HRD 110746

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

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B-178205

OCTOBER 26, 1979

HSE02303

The Honorable John D. Dingell
Chairman, Subcommittee on
Energy and Power
Committee on Interstate and
Foreign Commerce
House of Representatives

Subject: Alternatives for reducing oil imports by 1990; and current status of recommendations in a 1976 GAO report (EMD-80-18)

Dear Mr. Chairman:

This is in response to your letter dated October 9, 1979, in which you requested an analysis of alternatives for reducing oil imports by 1990 and an evaluation of the current status of the recommendations presented in our August 24, 1976, report entitled "An Evaluation of Proposed Federal Assistance for Financing Commercialization of Emerging Energy Technologies," EMD-76-10.

ALTERNATIVE MECHANISMS FOR REDUCING OIL IMPORTS BY 1990

The Nation is both politically and economically vulnerable to imported oil disruptions and we believe it should move to develop energy alternatives. These alternatives should constitute a balanced energy program including conservation, renewable energy sources, conventional oil and gas, coal, and synthetic fuels. Recently, we reported to the Chairman, Subcommittee on Synthetic Fuels, Senate Committee on the Budget on (1) our perspectives on a balanced energy program and (2) examples of some options to reduce oil imports. Enclosed are copies of those reports. The following summarizes our positions on those issues.

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Conservation and Renewable Energy

We believe that conservation and renewables should take a very high priority in the Nation's effort to reduce oil imports. They are likely to be considerably cheaper on a

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Letter Report 507627

per-barrel-of-oil basis than some other alternatives, will have a surer and more rapid payoff, and can be implemented on every level, from individual citizens to businesses, local governments, the Federal Government, and even international bodies.

Conservation and renewables would include all investments in energy efficiency improvements, along with technologically ready renewables, and passive solar construction, which are being kept off the market for economic reasons. A way of stimulating conservation and renewable energy investments would be to subsidize them on a per-barrel-of-oil-saved basis up to the level of the subsidy for synthetic fuels.

Conservation

Earlier this year we described a possible methodology for making decisions on specific national energy conservation policies and programs. 1/ In addition, we reemphasized our view that the Federal Government needs to take a more active leadership role in moving the Nation toward using energy more efficiently.

Selecting a specific set of strategies to achieve greater energy conservation or to reduce the level of crude oil imports is a difficult and complex task. Contributing to this task is the continuing reluctance of the administration to establish specific energy conservation goals which would reflect a more acceptable future energy supply and demand situation for the Nation. It is somewhat incongrous to decide what specific actions should be undertaken without a better understanding of our energy conservation goals.

Should the administration fail to develop and effectively implement a comprehensive energy conservation plan, we can expect increasingly severe supply disruptions and a diminishing ability of the Nation to effectively deal with them.

1/"A Framework for Developing a National Energy Conservation Program," EMD-79-76, July 31, 1979, report to the Chairman, Subcommittee on Energy, Joint Economic Committee.

We believe one issue deserves special attention in the continuing effort to achieve greater levels of energy conservation--the development of individual consumer habits and attitudes which result in more efficient personal consumption of energy. It appears that a conscientious concerted effort by the public to change their energy consumption habits and behavior has not yet taken place. Convincing the public to make such changes--development of an energy conservation ethic--is probably the most important challenge facing the Federal Government in the energy conservation area. The Government needs to clearly and convincingly describe the Nation's energy problem to the public and must promote energy conservation by providing positive economic benefits in an environment of rising energy prices. Accomplishing this objective will, in our view, provide the foundation necessary to achieve other energy conservation opportunities.

Our July 31, 1979, report included a list of energy conservation opportunities and, in many cases, estimates of their potential energy savings. We also provided examples of the range of specific strategies which could be considered to achieve some of these opportunities. Our purpose was to illustrate the range of policy and program options which should be considered in developing a national energy conservation program.

Renewable energy

While the most revolutionary renewable energy technologies are still far from ready a number of renewable technologies have been proven feasible and either are, or are expected to be, economically attractive to consumers within the next decade. These include

--hydro/geothermal electric systems,

--hydro/geothermal direct heating systems,

--low-head hydroelectric systems,

--small wind energy systems,

--urban waste conversion plants,

--wood burning,

--conversion of biomass wastes into alcohol,

--solar agricultural and process heating systems,

--solar water heating and/or space heating systems, and

--passive solar heating techniques.

In general, the widespread use of renewable technologies now is limited by a number of constraints such as high initial cost, long payback periods, and technical risk. For example, in a recent report we noted that although numerous Federal and State programs are underway, no concerted, coordinated effort to commercialize solar heating exists. 1/ Solar heating devices can cost anywhere from $1,000 to more than $500,000 for large commercial applications. In addition to these costs, a conventional backup system is usually needed. As a result buyers are often reluctant to make a solar investment. The incentives provided by the States and Federal Government thus far to commercialize solar heating systems have, in many cases, been too small or have not yet proven effective in overcoming high initial capital costs.

Conventional oil and gas

There are also a number of governmental programs in conventional oil and gas which could displace oil imports. For example, the administration is currently phasing out domestic oil price controls by 1981. Our recent report on oil import policies 2/ concludes that overall, phased oil price decontrol appears to result in the best combination of costs and benefits to the Nation. Phased decontrol is more effective at reducing oil imports by stimulating domestic production and helping to dampen the Nation's demand for energy, while avoiding the higher economic costs which would be imposed by the establishment of oil import quotas.

Based on a simulation of the administration's decontrol scenario, phased decontrol will not effect oil consumption

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1/"Commercializing Solar Heating: A National Strategy Needed," EMD-79-19, July 1979.

2/"The Economic and Energy Effects of Alternative Oil Import Policies," EMD-79-78, July 24, 1979.

in 1979, but by 1990 imports would be reduced by about 1.6 million barrels per day, 1.0 million barrels per day of which represents a slower decline of domestic production than would otherwise occur. In addition, the President has recently decontrolled heavy oil prices, which would affect the potential contribution of heavy oil production.

Conventional natural gas is also under phased decontrol. It is hoped that by taking this action natural gas supplies will increase or at least its rate of decline will be reduced. However, the actual impact of the phased decontrol has yet to be determined.

Actions aimed at developing unconventional natural gas sources are also taking place. The price of unconventional gas sources except tight sands will be decontrolled by the Natural Gas Policy Act of 1978 in about November of this year. We believe that unconventional gas production can contribute increasing portions of the Nation's gas supplies in the future, even though overall domestic gas supply is not expected to increase significantly.

Coal

Another energy option which should be pursued is oil import reductions through conversion to coal. Coal conversion actions will reduce the quantity of oil and gas used under industry and utility boilers, and measures in this area could be extended past those now contained in the Powerplant and Industrial Fuel Use Act of 1978. The President's Commission on Coal, for example, has examined a number of options in this area. The Commission's interim report of July 12, 1979, estimates that 2.2 million barrels of oil per day can be saved through various conversion measures, substantially more than the administration proposes. The administration proposes to cut utility oil usage 50 percent by 1990, for a savings of 750,000 barrels of oil per day.

Synthetic fuels

Another energy alternative to imported oil is synthetic fuels. Unfortunately, a synthetic fuels industry will, at least in the medium term, be expensive. Also, because it will be complex, capital intensive, and technologically novel, significant synthetic fuels production should not be

expected until the late 1980s. Nonetheless, since oil crises will almost certainly recur and may become even more serious in the 1980s, 1990s, and beyond, a national commitment to reducing our dependence is warranted, and synthetic fuels should play a part. In this regard, every effort should be made to establish the atmosphere to encourage private industry to invest in and operate the plants.

The Fact Sheet explaining the administration's recent energy proposals states that a determination will be made of the specific mix of the sources and technologies which will be used to meet the 2.5 million barrels a day (MMB/D) goal. It does, however, provide an "illustrative" division of sources. It indicates that 1 to 1.5 MMB/D might come from coal, 0.4 MMB/D from oil shale, between 0.5 and 1.0 MMB/D from unconventional gas, and 0.1 MMB/D from biomass.

Producing 1.0 to 1.5 MMB/D of synthetic fuels from coal by 1990 may be possible, but preliminary information from knowledgeable industry contacts suggests that even with a crash program, we should count on closer to 1.0 MMB/D. There are considerable problems involved in building the 15-25 plants that would be required as well as mining the coal needed to feed the plants. We would note that the entire World War II German synthetic fuel program produced only about 70 MB/D, about equal to one such plant. Getting the additional capital, manpower and equipment that would be required for both aspects of the program simultaneously could be a major obstacle.

Then there is the question of the readiness of technology. There are two proven coal technologies operating elsewhere in the world: a European coal gasification system, and the South African "SASOL" indirect coal liquefaction method. The length of time required to design and build such large plants indicates that these will probably be the two technologies which can be in operation by 1990, unless we accept the higher risk associated with unproven new technologies. There is a danger, however, of getting overcommitted to an early, inefficient technology.

Flexibility must be maintained to adopt to new technologies as they become available. A number of "second generation" coal technologies and several approaches to oil shale, now under development, could be demonstrated by about

the mid 1980s. It is widely believed that some of these will offer more efficient and less expensive production than the technologies presently ready. Reasonable production targets should be established to maintain the flexibility to adapt to new and more efficient technologies as they become available, and to avoid an overcommitment to the existing technologies.

Proven biomass technologies, already producing substitute fuels in commercial operations in the United States, could be expanded well beyond 100,000 barrels a day by 1990. Energy production from municipal solid wastes are the most practical. 1/

Since synthetic fuels are not expected to be competitive with conventional oil and gas, incentives may be necessary to achieve commercialization. As a general rule, the subsidies would be needed until the OPEC-determined world price of oil was slightly above synthetic oil production costs. If the two figures approach each other, subsidies could be progressively reduced.

CONSISTENCY OF GAO'S CURRENT OBSERVATIONS WITH PRIOR RECOMMENDATIONS

You also requested that we evaluate the current status of recommendations presented in our August 1976 report "An Evaluation of Proposed Federal Assistance for Commercialization of Emerging Energy Technologies, " EMD-76-10. That report contains recommendations on conservation, solar heating, municipal waste combustion, tertiary oil recovery, and synthetic fuels. As noted in the previous sections, we have, since 1976, in many cases issued reports to the Congress which have included more detailed recommendations regarding many of these areas. With the exception of the synthetic fuels area, our subsequent work involving these technologies has not uncovered any information which would affect the basic thrust of the earlier recommendations. Our position on Government financing of synthetic fuel efforts, while consistent when viewed in the context of

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1/"Conversion of Urban Waste to Energy: Developing and Introducing Alternative Fuels From Municipal Solid Waste," EMD-79-7, Feb. 28, 1979.

legislative objectives, requires some modification, as discussed below, due to the changed circumstances which have occurred since 1976.

GAO's August 1976 report, among other things, recommended that the Congress

> "Consider whether it is advisable to enact legislation which would at this time authorize Federal loan guarantees to builders of synthetic fuel plants, and consider instead directing ERDA to continue to expand its research and development to improve the technology and; in addition, construct and operate smaller plants of a size sufficient to meet its stated goal of obtaining socioeconomic, environmental, and regulatory information in a timely fashion."

The stated purpose of the synthetic fuels program at that time was to identify and resolve potential future socioeconomic, environmental, and regulatory impediments associated with constructing large commercial scale synthetic fuels plants before the synthetic fuels were needed to meet our Nation's energy needs.

Given this basic objective and the economic unattractiveness of first-generation synthetic fuels technology, we took the position that in lieu of providing Federal loan guarantees for billion dollar size "commercial" plants, efforts should be directed to research and development of improved synthetic fuels technologies and to meeting the objective of identifying and resolving socioeconomic, environmental, and regulatory problems. To meet this latter objective, it appeared possible to gain adequate information from smaller plants under Government control. At that time we also opposed financial assistance for commercialization until synthetic fuels had been proven viable through the approach advocated above.

The approach outlined in our 1976 report was less risky and perhaps less costly than its alternatives but also assumed that the Nation had time to pursue this path. We believe that if it had been expeditiously pursued, it could have provided the building blocks needed for a synthetic fuels industry. Unfortunately, not much has happened since 1976 to lay the ground work for this industry and

the potential problems in liquid fuels, including our dependence on foreign sources, has worsened. Time is becoming more critical than ever, and some new initiatives appear needed to expedite development of alternatives to imported oil. The stated primary purpose of a synthetic fuels program has now shifted from gathering energy information to one of energy production. We believe such an effort is appropriate within the context of an overall national energy policy. The Government's role in synthetic fuels today, we believe, should be one in which every effort should be made to encourage industry to invest in and operate plants. In establishing a synthetic fuels role, however, care must be taken to pace development in a way that will not overcommit us to an early, inefficient technology. This could be done, in our view, by establishing a more modest goal than the administrations and by demonstrating production of synthetic fuels using several technologies. In doing so, risks and costs could be reduced while still maximizing the value of the program. This effort could also find definitive answers to economic, environmental, socioeconomic, technical,and other questions which persist concerning synthetic fuels production. The experience and information gained through this program would better facilitate the selection of technologies for further commercialization and the development of updated goals for the contribution synthetic fuels can make in solving our energy problems.

As for financial assistance, we continue to believe that a more certain way to assure synthetic fuels production is to provide price guarantees coupled with purchase guarantees. Supporters of loan guarantees argue that the program is costless in the absence of a default. If the borrower repays the loan, the budgetary impact would be limited to administrative expenses. In the case of default, however, the liability to the Government becomes substantial--possibly greater than any other subsidy method. Furthermore, with very few but very large loans, it is difficult to establish an adequate default reserve. The 1-percent per annum reserve the administration advocates would probably be insufficient to cover the default of one coal liquefaction or gasification plant. There is also the cost of diverting capital to the guaranteed investment from other areas which may be more productive and would have been chosen in the absence of the guarantee.

Loans and loan guarantees may not induce private firms to produce synthetic fuels. After all, at current prices a

firm would have no reason to think that anyone would buy synthetic fuels without some sort of price subsidy or purchase guarantee, inasmuch as conventional OPEC or Mexican oil will most likely be cheaper, at least in the near future. And, a purchase guarantee would not work without a price guarantee. This could be very costly, although the Government could solicit proposals to supply the synthetic fuels at the lowest possible price. One problem is uncertainty. Firms will not actually know in advance how much synthetic fuels production will cost and may want a cost-plus contract. Given the potential for cost overruns, cost-plus contracts should be avoided if at all possible.

We trust that this information meets your needs. We will contact your office shortly to arrange for further distribution of this report and would be pleased to meet with your staff to discuss the matters presented should you so desire.

Sincerely yours,

Comptroller General
of the United States

Enclosures - 2

ENCLOSURE I

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-178205

July 27, 1979

The Honorable Gary Hart
Chairman, Subcommittee on
Synthetic Fuels
Committee on the Budget
United States Senate

Dear Senator Hart:

This letter is in response to the questions raised in your letter of July 19, 1979. You requested our views on various aspects of proposals to accelerate synthetic fuel development. The questions posed were:

--Whether synthetic fuel development should be an on- or off-budget activity.

--Whether the various proposals would develop a competitive synthetic fuels industry.

--Whether such an industry would need Federal subsidies or other forms of Federal regulation and intervention to make it successful.

--What are appropriate national goals for synthetic fuel production and the appropriate technical means to achieve those goals.

--What financial mechanisms might be most helpful in achieving those goals.

Because you asked for a very quick response, this letter of necessity does not represent an indepth analysis of all aspects of your questions. Nonetheless, we have been concerned with many of the issues raised for some time and hope that the following comments may be of some value to you.

Before addressing the five specific questions you raised, we would like to offer for your consideration some comments on two other basic issues: the importance of a significant effort to develop synthetic fuels and the need for a separate organization to encourage that development.

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The events of 1979 and the earlier embargo of 1973-74 have amply demonstrated our dependence on imported oil and the threats that dependence poses to our national security and economic health. While there is clearly a significant long-term energy crisis, these events point out that the most immediate and possibly most serious aspect of that crisis is in liquid fuel. Furthermore, the experience of the past six years, while encouraging in some respects, has not reduced our vulnerability to damage caused by oil price increases and supply disruptions. Our work in the energy area leads us to believe that the United States will never be able to produce conventional oil in anything like the quantities needed to substantially insulate ourselves from the OPEC-dominated world oil market. For that reason, we believe it important that the United States move to develop alternatives to imported oil. Such an effort should be placed in the context of overall national energy policy and synfuels should play a part.

The four bills you asked us to comment on, along with the Administration's recent proposal, all intend to develop a synthetic fuels industry through a variety of mechanisms such as loans, loan guarantees, price guarantees and construction of plants by the Government. In our view, every effort should be made to establish the atmosphere to encourage private industry to invest in and operate the plants.

Unfortunately, such an industry will, at least in the medium term, be expensive. Also, because it will be complex, capital intensive, and technologically novel, we will not see significant synthetic fuel production until the late 1980s. Nonetheless, since oil crises will almost certainly recur and may become ever more serious in the 1980s, 1990s, and beyond, a national commitment to reducing our dependence is warranted.

While synthetic fuel development is clearly an important and worthwhile national goal, we believe that conservation should take just as high or even a higher priority. Conservation is likely to be considerably cheaper on a per-barrel-of-oil basis, will have a surer and more rapid payoff, and can be implemented on every level, from individual citizens, up through businesses, local governments, and including the Federal Government, and even international bodies. These two emphases--synfuels to provide liquid fuels and feedstocks

ENCLOSURE I

for the medium to long term, and conservation both now and throughout the future--seem to us to provide both the decisive action and the balanced program the Nation needs. We should also keep in mind that our ultimate goal should be to move to renewable energy sources. Synthetic fuel development and even conservation should be integrated into that long-term goal. We discuss the issue of program balance more fully beginning on page 7.

Another basic issue is whether we need a separate entity charged with synfuel development and conservation. The Administration's proposal as well as three of the four bills your staff asked us to examine would authorize a separate corporation. We believe that such an entity may be appropriate for synfuel development, but not for conservation. The Administration's suggestion to establish an Energy Security Corporation--with several modifications which we suggest further on in this letter--seems to be a responsible way to promote synfuel development. This is not the case with conservation because many of the actions needed are only appropriate to Government (e.g., setting mileage standards, reform of building codes, various forms of mass transit, etc.). Furthermore, charging one body with two so disparate functions would probably result in its doing neither very well.

BUDGETARY STATUS

Your first question asked us to address whether a corporation should be on- or off-budget. The Administration's proposal would establish an off-budget corporation. The four bills you asked us to comment on would establish on-budget programs.

We have consistently taken a position against the establishment of off-budget agencies and programs. We have taken this position because off-budget agencies deprive the Congress of appropriate control and oversight. Off-budget funding short-circuits the normal authorization/appropriation process, making effective oversight difficult if not impossible. It would also insulate the corporation budget from competition with other areas worthy of Government funding. On the other hand, off-budget status would largely remove the corporation's deliberations from the political arena. It would enable the corporation to concentrate entirely on energy production rather than justifying itself and its activities to competing interests

promoting specific technologies and geographic areas. We note that, while the proposal would eliminate Congressional oversight once the Corporation is established, the Administration would maintain some degree of control through the apportionment process.

We would urge consideration of a middle ground through the use of on-budget multi-year funding, eliminating the uncertainty of annual appropriations but requiring periodic Congressional review, say every 2 or 3 years.

COMPETITIVENESS

Your question on whether these proposals would develop a competitive synfuels industry can be viewed from three complementary perspectives. First, synfuels would be in direct competition with conventional oil and gas. All observers agree that synfuels would be more expensive, hence the need for subsidies. Such subsidies could be needed indefinitely. Synfuels have always seemed slightly more expensive than conventional oil and this relationship may well continue. On the other hand, if the petroleum resource base is rapidly depleted, conventional oil costs may finally reach synfuel levels, eliminating the need for subsidies. There is no way to project this process reliably because it depends on how quickly synfuel costs can be reduced and also on the OPEC-determined world price of oil. This uncertainty could be dealt with by establishing a schedule for phasing out the subsidy or by periodic independent evaluation and adjustment of the subsidy. A fixed phaseout schedule has the virtue of certainty, but may damage the synfuel industry if oil prices do not rise at the expected rate. A periodic evaluation program does not guarantee when subsidies will end, but should keep the subsidy level as low as practicable.

Another aspect of competition is between firms engaged in synfuel production. If Government is the prospective purchaser of the fuel, it can create competition of one kind by soliciting bids for synfuel contracts or price or purchase guarantees. Whether there would be meaningful competition among firms selling synfuel in the open market is a more difficult question. The size of needed investment may bar all but the largest firms from entry into the synthetic fuel industry. Some firms may develop an overwhelming technical advantage. When encouraging development of such a large industry, it is clearly incumbent on the

Federal Government to keep alert to possible anti-competitive practices.

The third perspective on competition is how a synfuels industry may affect related industries, especially coal. In a recent report 1/ we found that the coal industry was workably competitive and that coal resource ownership by oil companies did not give the oil companies undue market power. One of the underlying reasons for this conclusion was that oil and coal are substitutable in very few uses. Therefore, oil companies could not exercise control of oil price by manipulating coal production or vice versa. However, once coal is liquified or gasified, it is obviously a close substitute for conventional oil and gas. Thus, if coal-based synfuels are to become a prominent part of future energy supply, closer attention should be paid to oil company involvement in coal reserve ownership and production.

NEED FOR FEDERAL SUBSIDIES

Your questions concerning the need for Federal subsidies or other forms of market intervention are very closely related. Since the most important types of Federal intervention being contemplated for synthetic fuels are subsidies, we will comment on these two questions simultaneously.

As we pointed out in answer to the previous question, synfuels are not competitive with conventional oil and will not be so for the foreseeable future. This is even truer for OPEC oil, whose costs of production are reportedly much lower than for domestic crude. As a general rule, subsidies would be needed until the OPEC-determined world price of oil was slightly above synthetic oil production costs. If these two figures approach each other, subsidies could be progressively reduced.

Ironically, a successful synfuel production program could have the effect of making subsidies for synfuels necessary for quite a long time. This is because a successful program would reduce U.S. demand for OPEC oil, making the world market softer and keeping OPEC prices

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1/"The State of Competition in the Coal Industry", EMD-79-22, Dec. 30, 1977.

lower than they would have otherwise been. If this were the case, continuing synfuel subsidies would be a sign of success, not failure.

GOALS OF THE PROGRAM

You also asked us to address the national goals that the President and others seek to achieve and the various means to achieve them. The fact sheet explaining the Administration's proposal states that the Corporation will determine the mix of the sources and technologies which will be used to meet its 2.5 million-barrels-per-day (MMB/D) goal, but provides an "illustrative" division of sources. It indicates that 1 to 1.5 MMB/D might come from coal, 0.4 MMB/D from oil shale, between 0.5 and 1.0 MMB/D from unconventional gas, and 0.1 MMB/D from biomass.

Producing 1.0 to 1.5 MMB/D of synfuels from coal by 1990 may be possible, but preliminary information from knowledgeable industry contacts suggests that we should count on closer to 1.0 MMB/D. There are considerable problems involved in building the 15-25 plants that would be required as well as mining the coal needed to feed the plants. We would note that the entire World War II German synfuel program produced only about 70 MB/D, about equal to one such plant. Getting the additional capital, manpower and equipment that would be required for both aspects of the program simultaneously could be a major obstacle.

Then there is the question of the readiness of technology. There are two proven coal technologies operating elsewhere in the world: a European coal gasification system, and the South African "SASOL" indirect coal liquefaction method. The length of time required to design and build such large plants indicates that these will probably be the two technologies which can be in operation by 1990, unless we accept the higher risk associated with unproven new technologies. There is a danger, however, of getting overcommitted to an early, inefficient technology. The program managers, as well as the Congress, must maintain the flexibility to adapt to new technologies as they become available.

Under the Administration's plan, for example, the corporation would be specifically barred from carrying out research and development, presumably because these pre-commercial activities would interfere with its primary

purpose--to produce energy. However, bringing currently unused technologies on stream will surely entail the demonstration and improvement of those technologies. Thus, it may be unwise to prohibit all research and development activities by the corporation. The distinction among research, development, demonstration, and commercialization is a fine one, and rigid prohibitions should be avoided. The Congress may well wish to permit some research and development which the corporation feels is necessary.

PROGRAM BALANCE

A number of "second generation" coal technologies and several approaches to oil shale, now under development, could be demonstrated by about the mid 1980s. It is widely believed that some of these will offer more efficient and less expensive production than the technologies presently ready. If the corporation targets for coal and shale were somewhat lower, a possible overcommitment to "first generation" technology could be reduced.

Proven biomass technologies, already producing substitute fuels in commercial operations in the United States, could be expanded well beyond the 0.1 MMB/D level by 1990 to take up the slack. Energy production from municipal solid waste and alcohol production from surplus crops and agricultural wastes are the most practical.

We recently reported 1/ that municipal solid waste could provide over 0.1 MMB/D by 1985, and over 0.4 MMB/D by 1995. Advocates of gasohol have argued that set-aside agricultural land and crop wastes could also yield several hundred thousand barrels per day. We are currently completing a study of gasohol which tends to confirm this.

To the extent that the Corporation can accelerate the expansion of these biomass synthetic fuel industries, it can meet its target with a more limited commitment to present coal technologies. At the same time, the United States could continue its coal and shale-based synthetic fuel development beyond 1990 on a more informed basis,

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1/"Conversion of Urban Wastes to Energy: Developing and Introducing Alternate Fuels from Municipal Solid Waste", EMD-79-7; Feb. 28, 1979.

with answers to many difficult technical questions in hand.

On the whole, the Nation needs a program which is balanced between conservation and renewable initiatives as well as synfuels. Conservation and renewables would include all investments in energy efficiency improvements, technologically ready renewables such as solar water and space heating and passive solar construction, which are being kept off the market for economic reasons, as are synthetic fuels. A key to stimulating conservation and renewable-energy investments would be to subsidize them on a per-barrel-of-oil-saved basis up to the level of the subsidy for synfuels. Fuel switching from oil to coal may also pay off handsomely. We are completing a study for the Chairman of the Subcommittee on Energy of the Joint Economic Committee which analyzes the potential of conservation measures and discusses how a comprehensive conservation program could be formulated.

The Administration's proposal does include initiatives on all of these fronts, but they may not be balanced. For example, the synthetic fuel initiative involves spending $88 billion for 2.5 MMB/D capacity or $35,200 per barrel-day. In contrast, the residential and commercial conservation proposal is estimated to save 0.5 MMB/D with $2 billion of expenditures, or $4,000 per barrel-day. This disparity suggests that more import reduction could be obtained by greater expenditures for conservation investments before a true balance was reached. The balance point would be the level where the next b/d of import reduction would cost the same whether accomplished by conservation, renewables, or by synthetic fuel production. Many conservation investments would also yield oil savings much sooner than the 5 to 7 years needed to build a large synfuel plant.

In addition, many conservation and solar technologies are classed by a DOE Environmental Readiness report as likely to result in net environmental benefits or have only low-to-medium probability of serious detrimental environmental impacts. This contrasts with synthetic fuel technologies, which are quite likely to have serious adverse environmental impacts.

Finally, many of the conservation and solar installations would be relatively small scale, widely distributed units which would involve large numbers of Americans in the

psychological lift of "doing something" to combat the energy problem. This wide participation could contribute to allaying the popular distrust in the reality of the energy crisis and providing our citizens with a sense of personal commitment to our energy future.

FINANCING MECHANISMS

A complete answer to your question of which financing mechanisms would be most appropriate to promote synfuel production would have to be based on considerably more information than is presently available. For example, we would have to know details of the specific projects being considered along with the set of alternative financing mechanisms which could be used in each case. However, there are some observations we can make at this time. Loan guarantees have become popular because supporters of guarantees argue that the program is costless in the absence of a default. If the borrower repays the loan, the budgetary impact would be limited to administrative expenses. In the case of default, however, the liability to the Government becomes substantial--possibly greater than any other subsidy method. Furthermore, with very few but very large loans, it is difficult to establish an adequate default reserve. The 1-percent per annum reserve the Administration advocates would probably be insufficient to cover the default of one coal liquifaction or gasification plant. There is also the cost of diverting capital to the guaranteed investment from other areas which may be more productive and would have been chosen in the absence of the guarantee.

Loans and loan guarantees may not induce private firms to produce synfuels. After all, at current prices a firm would have no reason to think that anyone would buy synfuels without some sort of price subsidy or purchase guarantee, inasmuch as conventional OPEC or Mexican oil will most likely be cheaper, at least in the near future. And, a purchase guarantee would not work without a price guarantee. A more certain way to assure synfuel production is to provide a price guarantee coupled with a purchase guarantee. This could be very costly, although the Government could solicit proposals to supply the synfuel at the lowest possible price. One problem is uncertainty. Firms will not actually know in advance how much synfuel production will cost and may want a cost-plus contract. Given the potential for cost overruns, cost-plus contracts should be avoided if at all possible.

At this time, the loan guarantee limits of the Administration's proposal are unclear. The implications in papers we have seen are that all loan guarantee commitments would have to be met within the $88 billion of authority. But this is not explicitly stated and needs to be clarified. One part of the Administration's proposal appears to us to be undesirable. That is the provision permitting the purchase of Federally guaranteed loans by the Federal Financing Bank. We do not agree with this because it has the effect of changing the loan guarantee into a backdoor direct loan.

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In summary, we believe it makes sense to increase the emphasis on synthetic fuel development as part of a balanced energy program. It may also be appropriate to establish a separate organization for this purpose. That organization, however, should not be shielded from Congressional oversight through the budget process, although multi-year funding seems to be a reasonable approach. We also believe equal or greater emphasis needs to be placed on conservation and renewable energy sources. As arranged with your office, we are sending copies of this letter to the Secretary of Energy and to the Chairmen of other energy-related committees.

Sincerely yours,

Comptroller General
of the United States

ENCLOSURE II

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-178205

AUG 30 1979

The Honorable Gary Hart
Chairman, Subcommittee on
Synthetic Fuels
Committee on the Budget
United States Senate

Dear Mr. Chairman:

This is in response to your letter dated August 13, 1979, requesting an analysis of alternative mechanisms to reduce oil imports by 1990. You referred to a study we have prepared for the Chairman, Subcommittee on Energy, Joint Economic Committee, and mentioned that the study draws detailed comparisons of the costs of reducing oil imports through conservation versus producing energy from renewable sources, conventional coal and oil, exotic sources of fossil fuels, and synthetic fuels from oil shale and coal. However, the study, which will be released in the near future, does not make these explicit cost comparisons. It does describe how the administration might (1) evaluate energy conservation strategies, ranging from voluntary to mandatory actions, based on expected energy savings and costs, and environmental, economic, and social impacts, and (2) select the best specific policies and programs for implementation. It also provides examples from existing literature of conservation measures and the potential energy savings.

Although we have not performed the overall analysis you referred to, we would like to (1) offer further perspectives on a balanced energy program designed to reduce oil imports by 1990 and (2) provide examples, drawn from our previous work, of some options to reduce oil imports.

PERSPECTIVE

As we stated in our July 27, 1979, letter to you, conservation should rank at least as high in priority as synthetic fuel development. Conservation could have a surer and more rapid payoff and could be implemented on every level, from individual citizens, up through businesses,

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local governments, the Federal Government, and even international bodies. We also pointed out that conservation is environmentally superior to synthetic fuel options.

A complete evaluation of the contribution each option can make toward reducing oil imports within a specified time frame must weigh trade-offs related to factors such as the status of the technology, front-end capital, life-cycle costs, the type and amount of incentive needed to spur private sector risk-taking and development, the environmental and socioeconomic impacts, and manpower and material requirements. We have not performed the complete analysis, but our past work strongly suggests that added emphasis should be given to conservation. Our concern here is to suggest for further consideration options that are achievable by 1990 through some combination of accelerated research, development, and demonstration, and economic incentives. Those options which cannot be stimulated by eliminating economic uncertainties and technological problems by 1990--in essence, long-term options--are not discussed here.

CONSERVATION

The most serious problem in the Federal Government's approach to achieving greater levels of energy conservation is the lack of an overall plan which (1) clearly establishes energy conservation goals, (2) specifies the actions which will be taken to achieve those goals, and (3) identifies standby initiatives which could be implemented if it appears that established goals would not be met. We believe energy conservation needs to play a more prominent role and that the administration did not include in its 1977 National Energy Plan enough energy conservation initiatives to have much impact in the short term. 1/ We continue to believe the administration's emphasis on conservation is lacking. The July 16, 1979, "Fact Sheet on the President's Import Reduction Program" underplayed the significance conservation investments can have in reducing imports over the next 10 years. For example, the proposal calls for a target which represents just 20 percent of the

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1/Letter from the Comptroller General to the Chairmen, Energy Related Committees and Subcommittees of the Congress, EMD-79-34, Feb. 13, 1979, "The Federal Government Should Establish and Meet Energy Conservation Goals," EMD-78-38, June 30, 1978, and "An Evaluation of the National Energy Plan," EMD-77-48, July 25, 1977.

potential savings that the administration cites as achievable by retrofit installation of conservation measures in buildings.

In the following sections we provide examples and indicate a range of potential energy savings which can be attained through energy conservation investments, based on our estimates and those of several groups of reputable researchers. They are representative of the potential of selected conservation options and our examples are not meant to be all-inclusive. In addition to direct conservation investments, changes in consumer attitudes and behavior can also reduce energy consumption significantly. Examples are thermostat setting changes or more energy-efficient automobile driving techniques.

Residential

We reported on residential conservation options in our analysis of the role of the Tennessee Valley Authority (TVA). 1/ TVA plans to provide interest-free insulation loans to 750,000 customers who will save a substantial amount of energy. TVA expects the cost to average $350 per customer and be recovered in 3 years through savings in electricity use. Our analysis of heat pumps installed in new construction in the region showed a potential for decreasing electrical energy usage by 1.3 billion kWh in 1990. The fuel bill reductions due to heat pump usage ($220 million) are greater than the increased capital cost ($170 million) by $50 million. In addition, the combined impacts of ongoing programs such as setting appliance efficiency standards, implementing thermal standards for constructing new residences, and insulating 56 percent of the existing residences by 1985 would produce an estimated net savings to the TVA region's households of about $90 million by the year 2000.

Options and estimates of costs and energy savings in the residential/commercial sector vary widely. For example, two researchers estimate that for an average investment of about $1,500 per household, about 60 million households

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1/"Electric Energy Options Hold Great Promise for the Tennessee Valley Authority," EMD-78-91, Nov. 29, 1978.

which heat with oil and natural gas could save the equivalent of about 2.5 million barrels per day of oil from heating alone by 1990. These measures include added insulation, caulking, weatherstripping, window improvement and furnace modifications. 1/ Finally, in an unpublished communication, a group of researchers from the University of California and several other institutions suggested a reasonable savings target for residential energy savings by 1990 was about 1.5 million barrels per day of oil and gas.

Industrial sector

There is an increasing tendency for industry to respond to the increases in energy costs with energy-saving investments, at least to a level which it finds fairly competitive with its other investment opportunities. For this reason it is often suggested that industry will make, what it terms, the economically appropriate adjustments to reduce its demand for energy wnen faced with energy priced at its long-range replacement cost (marginal cost). Without Government action, industry reactions to price increases to date indicate efficiency changes will continue to be made as energy costs increase.

Although industry is responding to higher energy prices, this is not to say that Government actions could have no important impact in this area. Government incentives can bring about additional industrial efficiency investments. For example, our ongoing study of industrial cogeneration indicates that industry initiated changes may save the equivalent of 120,000 to 280,000 barrels of oil per day by 1985 without further Government incentives. With additional Government incentives such as a 30 percent tax credit and exemptions from various regulatory statutes, the equivalent of about 220,000 to 350,000 barrels of oil per day can be saved in 1985. The direct effect of cogeneration on oil imports could be as high as 200,000 barrels per day by 1990.

Transportation sector

In the transportation sector we have not yet seen agreement on the potential for major energy-saving investments

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1/"Drilling for Oil and Gas in Our Buildings," M. H. Ross and R. H. Williams, Report PU/CEES 87, July 17, 1979.

in this area beyond the mandated increases in automobile and light truck fuel economy standards. However, additional opportunities in this area could include actions on mass transit, further taxes on cars with high gasoline consumption rates, and further improvement in auto fuel economy beyond the 1985 targets.

Federal sector

The Federal Government, being the Nation's largest single energy user, has a unique opportunity to save significant amounts of energy. We reported that many products are available from commercial sources which, when installed in the heating and cooling systems of Federal buildings and facilities, can save significant amounts of energy. 1/ In looking at 10 different energy-saving devices at selected facilities, we found that investments of about $900,000 would save the equivalent of 10,000 barrels of oil annually. While Federal agencies are presently using some of these energy-saving devices, they could expand that use and reduce energy consumption.

Our work in this area has shown that the Federal Energy Management Program is in disarray. While individual agencies have made some progress in conserving energy, Federal conservation efforts have been implemented on a fragmented and piecemeal basis. The Department of Energy, which is responsible for this effort, has not established a comprehensive and enterprising program nor has the agency developed Federal conservation plans as required.

NEAR-TERM RENEWABLE TECHNOLOGIES

A number of renewable technologies have been proven feasible and either are or are expected to be economically attractive to consumers within the next decade. These include

--hydro/geothermal electric systems,

--hydro/geothermal direct heating systems,

--low-head hydroelectric systems,

1/"More Use Should Be Made of Energy Saving Products in Federal Buildings," EMD-79-11, Jan. 23, 1979.

--small wind energy systems,

--urban waste conversion plants,

--wood burning,

--conversion of biomass wastes into alcohol,

--solar agricultural and process heating systems,

--solar water heating and/or space heating systems, and

--passive solar heating techniques.

In general, the widespread use of renewable technologies now is limited by a number of financial and institutional considerations. The financial constraints for the most part are high initial cost, long payback periods, and financial risk. In a recent report we noted that although numerous Federal and State programs are underway, a concerted, coordinated effort to commercialize solar heating does not exist. 1/ Solar heating devices can cost anywhere from $1,000 to more than $500,000 for large commercial applications. In addition to these costs, a conventional backup system is usually needed. As a result buyers are often reluctant to make a solar investment. The incentives provided by the States and Federal Government thus far to commercialize solar heating systems have been too small or have not yet proven effective in overcoming the high initial capital costs.

Electric utilities can influence the economic attractiveness of some renewable technologies, as we reported in reviewing the power-generating options available in the Pacific Northwest. 2/ We projected the costs and effects of traditional planning which emphasized thermal power generation additions, and compared them with conservation and renewable resource potential, including geothermal, solar radiation, conversion of wood wastes, wind, and small hydro developments.

1/"Commercializing Solar Heating: National Strategy Needed," EMD-79-19, July 20, 1979.

2/"Region at the Crossroads--The Pacific Northwest Searches for New Sources of Electrical Energy," EMD-78-76, Aug. 10, 1978.

Under a policy scenario assuming moderate energy growth and emphasizing renewable energy sources and conservation, the Pacific Northwest could approach electric self-sufficiency by the year 2000. This future contrasts sharply with the traditional policy, which would rely on thermal power generation for over 50 percent of the electrical energy supplies. The analysis also illustrates that conservation and renewables would be a less costly means of meeting the region's energy requirements than construction of new thermal powerplants. In the traditional scenario, electricity costs in 2000 would be between 23.7 and 29.8 mills per kWh (in 1977 dollars) depending upon the rate of energy demand. In contrast, the scenario emphasizing renewable resources and conservation would result in costs of between 13.1 and 18.7 mills per kWh. The total fixed and variable costs from 1977 through 2000 could range from $70.6 to $127.0 billion under the traditional policy scenario and from $53.6 to $89.4 billion under the renewable resources and conservation policy scenario.

In addition, we reported that there are 131 municipal solid waste systems in various stages of planning or construction in the United States. 1/ If all these plants are built, they will provide the equivalent of over 130,000 barrels of oil per day by 1985. Installation of similar systems elsewhere has the potential for producing the equivalent of 430,000 barrels of oil per day by 1995. However, these production levels depend on strong Federal efforts which currently are uncoordinated, misguided, and lacking in detailed overall strategy.

FOSSIL FUELS

Oil imports will be reduced through price decontrol; the administration is currently phasing out domestic oil price controls by 1981. Our report on oil import policies concludes that overall, phased oil price decontrol appears to result in the best combination of costs and benefits to the Nation. 2/ Decontrol is more effective at reducing

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1/"Conversion of Urban Waste to Energy: Developing and Introducing Alternative Fuels From Municipal Solid Waste," EMD-79-7, Feb. 28, 1979.

2/"The Economic and Energy Effects of Alternative Oil Import Policies," EMD-79-78, July 24, 1979.

oil imports by stimulating domestic production and helping to dampen the Nation's demand for energy while avoiding the higher economic costs which would be imposed by the establishment of oil import quotas.

Based on a simulation of the administration's decontrol scenario, phased decontrol will not affect oil consumption in 1979, but by 1985 consumption will be about 500,000 barrels per day lower than under continued price control. This analysis also shows the decline in domestic production to be about 500,000 barrels per day slower than would otherwise be expected, for a combined effect of about 1 million barrels per day in reduced imports. By 1990 the combined effect on oil imports is a reduction of about 1.6 million barrels per day, 1 million barrels per day of which represents a slower decline of domestic production than would otherwise occur.

In addition, decontrol would affect the potential contribution of enhanced oil recovery and heavy oil production. The President has recently decontrolled heavy oil prices, while enhanced oil recovery operations will continue to be affected by the current pricing schedule. Action in both areas should bring forth additional energy supplies by 1990 at prices likely to be equal to the world oil price.

Actions on unconventional natural gas sources are also taking place. The price of unconventional gas sources except tight sands will be decontrolled by the Natural Gas Policy Act of 1978 in about November of this year.

A study we are completing on unconventional gas sources indicates that added production can contribute increasing portions of the Nation's gas supplies in the future, even though overall domestic gas supply is not expected to increase significantly. The eastern shales and western tight sands are the major potential contributors to unconventional gas production by 1990. One study performed for the Department of Energy has concluded that prices between $2 and $3 per thousand cubic feet could yield significant additional eastern shales and western tight sands production. 1/ In addition, the administration has proposed a $0.50-per-thousand-cubic-feet tax credit for unconventional gas which, together with the prices allowed under the Natural Gas Policy Act and

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1/"Enhanced Recovery of Unconventional Gas," Lewin and Associates, February 1978.

technological improvements, might yield an additional 1.0 trillion cubic feet by 1990 according to the administration.

Another fossil fuel option which we intend to evaluate is the potential for oil import reductions through conversion to coal. Coal conversion actions will reduce the quantity of oil and gas used under industry and utility boilers, and measures in this area could be extended past those now contained in the Powerplant and Industrial Fuel Use Act of 1978. The President's Commission on Coal, for example, has examined a number of options in this area. The Commission's interim report of July 12, 1979, estimates that 2.2 million barrels of oil per day can be saved at a Government cost of $2 to $3 per barrel through various conversion measures, substantially more than the administration proposes. The administration proposes to cut utility oil usage 50 percent by 1990, for a savings of 750,000 barrels of oil per day.

In our earlier letter to you, we stated that synfuels should play a part in the context of an overall national energy policy. The administration's suggestion to establish an Energy Security Corporation--with several modifications summarized below--seems to be a responsible way to promote synthetic fuels development.

We stated that every effort should be made to encourage industry to invest in and operate the plants. However, such an industry will, at least in the near future, be expensive.

As for financing, a more certain way to assure synthetic fuels production than through the use of a loan guarantee approach would be to provide price guarantees coupled with purchase guarantees--obtaining the lowest possible price through solicitation of proposals to supply synthetic fuels. Due to the potential for cost overruns, cost-plus contracts should be avoided if at all possible. While the administration's proposal would establish an off-budget corporation, we would urge consideration of on-budget multi-year funding, eliminating the uncertainty of annual appropriations but requiring periodic congressional review, say every 2 or 3 years.

We also stated that producing 1.0 to 1.5 million barrels per day of synfuels from coal may be possible, but preliminary information from knowledgeable industry contacts suggests that we should count on closer to 1.0 million barrels per day by 1990.

There are two proven coal technologies operating elsewhere in the world: a European coal gasification system, and the

South African "SASOL" indirect coal liquefaction method. The length of time required to design and build such large plants indicates that these will probably be the two technologies which can be in operation by 1990, unless we accept the higher risk associated with unproven technologies. There is a danger, however, of overcommitting to an early inefficient technology.

A number of "second generation" coal technologies and several approaches to oil shale, now under development, could be demonstrated by about the mid 1980s. Some of these may offer more efficient and less expensive production than the technologies presently ready. If the Corporation targets for coal and shale were somewhat lower, a possible overcommitment to "first generation" technology could be reduced. Also, to the extent the Corporation can accelerate the expanded use of municipal solid waste and gasohol from agricultural land and crop wastes, it can also meet a 1990 production target with a more limited commitment to the present coal technologies.

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In summary, our work indicates that complementary programs of energy conservation and technically and financially feasible renewable options offer opportunities for the Nation which are not yet fully addressed. While we were not able to provide an overall analysis of the cost and energy contribution of options to reduce oil imports by 1990, we hope this serves to provide further detail on the need for balance in the Nation's energy program.

Sincerely yours,

Comptroller General
of the United States