



COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D C 20548

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AUG 30 1979

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

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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

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

^{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 when 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

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

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-foot tax credit for unconventional gas which, together with the prices allowed under the Natural Gas Policy Act and

^{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

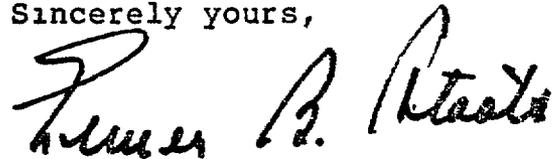
South African "SASOL" indirect coal liquefaction method. The length of time required to design and build such large plants indicates that these will probably be the two technologies which can be in operation by 1990, unless we accept the higher risk associated with unproven technologies. There is a danger,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