

In summary, it is not possible to estimate accurately budget costs of the Corporation over the next 10 years. However, assumptions can be made about the future and limits can be set based on these assumptions. The \$88 billion limit on the ESC should be adequate to bring into production enough plants to meet the Corporation's established 1990 production capacity goals.

Relationship of tax credits to the Corporation

Tax credits for unconventional gas and shale oil are estimated to induce 750 thousand barrels per day of oil import reductions. In combination with the activities of the Corporation the total expected 1990 oil reduction from synthetic fuels, oil shale and unconventional gas is about 2.5 million barrels per day (MB/d) [1.75 MB/D from ESC activities plus 0.75 MB/D from these tax credits.] See Appendix 1 at Tab I for more details on these oil reductions.

Tax credits of \$3 per barrel for shale oil and 50¢ per thousand cubic feet for unconventional gas are proposed. Each tax credit is tied to world oil prices, and phases out at about \$28 per barrel. The budget cost of the

credits varies with world oil prices. If world oil prices remain at 1977 levels the cost would be \$20* billion. If world oil prices grow in real terms at 2.5% the cost would be \$1.2 billion.

The Corporation would be given the authority to provide additional incentives to achieve more production of shale oil and unconventional gas than the 750,000 barrel per day level achieved by the tax credits. Incentives equivalent to \$32 per barrel for shale and \$30 per barrel for gas are assumed in the estimates of the Corporation to achieve an additional production of 400,000 barrels per day by 1990; 250,000 from unconventional gas and 150,000 from shale oil.

However, projects which benefit from the tax credits will not be entitled to financial assistance from the Energy Security Corporation.

* Very rough OMB estimate pending availability of final DOE/Treasury estimates.

G. Economic Impacts and Capital Investment

The National Energy Act, oil decontrol, and the President's July 15 import reduction initiatives will move domestic energy prices to world levels and establish incentives to adapt our economy to the higher oil prices expected to prevail in the future. A flexible policy response, combined with the proposed low-income assistance, should ensure that this adaptation can be made without sharp economic dislocations and without undue hardships for the American public.

This section focuses exclusively on the Energy Security Corporation, analyzing the impact of the Corporation's activities. We assume here that all of the major pieces of the President's energy program--decontrol, the import limit, the Windfall Profits Tax, low-income assistance, various tax credits etc.--will be in place.

Impact on the Domestic Price of Energy

The activities of the ESC are expected to increase domestic energy production by the equivalent of 1.75 million barrels of oil per day by 1990. The impact of this additional output on the domestic price of the energy depends upon whether the unconstrained demand for oil imports is greater than or less than the limit proposed by the President:

- ° If demand for oil imports is less than the allowed ceiling, domestic energy prices after September 1981 will reflect world prices. The additional U.S. output of 1.75 million barrels per day (with a corresponding reduction in the demand for oil imports) could reduce world prices (and hence domestic prices as well) by acting as a restraining influence on the OPEC cartel pricing decisions. Even if the cost of synfuels production is above the world price, the consumer will only pay the world price; the difference will be made up by the direct or indirect subsidy paid the producer by the Energy Security Corporations.

Moreover, a lower oil import bill will mean a stronger dollar which will not only decrease the cost of other goods and services of the U.S. imports but which could also restrain OPEC crude oil price increases which are dollar denominated.

- ° If the demand for imports is greater than the limit, despite the additional production of domestic fuel, the domestic price of energy will have to rise above the world price in order to balance supply and demand. But in any event, the increase in domestic prices would be smaller than it would have been in the absence of this additional domestic supply.

The Investment Requirements

The Energy Security Corporation will have flexibility in determining which technologies it uses to meet its output goal. In the illustrative scenario outlined earlier, the Corporation would generate the equivalent of 1.0 mb/d in coal liquids, 0.1 mb/d from biomass, 0.15 mb/d from oil shale, and 0.25 mb/d each from coal gas and unconventional gas. The total direct capital cost required through 1990 to produce this output combination is estimated to be \$110 billion in nominal dollars. More than half of this total investment would take place in the three years, 1986 through 1988. The Energy Security Corporation itself may own up to three synfuels plants. The balance of the investment will come from the private sector.

While these investments indicate a major financial effort, they would still represent a relatively small share of our total national output or investment.

- Over the 11 years, 1980 through 1990, the ESC generated investments at this level would represent about 0.25 percent of our gross national product and would account for roughly 1-1/2 percent of our gross fixed investment.
- During the peak years of 1986 through 1988, this investment stream would absorb only 1/2 percent of GNP and equal 3 percent of projected gross fixed investment.
- Over the five years, 1973 through 1977, total energy sector investment in the U.S. is estimated to have been equal to fully 3 percent of GNP and 30 percent of private gross fixed investment.

While the actual capital cost of the ESC program is small in the context of broader macroeconomic aggregates, the ESC is only one part of the total energy program. The adjustment of our economic structure from one based on cheap energy to one based on realistic current and probable future energy prices will require a total capital investment--including everything from the homeowner buying storm windows to auto industry retooling and utility fuel conversion--several times that induced directly by the ESC. Although there will be offsetting factors, substantial resources will be required over the next decade to achieve this shift in our economic structure.

Budgetary Impacts and Financial Flows

The budget impact of the Energy Security Trust Fund and the Energy Security Corporation have been outlined above (Section F). While the precise stream of receipts and outlays will depend on the level of oil prices, it is expected that receipts will exceed outlays substantially through at least the middle of the next decade. Investments in ESC projects, in other energy production and in conservation are expected to be concentrated

heavily in this same period. The economic impact of the investment requirements of the Energy Security Corporation activity, or of the total energy security program, cannot be determined independent of assumptions regarding future decisions on aggregate demand policy and federal tax policy. But, as noted below, future policy can be constructed to accommodate the requirements of the program.

Crowding Out

Given real resource constraints, and given an aggregate demand policy which aims to keep those resources employed at a level consistent with an inflation target, ESC induced investment in synfuels and gas will mean that fewer real resources are available for consumption and/or other investments. By themselves, these initiatives would have the effect of increasing the total demand for capital at any given interest rate. This would put modest upward pressure on interest rates which would, in turn, tend to increase savings (reduce consumption) and eliminate those investments which otherwise would have been only marginally profitable.

The ESC program will not, however, occur in a vacuum. The extent to which investments required by the President's program displace consumption or "crowd out" other types of investment will be determined by what happens to our national savings rate. Fiscal and tax policy will be crucial determinants of saving behavior. There are a range of ways in which the government could act to maintain investment flows to other sectors. It could use budget policy to reduce its own borrowing requirements. It could increase the supply of funds available through tax credits or through provisions for accelerated depreciation. "Crowding out" of other investments is not inevitable. Whether or not it occurs will be determined by future policy decisions.

Impact on Inflation

As with the question of "crowding out," the impact of Corporation-induced investment on inflation cannot be determined independent of overall fiscal policy. Assuming few significant bottlenecks and given policies which achieve our aggregate demand objectives, a given amount of expenditure on plants to produce coal liquids is, in the short-run, no more or less inflationary than a given amount of expenditure on other goods and services. In the longer-run, investment expenditure is less inflationary than consumption expenditure because it increases output. To the extent that it crowds out investments which also would have increased productive capacity, the net effect cannot be determined a priori and will be determined by the actual pattern of future world oil prices.

As a general principle, these programs should not require an adjustment in our inflation and employment objectives. Since, however, movements in oil prices will affect both windfall profits tax receipts and Corporation outlays and since the stream of energy-related investments also cannot now be projected with any precision, the impact of these programs will have to be monitored carefully and taken fully into account in the ongoing determination of aggregate demand policy.

Potential for Component and Personnel Bottlenecks

(An assessment of potential bottlenecks is underway and will be completed shortly.)

Employment Impacts

The President's oil import reduction program will generate substantial additional direct employment in the energy sector, approximately 160,000 jobs per year between now and 1990. Over 90,000 of such jobs will be related to the Energy Security Corporation and the tax credits.

These jobs revolve around:

- ° new and expanded coal production, which will create over 20,000 new jobs per year;
- ° the creation of a coal liquids industry, which will generate approximately 37,000 new jobs per year;
- ° the emergence of oil shale as a fuel, which will create approximately, 11,000 new jobs per year.
- ° encouraging expanded production of unconventional gas, which will require an additional 27,000 new jobs per year; and
- ° the utilization of coal gasification, which will increase energy related employment by 8,000 per year.

Creation of a new synthetic fuels industry will represent both a major opportunity and challenge for U.S. labor. It will, for example, require a doubling in the annual growth rate for energy related construction jobs over the 1980-1990 time frame. It will require attention to potential bottlenecks, including:

- ° A possible shortage of skilled laborers required for the construction of complex synthetic fuels plants.
- ° A possible need for relocation of construction manpower to states experiencing skilled labor shortages.
- ° Delays caused by labor negotiating complexities.

TABLE ____

ESTIMATED CAPITAL INVESTMENT TO BE GENERATED BY THE ENERGY SECURITY CORPORATION
(Millions of 1979 \$)

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>Total</u>
Coal Liquids	45	167	630	1350	3307	5827	10327	12020	8410	2700	225	45,008
Shale	0	62	250	675	238	25	125	500	1350	475	50	3,750
Coal Gas	36	90	306	468	720	1170	1800	2313	2295	1557	495	11,250
Biomass	100	125	87	149	187	274	348	348	348	348	174	2,488
Unconventional Gas	0	750	750	750	750	750	750	750	750	750	750	7,500
Total (1979 \$)	181	1194	2023	3392	5202	8046	13350	15931	13153	5830	1694	69,996
Total (Nominal \$)	196	1383	2496	4440	7194	11747	20586	25936	22623	10587	3249	110,437

H. ENVIRONMENTAL CONSIDERATIONS
(WILL BE DISTRIBUTED LATER)

TABLE I: ESTIMATED IMPACT OF ADMINISTRATION
INITIATIVES TO REDUCE 1990 OIL IMPORTS

	<u>Savings (MMB/D)</u>
<u>IMPORT SAVINGS FROM PRESIDENTIAL PROGRAMS</u>	
◦ Estimate Import Savings from National Energy Act, including	2.5
-- Natural Gas Policy Act	
-- Fuel Use Act	
-- Energy Tax Act	
-- Public Utilities Regulatory Policy Act	
-- National Energy Conservation Policy Act	
◦ Estimated Import Savings from April 5 Presidential program, including	1.5
-- Phased Decontrol of Domestic Crude Oil	
-- June Solar Energy Message	
<u>Total Estimated Savings from Actions to Date</u>	<u>4.00</u>
◦ Estimated Import Savings from July 16 Initiative, see Table II*	<u>4.50</u>
Total Estimated Savings from President's Programs	8.50

*Some small portion of the projected savings from the July 16th Initiatives would occur anyway with higher future oil prices. The breakdown of the 4.5 MBD savings is on page 1 of Appendix 1.

TABLE II: SUMMARY OF PROJECTED 1990 OIL REDUCTION
FROM PRESIDENT'S PROPOSALS

<u>Proposal</u>	<u>Expected 1990 Oil Reduction</u> (million barrels of oil per day)
Energy Security Corporation (ESC) Activities:	
° Synthetic Liquid and Biomass	1.10
° Coal Gasification	0.25
° Oil Shale	0.15
° Unconventional Gas	<u>0.25</u>
Subtotal ESC Activities	1.75
Tax Credits:	
° Oil Shale	0.25
° Unconventional Gas	<u>0.50</u>
Subtotal Tax Credits	<u>0.75</u>
Total Synthetic Fuels and Unconventional Gas	2.50
Heavy Oil	0.50
Conversion of Utility Oil Plants	0.75
Residential/Commercial Conservation	0.50
Mass Transit and Auto Efficiency	<u>0.25</u>
Total Oil Reduction	4.50

J. APPENDIX 2: Description and Status of Available Synthetic Fuel and Unconventional Gas Technologies

Introduction

Technologies are presently available which will allow construction of synthetic fuel plants to begin in the early 1980's. There are a number of risks, both technical and institutional, associated with building commercial sized plants in the U.S. However, the technology related risks which may occur are well within our capability to solve within the time frame necessary to meet the President's goal. In most cases the technologies have already been demonstrated at or near commercial scale. For other technologies large pilot plants or demonstration plants will have been built and operated by the time commercial sized plants are constructed in the late 1980's.

Coal Liquids

During World War II Germany produced a majority of its aviation gasoline from coal. Both of the pre-World War II technologies, the catalytic hydrogenation of coal using Bergius process (direct liquefaction) and indirect conversion using Fischer-Tropsch synthesis have been improved upon, but in recent years the production of liquid hydrocarbons from coal has been commercially demonstrated in only a few projects throughout the world. These two processes are the progenitors of present day coal liquefaction technology and represent the two major process paths - direct and indirect liquefaction - for producing coal liquids.

Indirect liquefaction processes include three major process steps:

- First, coal is gasified with oxygen and steam to produce a synthesis gas (a mixture of carbon monoxide and hydrogen). At least three gasification processes available on the commercial market are suitable for synthesis gas production.
- Next, the raw synthesis gas is freed of impurities, especially particulates, sulfur, and nitrogen. Again commercial processes are available on the commercial market for this step.
- Finally, purified synthesis gas is converted to clean liquid fuels by contacting it with a catalyst. The nature of the liquids produced depends on the catalyst.

Although some of these process steps are available on the commercial market, they have never been linked together in the U.S. at scale required for a commercial coal liquids plant.

Two classes of liquid fuels may be produced using indirect liquefaction:

- Fischer-Tropsch liquids have been produced commercially by SASOL in South Africa since 1960. Both American SYNTHOL and German ARGE Fischer-Tropsch processes are used at SASOL. The ARGE process uses a precipitated iron catalyst and produces essentially straight-chain

hydrocarbons and small amounts of gasoline. The SYNTHOL process produces mostly gasoline and light olefines such as ethylene and propylene. Fischer-Tropsch liquids can be refined to a slate of clean liquid fuels including gasoline, diesel fuel, fuel gas and chemicals.

- Methanol is another liquid product which can be produced from coal derived synthesis gas by using a different catalyst. Synthesis gas from coal is produced in at least a dozen countries including methanol from coal in South Africa. The U.S. produces about 6 billion pounds/year of methanol from synthesis gas. However, the synthesis gas is derived from oil or natural gas rather than coal.

Methanol and Fisher-Tropsch plants would probably be the first commercial coal liquids facilities to be built under an accelerated synfuels program because of their technical readiness. Assuming a 5-year planning and construction period the first such plant could come on line in 1985. Additional plants would be completed in the later 1980's using existing proved commercial technologies. However, it is impossible to determine at this time which technologies and which projects will eventually be funded by the ESC.

While methanol can be blended with gasoline or used directly as a stationary turbine fuel it can also be converted to high octane gasoline using the Mobil methanol to gasoline process. The Mobil M-gasoline process was demonstrated in a 4 bbl/day DOE supported pilot plant and DOE may participate in a 100 bbl/day project to demonstrate an improved version of this process. It is expected that the M-gasoline process will be ready for commercial plants which could be completed before 1990.

Direct liquefaction can also produce coal derived liquids using the following major process steps:

- First, coal is suspended in a solvent, and contacted with hydrogen at 750°-900°F and about 500 to 1000 psi.
- Next, the liquid product is separated from the solid residue which is composed of the ash or mineral matter originally present in the coal, and any unreacted coal which can be recycled.
- The liquids produced can be burned directly as boiler fuels or upgraded with additional processing and cost to a premium quality refinery feed.

The DOE is supporting development of three major variants of the direct liquefaction technology: Solvent Refined Coal, Exxon Donor Solvent, and H-Coal. Large scale pilot plants are currently under construction for the H-Coal and donor solvent processes and two commercial module demonstration plants are expected to be constructed using the SRC process. Given current activities in direct liquefaction the following deployment schedule is possible:

- 1980-1984 - Complete construction and operation of existing pilot and demonstration plants.

- 1985-1986 - Begin construction of commercial sized plants using results from pilot and demonstration plants.
- 1989-1990 - Complete commercial plant construction and begin operation.

Coal Gasification

Coal gasification technology is well known with hundreds of commercial gasifiers in operation throughout the world. In most medium Btu gasification processes coal is reacted with oxygen and steam to produce a gas with a heating value between one quarter and one half that of natural gas. Many proven processes are available including:

- Lurgi, primarily useful for non-caking Western coal.
- Winkler, primarily useful for reactive American lignites.
- Koppers-Totzek, primarily useful for caking Eastern coals.

The gasification step and its combination with gas conditioning processes are based on over 40 years of continuous development work and experience with a large number of gasifiers throughout the world.

Conversion of medium Btu gas to pipeline quality (high Btu gas) requires an additional step - methanation. There has been no commercial scale methanation of coal gas but there is a high degree of technical confidence in this step based on pilot plant test programs and commercial production of synthetic natural gas (SNG) from naphtha.

A number of commercial high Btu coal gasification plants have been designed and are ready for construction by the private sector although regulatory uncertainties and financing constraints are preventing immediate implementation.

Newer designs which are expected to more efficiently gasify a broad range of domestic coals are also ready for technical demonstration. Some examples are Cogas, Slagging Lurgi, and Texaco processes.

Given the advanced status of coal gasification technology it is expected that the first high Btu gas production could occur in 1984 achieving a production rate of 250,000 barrels per day of oil equivalent by 1990.

Coal Synthetics Cost

Estimates of the costs of producing synthetic fuels from coal vary from \$27 to \$45 in 1979 dollars per barrel depending on the plant's product (liquid or gas), its location, and source and cost of coal. A \$38 per barrel (or barrel of crude oil equivalent in the case of gasification) average has been used for the purposes of budget estimates for the Energy Security Corporation. Capital requirements also vary by technology. A capital investment of \$45,000 (1979 dollars) per daily barrel of crude oil equivalent has been used for budget estimating purposes.

Shale Oil

The richest U.S. oil shale deposits and the focal point of any oil shale development will occur in the Piceance Creek Basin in northwest Colorado and the adjoining Uinta Basin in Utah.

Two different techniques for producing shale oil are currently being developed: (1) mining with surface retorting (heating) of the shale and (2) heating crushed shale rock underground, known as "in-situ" retorting. Five major private shale oil projects in the Western United States are currently in various stages of planning or development in Colorado and Utah.

The surface retorting technologies that are most advanced and of the greatest interest to prospective U.S. oil shale developers are:

- The Oil Shale Company solid-to-solid heat transfer retort (TOSCO II).
- The Union Oil Company gas retort (Union Retort B).
- The Paraho gas retort.
- The Lurgi-Ruhrgas system.

These technologies have been demonstrated on oil shale (except the Lurgi process) at a pilot plant scale. In addition the multimineral approach proposed by Superior Oil Company, now being tested at a pilot plant scale may be of great importance to recover all of the mineral values in certain portions of the oil shale basins.

A modified in-situ process has been demonstrated by Occidental Petroleum in Colorado and two large commercial sized mines to provide shale for the modified in-situ technologies are currently being constructed on Federal lease tracts.

The first commercial scale oil shale facilities could be in production by the mid-1980's.

Oil Shale Cost

Production of shale liquids is expected to be less costly than coal liquids, with an estimated cost of \$25 to \$35 per barrel. These expected costs suggest that shale oil will be one of the first synthetic liquid fuel to compete economically with imported oil. It is expected that many companies need only the encouragement provided by the proposed \$3 per barrel tax credit to begin construction and operation of major oil shale production facilities. Oil shale projects receiving any assistance from the Corporation would not be eligible for the oil shale tax credit.

Biomass

Alcohol fuels - ethanol and methanol - can supplement oil supplies as a motor fuel extender and octane improver.

Production of ethanol by fermentation and distillation is an old art. Technology is available and is presently being used to produce ethanol which is blended with gasoline to produce gasohol - a fuel which is rapidly gaining acceptance. Ongoing R&D seeks to expand the applicability of this technology to biomass feedstocks of cellulosic origin (e.g., wood waste). The cellulose is hydrolyzed to a fermentable intermediate, which is converted to ethanol in the usual manner.

Production of methanol from biomass is achieved in a two-step process in which the biomass is first converted to synthesis gas which is then catalytically converted to methanol using commercial technology such as that available from ICI or du Pont. Large quantities of methanol could find an immediate market for stationary gas turbines in utility and industrial applications.

It is expected that in the future wood wastes could be the principal biomass feedstocks because of their availability and relatively low cost. Other biomass feedstocks such as crop residues and municipal solid waste could also be used at somewhat higher costs. Producing alcohol fuel from a renewable source such as biomass can also help improve the environment by converting waste materials to synfuel products.

Alcohol Costs

Because the technology is proven, alcohol producing plants could be designed and in production in 3 to 4 years. Such plants would optimally be much smaller than other synfuels plants having capacities not exceeding 3000 barrels per day. Capital requirements for an ethanol fermentation plant are estimated to be about \$25,000 per daily barrel of crude oil equivalent. A total contribution from this source can realistically be expected to be about 100,000 barrels per day of crude oil equivalent day by 1990.

Unconventional Gas

The term unconventional gas is used to describe natural gas produced from low permeability geologic formations. About 1 trillion cubic feet (5 percent of current domestic production) are currently produced from these unconventional sources - principally "tight gas" basins. The production potential of new supplies of unconventional gas is large (over 200 T CF by some estimates) and would come from a variety of sources such as near-conventional geologic formations in the Western "tight gas" basins to undefined resources in geopressed aquifers, i.e. water bearing geologic formations. The potential unconventional gas resource targets consist of:

- "Tight" or low permeability gas basins in the Rocky Mountain Region, the Northern Great Plains and the Southeast.
- Devonian shales of the Appalachian Basin.
- Methane from geopressed aquifers in the Gulf of Mexico area.
- Methane from coal seams.

The technology involved in the recovery of gas from tight sands and Devonian shales uses various fracturing techniques to expand the natural fractures in the gas holding formations. Methods of drilling deviated wells to bring more gas producing area into contact with the producing well have also been used to develop low permeability gas bearing formations and coal seams. Geopressured methane offers significant potential because of a potentially large resource base. However, additional research to better characterize this resource and solve certain technical development and cost reduction problems is needed. It is expected that these problems will be largely solved by 1990, although significant production from this resource is not assumed in the Energy Security Program.

Wells producing commercial quantities of unconventional gas can be drilled and developed in less than one year. Several thousand wells are needed to achieve the unconventional gas production goals the President has established.