CAPITAL REQUIREMENTS OF ENERGY INDEPENDENCE

JOINT HEARINGS

BEFORE THE

SUBCOMMITTEE ON ENERGY

AND THE

SUBCOMMITTEE ON FINANCIAL MARKETS

OF THE

COMMITTEE ON FINANCE

UNITED STATES SENATE

NINETY-FOURTH CONGRESS

FIRST SESSION

ON

THE CAPABILITY OF U.S. FINANCIAL MARKETS TO CAPITALIZE ENERGY PROJECTS REQUIRED FOR THE UNITED STATES TO MOVE TOWARD ENERGY INDEPENDENCE

MAY 7 AND 8, 1975

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CAPITAL REQUIREMENTS OF ENERGY INDEPENDENCE

WEDNESDAY, MAY 7, 1975

U.S. SENATE,
SUBCOMMITTEES ON FINANCIAL MARKETS AND ON ENERGY
OF THE COMMITTEE ON FINANCE,
Washington, D.C.

The joint subcommittees met, pursuant to notice, at 10:05 a.m., in room 2221, Dirksen Senate Office Building, Senator Lloyd Bentsen, presiding.

Present: Senators Bentsen (chairman of the Subcommittee on Financial Markets), Gravel (chairman of the Subcommittee on Energy), Curtis, Dole, and Packwood.

Senator BENTSEN. These hearings will come to order. I am very pleased to join with my distinguished colleague, Senator Gravel, in cochairing these hearings of the Subcommittee on Financial Markets and the Subcommittee on Energy of the Finance Committee.

When Secretary Simon was asked to testify, he asked that he be permitted to speak generally on the question of capital formation and capital requirements, rather than just limiting himself to the question of energy development. The Secretary, of course, is right in that regard because it is not possible to isolate capital required for energy development from the capital required for the growth of our economy. Capital is a fungible commodity. It goes where it is best served. It is the primary fuel of our economy. Without capital, our economy would come to a halt. With too little capital, economic growth strangles with serious consequences for employment, productivity, and the general well-being of our people. Clearly, we cannot ignore the capital needs. If we do so, we do so at our own peril.

Today, the United States ranks last among industrialized countries in the rate we save and in the rate our economy grows. This is of great concern to me. Today and tomorrow, these subcommittees will inquire into the capital requirements of energy independence. Among the questions we will ask are: What are the capital needs of the energy sector of our economy? What are the capabilities of our private financial markets to meet those needs? Are the prospects for private capitalization of energy resources adversely affected by the threat of changes in world energy prices? Is there a need for a minimum oil import price to permit private capitalization to proceed? Is there a need for additional Government programs to encourage energy capitalization?

We would also hope that this morning's witnesses will shed some light on the Administration's oil import policy. For the last several months, the policies of both the Treasury Department and the Department of State have appeared at odds on the subject of oil imports.

Secretary Simon has reaffirmed just this past weekend that he believes the international price of oil will go down before the end of this decade. He has supported energy independence for the United States in order to insure that the present international price is the maximum we will pay. On the other hand, the State Department appears to be pursuing a policy of entering into long-term commodity agreements with oil-exporting nations to guarantee them a minimum price in our markets.

This morning we are fortunate to have with us Secretary Simon, who will discuss the oil import floor price and capital requirements generally, and Assistant Secretary of State Thomas O. Enders, who will address the question of a minimum oil import price.

My cochairman has a statement to make.

Senator Gravel.

Senator GRAVEL. Thank you, Senator Bentsen. I would like to have my statement inserted in the record as if read because I look forward to the statement of the Secretary as much as you do.

I just merely want to add that it was the initiative of Senator Bentsen to have these hearings on a subject obviously which is the touchstone of our energy policy, whether or not we are going to get the money to do the job, so Mr. Secretary, I would like to hear your views on that particular subject.

[The prepared statement of Senator Gravel and the press release announcing these hearings follow:]

STATEMENT BY SENATOR GRAVEL

This hearing marks another in a long series of investigations by these Subcommittees into the energy crisis and the role of the Federal Government in its solution. For the past three years everyone in the Congress has been concerned with the energy crisis and we have had a chance to review the thousands of bills which have been introduced. Whenever I consider whether or not I will support a piece of legislation I ask: to what extent will the legislation tend to improve the production of our domestic energy resources? I can think of only a few bills which have passed the Congress which actually stand up favorably to this criterion—the Alaskan pipeline and the decontrol of new oil prices.

In a large sense, we are here today because of past Federal policies which have limited the production of domestic energy. There is no shortage of energy resources in the United States; there is merely a shortage of energy policy. For the past twenty years, the Government has attempted to dictate the market price for our cleanest and most convenient fuel—natural gas—and now with the passage of S. 622 the Senate has indicated its desire to continue this policy by regulating the price of new oil. It is my belief that if the Congress were to get out of the energy business and let the free market do its work, we would not have to worry about whether there are sufficient incentives to capitalize our vast requirements for new energy production. Instead, we have preferred to set up several new Federal agencies with conflicting jurisdiction over energy policy.

I believe that these hearings will bear out the fact that our energy industries require a great deal of capital to meet the needs of energy independence. The estimates which I have heard both from the Administration and from private sources are that we will need approximately $500 billion of investment by 1985. This figure implies that 25 percent of all private investment will be undertaken by the energy industry. Aside from conventional energy production such as oil, gas and coal we will need the development of new sources of energy through solar, geothermal, nuclear fusion and other energy sources.

I have introduced legislation this session to help meet those capital needs—S. 1112, the Energy Revenue and Development Act. My bill would establish a trust fund which would finance energy independence through research, development and demonstration activities carried out by the Energy Research and Development Agency. The management of the moneys in that trust fund would be undertaken by our first witness this morning, Secretary Simon.

Mr. Simon, I look forward to your testimony and hope that you will touch on the capital needs of the industry as well as the merit of such an energy independence trust fund so long as our free market is pronibited from allocating capital in energy development.

PRESS RELEASE

FOR IMMEDIATE
April 22, 1975

COMMITTEE ON FINANCE
Subcommittees on Financial Markets and Energy
UNITED STATES SENATE
2227 Dirksen Senate Office Building

SENATOR LLOYD BENTSEN, CHAIRMAN OF THE SUBCOMMITTEE ON FINANCIAL MARKETS, AND SENATOR MIKE GRAVEL, CHAIRMAN OF THE SUBCOMMITTEE ON ENERGY, ANNOUNCE JOINT HEARINGS ON THE CAPABILITY OF U.S. FINANCIAL MARKETS TO CAPITALIZE ENERGY PROJECTS REQUIRED FOR THE UNITED STATES TO MOVE TOWARD ENERGY INDEPENDENCE

Senators Lloyd Bentsen and Mike Gravel, Chairmen of the Subcommittees on Financial Markets and Energy of the Committee on Finance, today announced that the Subcommittees will conduct joint hearings May 7th and 8th on the capability of U.S. financial markets to provide capital for the development of domestic energy resources.

The hearings will be held at 10:00 a.m., on Wednesday, May 7th and Thursday, May 8th, in Room 2221 of the Dirksen Senate Office Building. The Subcommittees will receive testimony on Wednesday from the Honorable William E. Simon, Secretary of the Treasury, and the Honorable Thomas O. Enders, Assistant Secretary of State for Economic and Business Affairs.

Following is a joint statement of Senators Bentsen and Gravel:

"The purpose of these hearings is twofold: first it is our intention to inquire into the amount of capital required to hasten the development of domestic energy resources and the capability of private financial markets to supply that capital; second, the Subcommittees intend to explore the closely related proposal to establish a minimum oil import price as method of encouraging capital formation and protecting domestic investment."

"Whether the United States attains energy independence or becomes increasingly reliant upon foreign energy sources i largely dependent upon whether our financial markets are able to provide the vast sums of capital required to finance the expansion of present energy resources and the development of alternative energy systems. Because the capital requirements are so great and because our financial markets are in such disarray, there is reason to doubt our present capacity to finance energy development."

Following is a complete list of witnesses who will testify:

Wednesday, May 7, 1975

The Honorable William E. Simon, Secretary of the Treasury

The Honorable Thomas O. Enders, Assistant Secretary of State for Economic and Business Affairs.

Thursday, May 8, 1975

Mr. Gaylord Freeman, Chairman of the Board, First National City Bank of Chicago

Professor M. A. Adelman, Department of Economics, Massachusetts Institute of Technology.

Mr. Fletcher L. Byrom, Chairman of the Board, Koppers

The Honorable William Greene, Senator, State of California.

The Chairmen stated that the Subcommittees would be pleased to receive written testimony from those persons or organizations who wish to submit statements for the Record. Statements submitted for inclusion in the Record should be typewritten, not more than 25 double-spaced pages in length, and mailed with five (5) copies by May 10, 1975 to Michael Stern, Staff Director, Senate Committee on Finance, 2227 Dirksen Senate Office Building, Washington, D.C. 20510.

PR #15

STATEMENT OF HON. WILLIAM E. SIMON, SECRETARY OF THE TREASURY OF THE UNITED STATES, ACCOMPANIED BY SIDNEY JONES, ECONOMIC CONSULTANT TO THE DEPARTMENT OF THE TREASURY

Senator BENTSEN. Mr. Secretary, we are very pleased to have you before us to clarify some of these things for us.

Secretary SIMON. Thank you, Mr. Chairman.

I am delighted to be here on this subject of timely and urgent concern, our capital investment needs for the future.

I am going to condense my very lengthly statement. I would hope that over the coming months not only this committee but the Congress would have an opportunity to focus on this critical issue in our country, and I would urge that this be read in its entirety.

Senator BENTSEN. Mr. Secretary, would you please identify for the record the gentleman at the table with you?

Secretary SIMON. Dr. Sidney Jones, my economic consultant to the Treasury Department, Mr. Chairman, who will respond to any questions that you might have on economic assumptions that are the basis of our forecasts.

For several months, many economic policymakers in Washington have been preoccupied with the problems of ending the recession, slowing the rate of inflation, and steering the Nation back to a course of stable, durable economic growth. Today, there are many signs that the economic slide is gradually decelerating, and we can be increasingly confident that we will be on the road to recovery before the end of the year.

As we emerge from the recession, it is especially important that we now begin to focus greater public attention on the longer-range problems of our country. While the process of recovery will require careful and vigilant management, we must be equally concerned whether the period of the recovery and beyond will bring sustained economic progress or a sorrowful repetition of the boom and bust cycle of the past.

Certainly, there is no subject more central to our hopes for the future than our ability and our willingness to meet the capital investment needs of the future. Those needs are impressively large, and they will demand a full-scale effort. In my testimony this morning, I want to draw upon an abundance of documentary evidence showing that the United States has not been keeping pace in its capital investments and that we must devote more of our resources to this purpose if we are to achieve our most basic economic dreams for the future.

To summarize, the record shows that during the 1960's, the United States had the worst record, as you said Mr. Chairman, of capital investment among the major industrialized nations of the free world. Correspondingly, our records of productivity growth and overall economic growth during this period were also among the lowest of the major industrialized nations.

As other nations have channeled relatively more of their resources into capital investment and have acquired more modern plants and equipment, they have eroded our competitive edge in world markets.

Our record on capital investments reflects the heavy emphasis we are placing on personal consumption and Government spending as opposed to savings and capital formation.

Our record also reflects a precipitous decline in corporate profits since the mid-1960's. While the U.S. economy remains sufficiently large and dynamic to overcome our investment record of recent years, our future economic growth will be tied much more directly to the adequacy of our capital investments. Estimates of future needs vary, but it is relatively clear that in coming years we will have to devote approximately three times as much money to capital investments as we have in the recent past.

It is an economic fact of life that increased productivity is the only way to increase our standard of living. For the sake of future economic growth, jobs, real income, and reasonable price stability, the inescapable conclusion is that Government policies must become more supportive of capital investment and that we must make a fundamental shift in our domestic policies away from continued growth in personal consumption and Government spending and toward greater savings, capital formation, and investment.

Some analysts have concluded that it will not be possible to meet our future investment needs. I disagree. I firmly believe that we are capable of achieving our basic investment goals, but I also believe

that they represent one of the most formidable economic challenges of the decade ahead.

The average annual rate of real economic growth during the period for the 20 nations belonging to the OECD—we were much lower. Of the many economic, political, and social factors that influence economic growth rates, none is more important than the level of capital investment. Economists generally agree that the factors affecting growth include: the accumulated base of capital goods, the current pace of new capital investments, the effective application of new technology, the quality of the national labor force, its education, the infrastructure of transportation, communication, financial facilities, access to industrial raw materials, managerial skills, and the organization of the economic system itself.

The mix of these basic economic variable varies from country to country and changes over time. It is also possible to substitute one, or a combination of these productivity variables for specific inadequacies. However, a strong rate of new capital investment is required to generate sustained growth. In fact, the effectiveness of all of the other factors that determine productivity are heavily dependent upon the quantity and quality of capital goods made available by new investment.

For many years our advantageous ratio of capital to labor has been acknowledged as the basis of the remarkable rise of the U.S. economy. Even though plant and equipment expenditures will continue in the future as the economy grows, it is unrealistic to assume that the historical patterns of investment and productivity will be adequate to meet the priorities of the future, and I am certainly not suggesting that we can fulfill every claim present by society. The disappointing record of Federal deficits in 14 of the last 15 years—or 40 out of the last 48 years—and the unfortunate boom and best pattern of economic performance over the past decade indicate that we have not been able to effectively identify and manage out national economic priorities.

Although the amounts of capital investment continue to increase in the United States and our capital-to-labor ratio is still relatively high, other nations during recent years have allocated a substantially larger share of their resources to new capital formation.

Furthermore, the gap between the U.S. level of investment, measured as a share of national output, and the commitments of other leading industrial nations has increased. Total U.S. fixed investment as a share of national output during the time period 1960 through 1973 was 17.5 percent. The U.S. figure ranks last among a group of 11 major industrial nations. Our investment rate was 7.2 percentage points below the average commitment of the entire group.

First, the unusually large size of the U.S. economy and its relatively advanced stage of development, including the accumulated total of previous capital investments, creates a different investment environment.

A second and even more important influence has been the historical priority placed on consumption within the U.S. economy. We are a consumption-oriented society and this pattern has been developing for several decades. The emphasis on consumption has undoubtedly caused much of the rapid development of the U.S. economy because it has created a strong demand for goods and services needed to sustain out-

put, employment, and investment. As a result, despite our high per capita incomes, the accumulations of gross savings flows required for capital investment are lower in the United States than elsewhere.

Some analysts have claimed that it will not be possible to attract enough savings to meet future investment needs. This negative conclusion assumes that the capital needed to increase plant and equipment capacity will be preempted or diverted to meet the consumption preferences of the private and public sectors. I would hope that the severe output, inflation, unemployment, and balance-of-payment distortions of the past decade would be useful warning against such a result.

It should be apparent from the experience of recent years that we must invest adequate funds in new plant and equipment, as well as in education and training, in order to increase our Nation's productivity and thereby raise our standard of living. Others claim that there will not be any particular strain in handling out future investment needs.

I do not agree that past investment levels have been fully adequate. Experience has demonstrated that inflation and unemployment problems have been created in part by capacity shortages. Many of our current difficulties are the direct result of the energy and raw materials strains that developed in early 1974 and eventually contributed to our current recession and related unemployment.

We must also be concerned about the capacity of our capital markets to provide adequate financing. Economists often assume that the supply of investment funds will automatically match the demand for capital if interest rates and equity yields are attractive. Our financial markets are very efficient in collecting savings and allocating funds.

However, we should be more sensitive to the disruptive impact of high interest rates. Even though financial markets may be functioning well in allocating the available capital, specific sectors of the economy may not be able to obtain the investment funds needed, especially at interest rates they can afford.

The periodic problem of providing adequate mortgage financing at reasonable interest rates is one example of the limitations within the markets. The difficulty in obtaining equity financing is another. Whether or not industry will be able to acquire the investment funds needed will be heavily influenced by future actions of the Government. National policies cannot ignore financial realities by diverting capital into deficit financing and disrupting the goals of stable monetary policy without inhibiting the necessary process of capital formation. The costs of capital and its availability for private sector needs are heavily dependent upon these public fiscal and monetary actions.

While the financial markets are very resilient and responsive to changing credit and equity needs, they are not immune to the disruptive impact of Government policies.

A third important factor affecting the pattern of U.S. investment compared with other nations is the relatively large share of total capital outlays that we commit to the services category, which includes housing, government, and other services. According to a study published by the OECD, the United States allocated 70 percent of its total investment to the services category during the 1969 to 1971 time period. The U.S. figure is significantly higher than that reported by the other five major industrial nations. Our heavy investment in the

services category tends, of course, to emphasize consumption and moderate the growth in productivity.

This arrangement may satisfy immediate consumer preferences, but we must weigh those preferences against long-term concerns about domestic productivity and international competitiveness.

A fourth influence on the pattern of capital investment in the United States is the relatively large share of our investment that must be used for replacement and modernization of existing facilities. This heavy replacement does provide a continuing opportunity to introduce new technology into the U.S. economic system, but the other imposing outlays for replacement and modernization do not add to the total productive capacity of our economy.

A fifth and final factor influencing the national rate of capital investment is the pattern of Government policies. Government affects investment either directly through the incentives it provides or indirectly through various tax and regulatory policies as well as its own pattern of spending.

A review of the diversified economic incentives available in other nations indicates the very active investment role played by many foreign governments. The United States has avoided most of the capital allocation and special incentive programs used in other countries. I strongly favor this private sector approach and believe that it has been a positive factor in the development of our economy.

There are some Federal programs which provide direct financial support through the Economic Development Administration, the Small Business Administration and 169 different Government credit programs, but the major influence of Federal Government on capital investment comes through our budget. Government budget decisions now represent approximately one-third of the total GNP and this figure will rise even higher if spending trends of the past 20 years are continued.

While the historical pattern of capital investment in the United States may satisfy our immediate goals, there are serious economic risks in having a slow rate of capital investment for an extended period of time. Various studies have indicated the close relationship between capital investment and various measures of economic growth and productivity. A dynamic economy is needed to create jobs by applying new technology and expanding production capacity. A productive labor force is also necessary for producing goods and services to meet rising demands for an improved standard of living and as a means of holding down inflation.

Unfortunately, productivity gains in the United States have been disappearing, especially when compared with the experience of other nations.

Economic projections are always difficult, but estimating future capital needs is especially uncertain at this time because costs and priorities continue to change rapidly. It is obvious, however, that future capital requirements will be enormous, larger than anything we have ever faced before.

The Commerce Department estimates that capital requirements for producers' durable equipment and nonresidential structures will total $3.4 trillion during the 1974 to 1985 period. If annual outlays for residential construction, which have averaged $50 billion during the past

4 years, are added to this figure, the total capital needs rise to well over $4 trillion.

A similar study performed by the GE Co. confirms the massive size of future capital requirements. Assuming a real GNP growth rate of 4 percent and an inflation rate of 5 percent, GE expects gross private domestic investment, including residential housing, to total $4½ trillion over the same period. Both estimates are limited to private investments and exclude the large Government expenditures for roads, dams, et cetera.

Assuming then that the cumulative investment needs between 1974 and 1985 will range from $4 to $4½ trillion, the point to remember is this: over the most recent period of the same length, 1962 through 1973, our total outlays for capital investment in the United States were $1½ trillion. Thus, our capital investment needs in coming years are approximately three times the level of the recent past. That is perhaps our best measure of our challenge ahead.

One area of capital investment that is particularly critical for the future is energy. To achieve greater self-sufficiency in energy, enormous capital investments will be required. We basically have two alternatives. The first one is to meet our increased energy investment requirements by reducing outlays in other sectors. While energy priorities are indeed important, it would be most unfortunate to disrupt the entire economic system in this way.

A second and more desirable approach is to include these new requirements within an enlarged total investment goal. Our purpose should not be to redistribute the economic pie, but to continue enlarging it so that everyone will have a bigger share.

Recognizing that the ultimate cost of energy investment needs will be influenced by many variables, it appears that capital requirements over the next decade will total about $1 trillion stated in current dollars to include the effects of inflation. Energy investments will comprise an important share of the total capital requirements discussed above, but their financing is manageble if they are given a high priority as part of a comprehensive national energy program. The specific amounts to be spent in each category will depend upon the energy policies adopted and dynamic developments within the economy.

The overall impact of energy requirements is summarized in a special report issued by the Chase Manhattan Bank in March. Over 20 years ago that division predicted that an energy shortage would develop in the United States if certain policy adjustments were not made. One of the major concerns of these reports over the years has been the chronic underinvestment in energy resources which became apparent in the late 1950's. The conclusion of their most recent Chase Manhattan Bank report is especially perceptive:

> Although the relationship between investment and supply of energy is an elementary principle that applies to any and all sources of primary energy, it is nevertheless one that is not well understood. In fact, the lack of understanding was responsible for the incredibly unenlightened regulation and many other political actions about the world that had the two pronged effect of preventing the generation of sufficient capital funds and discouraging the investment of money that actually was available, and the current energy shortage is the consequence.
>
> Yet, even today after so much damage has been done, there is still a widespread failure to recognize the relationship between investment and supply.

Instead, two distinctly different attitudes generally prevail. Many apparently continue to believe they can somehow again have enough energy without paying all the associated costs. Others, obviously, are resigned to the prospect of a permanent shortage and see conservation as the only avenue. Neither attitude is realistic, of course. The world still does not lack basic energy resources, and it is conceivable that eventually there can again be enough to serve all its needs, but only if the necessary investment is made first.

If it is not, a permanent shortage will indeed be the certain outcome.

The report goes on to emphasize, correctly, I believe, that a permanent shortage is intolerable because it would so constrict total economic growth that the growth in labor force, even at the more moderate pace that is expected in the 1980's, could not be absorbed. The resulting unemployment problems would cause severe economic problems in addition to threatening our political and social stability.

Turning to the financial requirement for the petroleum industry, Chase Manhattan Bank estimates a worldwide need for $400 billion to find 600 billion barrels of oil between 1970 and 1985. This is more than 2½ times the actual investment for this purpose during the 1955-to-1970 period. An additional $370 billion will be needed between 1970 and 1985 for worldwide development of refineries and processing facilities, tankers, et cetera. The total of $770 billion is nearly three times the actual commitment in the preceding 15-year period. Finally, another $400 billion will be required for other investments, payment of dividends, debt repayments, and additions to working capital.

The total financial needs of the world's petroleum industry from 1970 to 1985 are estimated by the bank to be $1.2 trillion stated in constant 1970 dollars. Inflation, of course, will increase the dollar amounts required. If inflation averages 5 percent over the time period, the needs would rise from $1.2 to $1.6 trillion. With 10 percent inflation, the figure would increase to $2.2 trillion.

The bank report states:

There cannot possibly be enough energy of any kind without adequate investment, and investment cannot be adequate without sufficient profits. But profits are labeled excessive and restraints are proposed without apparent consideration of the need for profits as a source of investment funds.

As indicated earlier, the industry will need at least $845 billion of profits between 1970 and 1985 if the world experiences a 10-percent rate of inflation. But in the first 4 years of the period the industry generated no more than $60 billion of profits, only 7 percent of the required amount. Even in the highly unlikely event of no further inflation, the $60 billion would represent but 13 percent of the industry's total needs for the 15-year period.

While our economy is capable of financing its large private capital investment requirements, our success in meeting that goal is heavily dependent upon the shape of Government policies. It is absolutely imperative that Government policies become more supportive. A continuation of the severe fiscal and monetary distortions of the past decade would undoubtedly prevent the achievement of our basic goals. Inflation must be controlled, and the Government must avoid disrupting the capital markets if the private sector is to obtain the financing required.

In fact, public officials must balance the Federal budget over time and record occasional surpluses in order to free up capital resources to fulfill existing private investment claims. Instead of reducing private investment to release resources for Government social programs, we should concentrate on balancing the budget over time so that the future flow of savings is not diverted away from private investment.

Looking beyond the recession problems of 1975, we seem to face the dilemma of having an apparently irresistable force of growing Government spending meeting the immovable object of future capital investment requirements. But we should no longer consider the growth of Government spending and related deficits to be an irresistible force. To do so will inevitably lead to even more serious economic problems of unemployment, reduced real gains in our national standard of living, and even more inflation resulting from inadequate physical capacity and reduced productivity, nor can we wish away the problem by claiming that there is plenty of slack in the 1975 recession and that we can ignore problems of overheating the economy until later years.

The escalation of Government spending levels summarized in table 4 has already seriously eroded our future fiscal flexibility and the lagged impact of current spending decisions will directly affect our future. In short, if we are to achieve our crucial goal of adding at least $1 trillion of private capital investment by 1985, we must first establish more moderate and sustainable fiscal and monetary policies.

Turning to tax policies, we find that Federal tax policies affect capital investment decisions by determining the after-tax earnings available for investment and by establishing incentives or disincentives for future investment. An OECD study of tax policies indicates that total Government tax collections in the United States during the years 1968 through 1970 were a smaller proportion of the gross national product than in most other industrial nations.

There is, however, a major difference in the distribution of the tax burden. As indicated in table 5, only 18.1 percent of the U.S. tax revenues in 1971 were provided by taxes on the consumption of goods and services. Other industrial nations relied much more heavily on consumption taxes.

The future requirements for capital investment indicate that tax policies should be reviewed. Just such a review has been underway in the Department of the Treasury in preparing for the tax law changes completed last month and in anticipation of a joint review with Congress in the coming months of possible tax reform initiatives.

I do not want to make any specific recommendations this morning because we are still working on our analysis. We will want to review the options with Congress before specific actions are suggested. I will merely refer to some of the policy areas that need to be reviewed.

Corporate income tax—these taxes directly influence the cash flow available for investment. The rate has vacillated slightly above or below the 50-percent level for many years. While a reduction in the rate of taxation would probably be the most straightforward approach to enhancing investment incentives, any change would represent a major shift in policy and would require extensive congressional consideration.

As part of this ongoing review of tax policies, we also need to consider the influence on investment of our two-tier system of corporate taxation in which income is taxed once at the corporate level and again at the shareholder level. This approach discriminates against corporate investors generally and small equity investors particularly.

Our tax system puts a great penalty on companies that must incorporate. Companies that do incorporate are those that have large capital needs that must be raised from many persons. We should keep

in mind that our system of taxation bears more heavily on corporations than do the tax systems of almost every other major nation. In the last few years out major trading partners have largely eliminated the classical two-tiered system of corporate taxation. Through a variety of mechanisms they have adopted systems of integrating the personal and individual income taxes so that the double taxation element is radically lessened.

The investment tax credit—business firms have strongly supported the ITC as a major stimulus to additional capital investment, and the Tax Reduction Act of 1975 increased the credit to 10 percent for 2 years and removed the utilities bias. Unfortunately, the investment tax credit has had an uncertain status since it was initiated January 1, 1962, and businessmen are justifiably concerned about the stability of an incentive which has already been removed twice and then reinstated.

Depreciation guidelines—the amount of capital recovery charges permitted for tax purposes also influences the after-tax earnings available for private investment. In 1954 the Internal Revenue Tax Code was changed to permit depreciation charges to be made on an accelerated basis. The official guidelines were again liberalized in 1962, and in 1971 the asset depreciation range, along with the investment tax credit, was added to the regulations.

Various business groups have proposed further liberalization, such as a wider ADR percentage, but further consideration should be part of the general tax reform analysis.

The Government is frequently asked to provide special incentives in the form of reduced or delayed taxes, accelerated depreciation schedules, capital grants, or other benefits to enhance the rate of return on capital investments. While such incentives are usually requested on the basis that they will contribute to the achievement of some national priority, it is usually difficult to justify such special treatment. When special advantages are given to a specific industry or geographical region, others become relatively disadvantages and it is very difficult for Government authorities to determine which claims should be favored, particularly in a dynamic economy where priorities can change rapidly.

While there may be a few specific situations where the Government should intervene in the allocation of resources which is now handled efficiently by the private markets, my overwhelming preference is to avoid the economic distortions which are found to occur.

The final area of concern that I want to address here is the future outlook for corporate profitability. Such profits are, of course, the major incentive for additions investment and an important source of funds for financing outlays, along with various external sources. Unfortunately, corporate profits are too often thought of as an unnecessary claim required by greedy businessmen rather than the basic incentive in our economic system.

Actual earnings of business firms are thus far below what the general public, and some Members of Congress, perceive them to be. In fact, corporate profits will have to improve substantially in order to provide the necessary incentives and to make the necessary contribution to future investment outlays. My concern is that the negative attitudes about profits held by many Americans might become an unfortunate part of public policy. We must avoid legislation and regulation that

is punitive of profits honestly earned. The result could only be that capital formation would be inhibited, and the real purchasing power of wage earners would rise more slowly. We must always be alert to the fact that profits translate into jobs, higher wages, and an increased standard of living for everyone.

In summary, as we strive to end the most severe economic recession in our postwar experience, my deep and abiding concern about the future adequacy of capital investment will perhaps be ill timed to some analysts. There is extensive slack in our economy with an unemployment rate near 9 percent and reduced rates of plant capacity utilization in many, many industries.

The economic slide, however, will not last much longer, and we will again be reporting real growth gains before the end of the year. As the pace of economic activity accelerates, we will likely rediscover shortages of labor and production capacity. In fact, some industries still have high plant capacity utilization ratios, and many types of skilled labor will be difficult to find even in the early stages of economic recovery. In 1971 it was widely believed that extensive slack existed but the economy was again operating at a very high rate of capacity by 1972 and shortages and explosive inflation soon occurred.

Our statistics on plant capacity have always been uncertain measures, and it is ironic that such a fundamental factor in preparing national economic policies has been based on such uncertain economic statistics.

For example, Dr. Pierre Rinfret, president of a well-known economic consulting firm, has published an impressive study of the national production capacity which indicates that our current Government statistics grossly underestimate the rate of capacity utilization in American industry and that there is virtually no reserve capacity. His studies estimate that the capacity utilization rate for manufacturing industries was 86.6 percent in 1974, a figure well above the Government's estimate for 1974 of 78.9 percent.

Looking beyond the current problems of recession and sustaining an economic recovery, the additional capital investment of at least $4 trillion from 1974 to 1985 represents a major challenge to the future growth of our economy. We must also give careful attention to the problems of specific industries in attracting needed investments for balanced growth.

I am confident that these basic goals can be accomplished. But the desired results will require Government policies which will moderate inflation and balance the Federal budget over time in order to avoid diverting needed capital away from investment and into the financing of chronic Government deficits. A continuation of the fiscal and monetary distortions of the past decade will only frustrate our capital investment efforts and lead to still more serious economic problems in the future.

Senator BENTSEN. Mr. Secretary, that is a very comprehensive statement, and it will be very valuable source material to us. You have stated very well the seriousness of the problem.

Secretary SIMON. I would hope again, Mr. Chairman, if you would forgive me, that people would have an opportunity of reading the entire statement, because the statements that were made are supported

by the facts. There are, of course, many assumptions which I think are a useful beginning for this topic.

Senator BENTSEN. I share very much your concern about the problems of capital formation in this country. Our economy must generate adequate capital if we are to remain competitive with the world market in advancing the latest technology that is needed in this country.

Mr. Secretary, I would like to limit our questions to 10 minutes, because I know the limitations on your time, and we are very appreciative of your coming this morning. You referred to Government policy and its influence on capital formation. We are looking at this energy problem, and I hear people say to me, "they told us we had an energy shortage, and now we are seeing gasoline wars and they are giving away free mugs and glasses to people buying gasoline. And where is this energy shortage?" Sometimes I think we have the attention span of a 5-year-old. We tend to forget just what was happening a very short time ago, when we really did have an energy shortage, because the embargo cut off the valves of the OPEC countries. At this moment we may not have an energy shortage, because of a surplus of oil. But that does not mean we cannot have a shortage again very shortly, and that does not mean that we should not be preparing for a shortage.

If you sit on a corporate board, you try to decide whether or not to make major capital investments to develop some of these new, alternative sources of energy which may be quite expensive. Business is deeply concerned about Government policies, and what will happen.

Now, Secretary Kissinger, in speaking before the National Press Club in February here in Washington, had one proposal, and his was, and I quote, "To the extent that OPEC's current high prices are caused by fear of precipitous declines, the consuming countries, in return for an assured supply, should be prepared to offer producers an assured price for some definite period, so long as this price is substantially lower than the current price." Now, Mr. Secretary, it seems to me that such a commodity agreement would be a disadvantageous one. It seems to me that would be providing the glue to hold together the cartel, and also that it would be a formal recognition of the cartel in its pricing action. And frankly, I do not see what there would be to bind them to continue to meet that kind of commodity price. Would you care to comment on that approach?

Secretary SIMON. Certainly, Mr. Chairman. First, the cartel and the price of oil worldwide is going to be subject ultimately not only to political considerations, but to market considerations as well. The basic law of supply and demand cannot be repealed by governments as hard as they may try. The OPEC nations now have about 67 percent of the world's proven reserves; as long as they maintain a dominance and a cohesiveness within the OPEC community, they can continue to charge a price for oil that bears no relationship to production costs or the true economic aspects of alternate sources of energy. When we take a look at the future market, we expect the international market for oil to change, reducing the dominance of the OPEC nations and their percentage of oil reserves. We anticipate bringing on the superabundance of natural resources that we have in this country. But there are inherent economic risks if a precipitous drop in the price of oil should occur, perhaps for political reasons, as unlikely as you and I

may think that decline may be in the future. I must admit that I do not see that occurring. I do not see world oil prices going back to the 1971 or 1972 level. I am sure, Mr. Chairman, that you will agree with that. But I do believe that they will certainly come down in the future when the additional supplies become available and the reduction of their dominance is accomplished.

Senator BENTSEN. Do you think we should enter into a long-term agreement to set a floor under the price of oil imports?

Secretary SIMON. Well, we can talk about what we are discussing in the executive branch. There are various mechanisms that can be established to give some assurance to encourage capital investment in this country. You well recognize that these investments will be more expensive, whether it be the drilling of new oil, oil shale, gasification or liquification of coal, et cetera, that is going to be required. Will the money be invested? Is there a role for Government in this area?

Approximately a year ago, Senator Gravel proposed the creation of a trust fund. One might say that that is an approach to making sure that these investments are made whether the Government provides the seed money to private investors, or whether they guaranteed that they would be taken out up to a certain return on their investment through a price mechanism. Another approach might use a tariff, to make sure that cheaper oil would never come into our markets to disrupt domestic investment. We have used tariffs and indeed are using one today. That is the reason we have a license fee system.

So, there are lots of different mechanisms that can be used to give the necessary assurance to industry. You spoke of sitting on a board and attempting to make these very difficult decisions for future investment needs in this country. Well, there is nothing that markets or corporations despise more than uncertainty. And anything that we can do to remove an uncertainty in this area, as we did with the oil import quotas and again with the fee system that we have in place right now, to give them these assurances will be helpful. I would like Tom to comment on the oil price floor at the same time.

Senator BENTSEN. Mr. Secretary, I would like for you to comment on it. I value your judgment, and it seems to me that if we enter into that kind of an oil floor price agreement, on oil imports, we add the glue to hold the cartel together. It is a formal recognition of what they are doing, and we would be encouraging such floors to be put under other commodities.

Secretary SIMON. I am not talking about other commodities, Mr. Chairman.

Senator BENTSEN. I know. But can it not lead to others?

Secretary SIMON. I would certainly hope not, because basically, I am an advocate of the free market as everyone knows. I also recognize, at the same time, that free markets may not work for certain periods of time. The OPEC nations are not allowing this market to function freely and there are times when the Government has a role to play in the free market process.

Now, we talk specifically about an oil price floor. But a rose is a rose. If we say we are going to have license fees that will adjust themselves, so that oil imports will never come in cheaper than whatever the domestic price is in our economy, then that is equal to a floor price. Whether it is done through quotas or through tariffs is immaterial. Tariffs happen to be my particular favorite.

Senator BENTSEN. Did I understand you? Do you think it is immaterial whether it is through quotas or tariffs or price floors?

Secretary SIMON. No. What I was suggesting is that license fees are the same thing as a floor price. It is a fluctuating floor price, if you will, rather than a fixed floor price.

Senator BENTSEN. Well, there is a difference right there. If you are talking about a fixed price floor agreement with OPEC countries, that is one thing.

Secretary SIMON. You asked my bias, and that is obviously it.

Senator BENTSEN. Which one?

Secretary SIMON. The one that allows it to fluctuate with the free market dominating.

Senator BENTSEN. You favor the one that allows it to fluctuate. That is an important distinction, I think.

I would like to hold our questions, Mr. Secretary because I know of your time limitations and we would like to let you make your other commitment. Mr. Secretary, do you know anyone outside of the administration that supports a proposed oil price floor?

Secretary SIMON. I must admit I have not had any conversation on this subject with people outside of the administration, Mr. Chairman. Our discussions continue in the administration on the exact approach, and the exact approach has not really been finalized. Ultimately, the President will make the specific decision on this issue, just as he does on all of these very important issues; and of course, the final decision of the President will be subject to debate and consent of the Congress.

Senator BENTSEN. The Treasury Department proposed, in the last session of the Congress, an exploratory tax credit, an additional tax incentive for exploration. Does the Department still favor that?

Secretary SIMON. We thought that was a very good incentive when we proposed it, and we still favor it. Those proposals were submitted, if I remember correctly, in March of 1973. We have been through the debate in both committees, Senate Finance as well as Ways and Means. As you well know, I guess I was the last fellow in the United States, other than the people involved in the oil industry—which I never have been—still arguing against the removal of depletion. I think that sometimes we do things in this country for short-term pleasure of punishing people who we perceive to have done something wrong.

Senator BENTSEN. Mr. Secretary, my time has run out; these time limitations are always a great idea until your time runs out.

Senator Gravel?

Senator GRAVEL. Thank you, Mr. Chairman.

Mr. Secretary, I think this is an excellent statement, and I agree with you that this is something that has to be mulled over and studied because of the dearth of data here that you have in the specifications. I feel so strongly about it that I intend to place it in the Congressional Record so the other Senators, and anyone else who wants to, can read a sort of baseline document on the problem.

I might add, I read a recent piece by Harland Cleveland on the International consequences of OPEC decisions, and he advances what I thought was an interesting theory. And as you know, I had some concern in the months back about the energy dollars out of this country. But the thesis he advanced was essentially what OPEC is doing is levying a tax for capital formation, and that this capital is used for

investment, vertical investment, in energy, which is something they know most about, and likely as not, will be the nature of the lion's share of their investment either in their own countries or in Europe or in this country; that we, in our marketplace, would not have levied such a stringent tax, recognizing that price is a method of tax. And so, had we been free without OPEC's actions, we would not have boosted the price of energy the way it has been. Therefore, we would not have levied a tax which would have brought about the capital formation which obviously the world needs and not only ourselves.

So I address this question, at this point, to you, not obviously from our provincial point of view—which is certainly the purpose of these hearings; how we are going to form our capital—but certainly we are interrelated with the whole world in the process of forming capital. Do you think there is some merit in the thesis advanced by Professor Cleveland?

Secretary SIMON. I have not read his study but I have always considered this massive flow of funds to the OPEC nations as a pool of savings. And this pool of savings would be used for productive investment in the developing and developed nations of the world.

I will go that far with him. But I would certainly hope we would begin to act with uncharacteristic wisdom and do it ourselves. Because, let us take a look at the price that the world is paying. Recognizing the interdependence of the world, and the price the world is paying, it is devastating for the most seriously affected of the developing nations. It is harmful to most of the developing nations. And the industrialized world is going to pay the price of reduced economic growth because they are paying so much more for their energy. I would suggest that while it has occurred, and one could make this thesis, that it certainly would be much better if we adopted our own domestic policies and did what we can do—and what the good Lord has given us the superabundance of natural resources to do—and remove all of the impediments from this industry and let them go function in the dynamic way that our free enterprise economy is allowed to function.

Senator GRAVEL. Of course, Mr. Secretary, we did not do that. And so OPEC prices brought about capital formation in the international areas that they control, but they also brought about a price increase in this country because the prices set in the Persian Gulf caused the rise in price, of course, haltingly, because of Government controls. But had we a free market during the same period, we would have seen a price rise in this country more aggressive than did take place, and, similarly, a capital formation that would have alleviated the problem you speak of.

The capital formation goes back to the 1954 decision by the Supreme Court on natural gas, and that is from whence it stemmed—the flight of capital. So, since we do not have the guts in a democracy to make the belt tightening needed to raise that kind of capital, and obviously the Government will not permit it now, or will eventually, because we are going to solve this energy crisis one way or another. The problem is going to keep coming back until we make the right decision. And we are not making the right decisions.

Secretary SIMON. The problem is—if I could just interrupt a second, Mr. Chairman. We are always looking at the short run, and we do it under the guise of giving consumers a break, when really it is a long-

run rip-off. And what we are doing is penalizing our children and our grandchildren through focusing our policies on consumption and short-range objectives, rather than looking at the longer term.

If we removed all of the impediments from our energy industry today, we would have a lower price of oil and energy in this country in the future. There is no doubt about that now, in my mind. We have to begin to look at the longer term and that is what I attempted to address in my paper this morning.

Senator GRAVEL. You subscribe, obviously, I believe—and I just want to underscore it here—that the method of price is the only method of capital formation.

Secretary SIMON. Yes.

Senator GRAVEL. I noticed in your statement——

Secretary SIMON. Well——

Senator GRAVEL. Unless you know another way.

Secretary SIMON. It is always subject to price in the last analysis. I had several criteria in my testimony.

We preempt a good deal of capital formation through continued budget deficits. Tax incentives do help as far as capital formation too. The price will adjust to those various considerations depending on the dynamics of a particular marketplace.

Senator GRAVEL. I was just going to go to the part of your statement that really is concerned, and I do not know if this is a partisan bias—and I do not say partisan in a political sense; I am talking of a philosophical sense between, let us say, the Republican thesis or Democratic thesis.

But the concern you have is your statement over Government expenditures—and just doing some rapid figuring, we probably, at best, would have discretionary control in the Congress of somewhere between $10 billion and $20 billion per year. The difference between the Congress' budget and the President's budget is roughly around $10 billion this year, and I think that is representative of the two possible extremes—$10 billion to $20 billion.

But if you compute that out over a 10-year period, you are only talking, with the capital formation you suggest, of $4 trillion, which I buy, with the reservation of end use conservation which is something we have not really addressed ourselves to, because we, on a per capita basis, consume twice the amount of energy than do other nations who have almost or equal our standard of living. So that obviously, we need some changes in our lifestyle to rheostat greater productivity.

But the point I am making is, we are talking about somewhere between 2.5 percent and 5 percent of this total capital formation, with the total parameters of Government action. So I find it difficult to share the degree of concern in your statement about Government spending. And, of course, this is a point of great acrimony between philosophies.

Secretary SIMON. What I am talking about, Mr. Chairman, are the continuing deficits. When you say the difference between Republicans and Democrats this year is only $7 or $10 billion, depending on what assumptions are used, it is relatively small. But the actual, continuing deficits, the cumulative deficits, are taking money from the productive sector away from private investment, housing, into the nonproductive sector which is government—which puts the emphasis on consumption.

The recession has caused a major portion of our deficit problems this year, but one cannot draw the assumption that it is either the Democrats or the Republicans. If it is Democrats and Republicans that do this, of course, then they are both wrong.

Senator GRAVEL. I did not mean this in a partisan sense.

Secretary SIMON. You said you wanted to underscore this as well.

Senator GRAVEL. I wanted to emphasize we were not saying this in a partisan sense, but only in the philosophic sense, where we hear a lot of rhetoric in that regard.

Secretary SIMON. Sure.

Mr. JONES. I think it is also an important issue although the slowdown in the rate of Government spending would only affect a small portion of the total resources required in capital investment. It is very important in two ways.

First, in its effect upon the capital market when you have these cumulative deficits which have totaled $103 billion in the last decade, from 1966 through 1974, and added to that the off-budget programs, it is very clear that the continuing diversion of capital out of the private sector to finance these deficits does have an effect.

Second, it involves a momentum issue. That is, that we are spending at such a rate that we are eroding the capability of making decisions in the Federal budget to attack new priorities. We are stuck, as you said earlier, with 75 percent or 85 percent or 90 percent of our budget turned toward priorities of the previous years, so that we cannot adjust. I think those two issues are at the heart of why we should regain control of Federal spending.

Senator GRAVEL Well I would raise an eyebrow on one aspect of that, and that is, when you talk of budget deficits of $30 billion to $50 billion—and, of course, deficits do not respect party ownership, or party operation of the White House; we have had them on both sides, but we do not have that flexibility in our economy, nobody does—you cannot turn off the Government operations to the tune of $30 billion or $50 billion in 1 year's time. It would be a disaster; it could not be done. So that, of course, the big deficit we have this year is an effort to try to get the economy going.

Secretary SIMON. Of course, this whole discussion reflects—and I do not think there is any difference of opinion, really, between what we are saying—the whole discussion reflects the need for the reordering of priorities in our spending in the United States, recognizing the critical dimensions of what we are here to discuss: capital formation and shortages, future capacity, and, of course the most important part, the country that we turn over to our children as far as the standard of living and the productivity.

Senator GRAVEL. Yes. Thank you.

I think that ends my questions. Thank you, Mr. Secretary.

Senator BENTSEN. Senator Packwood?

Senator PACKWOOD. Bill, this in an extraordinary statement; more so, I think, on capital formation than actually on the energy aspects, which is really what the hearing is about. But I am more intrigued about the entire statement. So let me ask you just two questions about energy, and then move on to capital formation.

One, in your estimation, should energy get some kind of an investment priority now, as opposed to other capital formation? Or

would you just prefer to see general encouragement of capital formation and let energy take its share?

Secretary SIMON. Well, as a basic philosophy, I prefer to just give everyone the same break, because I do not believe the Government has the wisdom to begin to allocate resources in this complex system we have here in this country. But recognizing the urgency of the requirements in the energy area, there are special incentives that will be useful in the energy area.

Senator PACKWOOD. So at the moment it is sufficiently urgent that energy ought to get a priority?

Secretary SIMON. Yes.

Senator PACKWOOD. Two, forgetting whether the price of imported oil——

Secretary SIMON. In certain areas, but not across the board.

Senator PACKWOOD. Forgetting the argument as to whether or not international oil prices will go down by the end of the decade or not; unless facts have changed since we had the first go-around on the oil tariff, if we do nothing we will be about 40-percent dependent on imported oil by the end of 1977, regardless of price.

In your estimation, can we count on a continued guarantee of imported oil for the almost unforeseeable future?

Secretary SIMON. We most certainly cannot, Senator.

We did not profit by experience, and those who do not pay attention to history—as someone said—are doomed to relive it. We just experienced our third embargo since 1947, and the first two times we had a surplus in this country.

We did not recognize the warnings of testimonies in the early sixties that our demand continued to increase while our production and exploration was declining. Finally, the lines crossed, and the embargo imposed upon us in October of 1973 exacted an economic penalty on this country. And as we continue to grow in reliance on insecure sources for our oil needs, it increases the danger of an even more severe economic impact if the political decisions are made for another embargo, or indeed, another arbitrary increase in the price of oil.

That is why there is a great sense of urgency. And one of my great frustrations during the time I have been in Washington—it is 2½ years now—is that we continue to debate the same subject. The problem is obvious, and while we may differ in some of our directions in the solution, we ought to get at it.

Senator PACKWOOD. I will tie the first two questions together then. We come to the same conclusion. Regardless of whether it necessarily makes economic sense, it does not make national policy sense for us to continue this dependence on imports, and we may have to skew our investment priorities a bit to get out of that bind.

Secretary SIMON. Well, as I said in my prepared statement, I would prefer not to redistribute the economic pie. I would prefer to enlarge it. But obviously, we cannot enlarge the economic pie that rapidly. The policies are not going to change in the situation in 6 months or 9 months. So, we should direct, while we are enlarging the pie instead of redistributing it, incentives into certain areas that can provide us with rapid benefits.

Senator PACKWOOD. You made substantial reference, Bill, in your statement to kinds of taxes the different industrialized countries levy.

And while our total tax levy in this country is comparatively low, it is more heavily levied on capital formation and production as opposed to consumption. And yet I notice on your table 5 that Japan's method of taxation and ours is very similar—their consumption taxes are quite low; their corporate profit and income taxes are substantially higher than ours, the household income profits slightly lower, but the two of them together about equal ours.

How has Japan managed to accumulate this tremendous capital formation and growth with roughly the same form of taxation we have?

Mr. JONES. I would like to answer that, Senator.

Beginning in about 1890, when Japan began its industrial development, there was a very conscious effort to combine industry and Government. Over the intervening decades, they have directed investment by taking taxes from various sources, particularly agriculture land taxes and through Government capital grants. They have also aided investment by allowing Japanese corporations to go up to 70 or 80 percent of their capital being supplied by debt, which our corporations certainly do not do. Through a variety of close Government and industry working relationships, the capital has been provided through grants and preferential treatment in the capital markets.

Senator PACKWOOD. Almost what we would regard as violations of antitrust laws.

Mr. JONES. We would not permit the combinations of financial, Government and business groups in our country.

Senator PACKWOOD. Certainly if you regarded the free enterprise system as good. They have combined an almost governmental paternalism that we would not call free enterprise.

Mr. JONES. They have achieved a very rapid rate of economic growth over a rather short period of time. I think those trends are beginning to change. It certainly would not be consistent with our goals or our concept of business freedom.

Senator PACKWOOD. Are you saying you think Japan cannot continue the progress they have had because they have an inherent built-in tax system of Government-business relations that is going to eventually cause them to slow down substantially?

Mr. JONES. Well, Japan will continue to have a very rapid growth rate because they are a productive people, and they have very high rates of capital investment. However, the decisions that they have made over the intervening decades have tilted away from consumption, whereas we have tilted toward it. They have tilted away from their infrastructure in schools and transportation, and more recently in pollution abatement. So really, it is part of the whole set of national priorities. We have emphasized consumption and many of the intrastructure issues. The Japanese, certainly in recent years, have begun to talk along these other lines. And I think this can only be judged way out in the future.

But, yes, they will continue to grow rapidly, but I would not choose their system in preference to ours.

Senator PACKWOOD. Now we get down to this consumption argument. I assume, Bill, the European taxes, the value-added taxes, is principally a consumption tax.

Secretary SIMON. That has been, in recent times, the most common vehicle.

Senator PACKWOOD. We get down to the trickle-down, trickle-up argument. With capital formation at the top and expanded industry we would all benefit. Those who sometimes advocate that are accused of being hardhearted and heartless because you are not helping the people at the bottom; as opposed to the consumption theory that if the people at the bottom have enough money, they will consume, and that will force industry to expand—not force them, but industries will naturally expand.

Would that latter theory work well if we levied heavy consumption taxes rather than production taxes?

Secretary SIMON. Well first of all, what can they expand with? When we take a look at the profitability——

Senator PACKWOOD. That is what I am saying. If we were to shift to consumption taxes——

Secretary SIMON. Well I would prefer heavier emphasis, most assuredly, on consumption taxes in this country.

Senator PACKWOOD. If we were to go to the heavy value-added tax, reduce our corporation tax, and continue emphasis on consumption, would the combination of those things work in both expanding the capital formation and continue our emphasis on consumption?

Secretary SIMON. I would not want to answer that quickly without looking at an analysis. When you say putting the consumption taxes on, and leaving the corporate taxes the same——

Senator PACKWOOD. No; I said lowering the corporate taxes.

Secretary SIMON. Lowering the corporate taxes; yes, indeed, it would. Whether that would be the preferred route or not, I would want to take a close look at. But that is certainly the direction that I would prefer.

Senator PACKWOOD. What I am trying to do, Bill, is figure a way out of this dilemma. If our historic pattern is consumption, than it does not really matter whether this is a free enterprise country or an absolutely socialized country; if our concept is consumption, it would not do any good for capital formation if the Government owned all these corporations.

Secretary SIMON. It certainly would not be.

Senator PACKWOOD. We would end up very much like Great Britain, which has a heavy consumption orientation and a very low capital formation record.

So you would advocate going toward or starting down the road toward some sort of value-added taxes?

Secretary SIMON. I would not say value-added tax; that is a pretty broad statement to make. But I would say that this is the direction that the President has chosen as far as energy is concerned, and as far as oil is concerned—levying a consumption tax to reduce and conserve this finite commodity.

Senator PACKWOOD. In terms of general production, if we were going to move more toward the European concept of the consumption taxes, what kind should we be looking toward? What kind should this committee be looking toward?

Secretary SIMON. Well, I think that each country—and I did not come prepared to respond in detail to a question like that—but each

country has its different priorities in the consumption area. One must look at where commodities are plentiful and where they are scarce, or indeed will be scarce 1 day. What our priorities are—again, every country has different priorities, so I could not answer that question without looking into it in a very detailed way.

Senator PACKWOOD. If the argument that corporations do not pay taxes, but people pay taxes, and corporations pass them on and you would simply act as an intermediate tax collector, why is the corporate tax not just a consumption tax?

Secretary SIMON. Fundamentally I agree with that basic statement.

Senator PACKWOOD. So what it really means in a free market economy, so long as you have a free market it would not matter what tax you levied on the corporations, so long as they passed it on to the consumer. It should not inhibit capital formation.

Secretary SIMON. Yes; but the effects of two other factors: (1) inflation and (2) the outmoded accounting methods—have reduced profits. That is why we have to look at the bottom line. But we also have to recognize that not every corporation has the ability to pass on these increased costs, whether it is in the commodities produced by inflation each year, or by a heavy tax burden on their company, because we are competitive in many areas—in most areas—in this country, and competition restricts their ability to raise the price and pass it completely through. You know we saw that in the embargo last year.

The OPEC nations had quadrupled the price; it had an incremental effect on everything, but we still had gasoline wars when inventories got too high. And when people are paying 10, 11, 12 percent to carry an inventory, they are going to sell it, and sell it rapidly. And that is what starts the competitive process again.

So you just cannot make a top blanket statement and say, well, they can just pass it along, because our competitive system does not allow this, and our inflation erodes the profitability of these companies as well.

Senator PACKWOOD. I understand the inflation problem. It seems to me so long as all the corporations were levied at the same rate and they all had the same amount imposed upon them——

Secretary SIMON. But they do not.

Senator PACKWOOD [continuing]. That would change the competitive situation.

Secretary SIMON. They are different; that is the complexity about our economy. You just cannot say all companies are the same. Profitability varies for many reasons in our corporations, in our industries; it depends on many outside variables as well.

Senator PACKWOOD. Thank you.

Senator BENTSEN. Mr. Secretary, I just have one more question. In trying to accelerate the development of some of these alternative sources of energy, and some of the major financial commitments that have to be made, and I for one do not want to see the Government do it by building plants, what do you think of the feasibility of having a so-called "energy development bank"? This bank would try to encourage the construction of plants for some of these major new, alternative sources of energy such as coal gasification. The Government might come in and guarantee the bottom 70 percent of the

investment, something like that, so you would have the discipline of private enterprise.

I am concerned that some of these plants just are not going to be built, the gamble is not going to be taken. I am concerned about what is going to happen to the price of oil, and the possibility of the Middle East countries fluctuating that price to a point that they would break some of these alternative sources, and make them not feasible.

Secretary SIMON. This is a form of allocation of credit that Senator Packwood referred to a moment ago. You are asking Government to set priorities about which particular specifics in the energy industry can or cannot finance.

What are the priorities? Are they utilities? Are they development of oil shale? Or the gasification/liquifaction projects? We are discussing these various mechanisms that the Government can assist with the notion that a free enterprise system ought to be allowed to function freely. Where the money will not be invested in the future, what assistance can we give that would not be an impediment? What assistance would not inhibit free enterprise from developing?

I always go back to the synthetic rubber experience. That was one way of doing it. I am not suggesting that that is the way we should go right now, but it was an interesting experience where private enterprise could not be expected, because of the economic costs and the ability to sell at a competitive price in the world which were unknown, so the Government took over that responsibility.

Well, maybe oil shale is an area where we should look into joint ventures, or putting up the initial costs of these plants.

Senator BENTSEN. I would still like to see the discipline of private enterprise, rather than just the Government building it and operating it. That is why I was exploring that as a possibility.

Secretary SIMON. I agree. I must admit that I agree with that direction in the same way, Mr. Chairman.

Senator BENTSEN. Senator Gravel?

Senator GRAVEL. Is the conclusion that you come to—and, of course, we all recognize we are a consumption, or service-type economy, and that changes our thoughts when we think in terms of services being not as important as production or other facets of them—so what you are advocating is really a rheostating between our consumption, with respect to service economy, into elements that should go into greater production.

But what strikes me is that if we got back on consumption, we will obviously have a cutback on production, because there will be less demand for production since there is less consumption. Therefore, there will be less need of capital to satisfy the needs of production, which is the result of consumption.

Secretary SIMON. If everything remained the same, you would be exactly correct. But nothing has remained the same. Our economy grows and will grow in the future, year by year, hopefully at not too rapid a rate—somewhere in the area of 4 percent real GNP.

The labor force is going to increase, and indeed the population is going to increase, and create greater demands on our economy to produce more to meet this demand.

Some people are beginning to believe we are already out of the deepest recession in history. The last numbers I saw before I went away involved the steel industry. I do not think there is a more important activity; it is one of the basic industries in this country. I think we would all agree to that. They were operating at close to 90 percent of capacity.

Now it does not take very much of an economic recovery, and if it is indeed sharp, we are going to find ourselves back in the same sequence that occurred in 1971–72. According to the Government's figures there was slack in the economy. Some private people were arguing there was no slack. But price pressures reappeared immediately as soon as the economy got back to functioning normally.

We are going to be back in that same boat, depending on the strength of the recovery, as far as many of our basic industries are concerned. So I believe that there is already a capacity shortfall in this economy in a great many areas.

Taking all the other components, the growing labor force and the demands of the citizens for the increased standard of living, et cetera, and you are going to see demand grow in the future. And it can only be met—the higher standard of living that we all desire—through higher productivity and through expanding the productive capacities of our plants.

So I am not suggesting that we just cut consumption dramatically. It is a shift. It is a shift from consumption to savings and investment to provide what we need in the future. That is all.

Senator GRAVEL. The vehicle to do that, though, is what we have to think of.

Secretary Simon. It is a political decision, because it shows no short-run benefits. And anything that does not show shortrun benefits, we do not do.

Senator GRAVEL. What, specifically, would it be? A value-added tax?

Secretary SIMON. No, I was not talking in the tax area, although that is a useful area. As I said in my testimony, we are exploring tax reform now. The basics, we believe, are in the budgetary area involving Government spending which emphasizes consumption. We have to look at a budget balance over the business cycle and when the economy is operating in periods of high economic activity, as it was in the mid- and late-1960's, we should have a surplus.

A surplus frees up money for private investment. That is when the housing sector will be able to borrow money at reasonable rates of interest. I have always felt—I know there are economists that disagree with this—that when mortgage rates rise, housing activities suffer. Even though the flow of funds into the thrift institutions is important, and increased flows occur when interest rates are in the short end of the spectrum, there is still a great impediment to a person buying a house with a mortgage interest rate at 9 percent rather than at lower levels around 5 percent. The difference comes to $100 a month, and that is a great impediment. And, when you add to that the effects of inflation, land and construction costs, and the other costs, we are pricing too many of our citizens out of the markets with our economic policies.

And yet at the same time we subsidize housing to the tune of 35 percent of the residential and farm mortgages, last year, and look what

happens. Housing starts go down to an annual rate of 800,000. Is that the proof of the pudding?

Senator BENTSEN. Senator Packwood?

Senator PACKWOOD. Bill, did I see the Treasury had its new estimates earlier this week of the budget deficit for this year?

Secretary SIMON. No, just on the revenue side. The expenditures are still unclear. Revenues came in more rapidly than we had expected. We make revenue estimates. We have to make estimates on everything. Revenue estimates are probably the trickiest estimates to make, and also one of the most unreliable.

Senator PACKWOOD. Your recent increase in your estimate is what? $4 or $5 billion?

Secretary SIMON. It was $7 billion.

Senator PACKWOOD. $7 billion?

Secretary SIMON. Yes. Most of that, from individuals on 1974 tax returns. And when you look at it, this is only 2 percent of the total. So it is not that much off, but it is a significant amount of money and it was a very happy thing to see.

Senator PACKWOOD. So that ought to bring us in at a deficit this year of about $43, or $44, or $45 billion?

Secretary SIMON. We are looking at somewhere in the $40, $41 billion area, but it is still a little early to foresee. June is a tricky month. With Government expenditures, so many things happen. The various bureaucracies love to spend that money quick before they have to turn it back.

Senator PACKWOOD. Bill, we have a $40 billion deficit this year, $80 billion next year for the 15 months, and $20 to $25 billion off-budget borrowing. Let us say it is a 6-percent increase in the money supply and we try to fund all of the deficit in the borrowing out of the private capital markets.

In your estimation, how much would it cause interest rates to rise?

Secretary SIMON. Oh, nobody can give an estimate of that Senator, because it depends on so many other factors like our rate of inflation, but clearly a deficit in the range of $80 to $100 billion, as I have said so many times, would be dangerous.

I have also said, at the same time, that a deficit of $50 to $60 billion, in my judgment, could be managed, with strains, but it could be managed. The danger—as I have been inaccurately quoted on so many occasions—is not this year. It is when the economic recovery commences, and it depends on the strength of the economic recovery. There are those right now who say the economic recovery is going to be sharper.

Senator PACKWOOD. I agree that you have been, in my mind, unjustifiably misquoted. Because as I read what you said, you were talking about next year, and it was almost like we are all being criticized for warning about next year. It is as though that will not come until next year; don't worry about it.

Secretary SIMON. That is what one financial columnist recently wrote in the newspaper. He said: "Let's worry about inflation next year." But we must realize that what we do this year is what creates inflation next year. That is what our problem is in this country. This economic nonsense gets passed out to the American people and that is the reason we do not have any understanding of the problem.

That is why we have had the boom-bust cycles in the last decade. I am just trying to warn, because I feel it is the responsibility of the Secretary of the Treasury, as chief financial officer, to warn of dangers that may occur.

Some people think I am shrieking about a problem. I am not. I am just warning of a danger. It is not a prediction.

Senator PACKWOOD. You know, your inability, Bill, I cannot really blame you, to say what interest rates will be next year——

Secretary SIMON. I do not know.

Senator PACKWOOD. I know you do not know.

Secretary SIMON. But I do know one thing. If the deficit goes to those levels of $80 to $100 billion during fiscal 1976, even if the inflation rate declines more than the original forecasts, they would be higher than we would normally expect.

Just look what they are right now. Again take into consideration the recession and its severity and where long-term rates are. That is an indication of what is occurring in the real world.

Senator PACKWOOD. Bill, we have got the best brains around in banking. Last week I asked the same question to four different economists and two of them said the rates would trickle upward and two of them said they would trickle downward. You are kind of sporadic in your estimates, and yet we have to vote budget deficits, we have already agreed.

Secretary SIMON. I am not sporadic. All I have ever been interested in is the total impact. I am not an economist. I am a banker. I have worked in those markets and I made the decisions in the marketplace, in a firm that carried an average inventory of about $2 billion a day—and that is a sizable amount of money to manage—in a very risky business.

I talk to economists, as well, but I do not restrict my conversations to economists. I also talk to people who make the decisions, judging the expectations in the marketplace. I have talked to the financial officers of major corporations, as to what their needs are, and what their expectations are as far as inflation in the future, because that depends on what interest rates are. And then you make a judgment on whether you think the trend is up or down.

Now the trend for interest rates, when an economy recovers, depending on the sharpness of the recovery, the bias is always slightly upward. But then it depends on what the expectations are, because markets, just as the stock market has been doing, is bidding on the future, believing that we are going to have a sound economy at that point with low inflation rates.

Well, at the point of the economic recovery, as it gains momentum, then we have to look at what the money supply is. Has the Fed moderated its growth targets so that we are not going to have the creation of an excessive amount of reserves in this country? What the borrowing needs are for the future. What the deficits of the Federal Government will be.

We are certainly going to compete with these borrowing needs. Then you reassess it. You reassess it as far as the direction is concerned. It is necessarily done on a relatively short-term basis, meaning 3, 4, 5, 6 months, because so many events are constantly happening world-

wide which affect this that no one can say what is going to happen a year from now.

But, you can say, if you make the basic assumptions, that if the economy is going to have strong, real growth next year, or moderate real growth next year, private demands will be x, government demands will be y, and who are we squeezing out?

There is a strange notion around that a bell goes off any time we crowd people out of the marketplace. People are crowded out of the marketplace every day. Some are crowded out by their own decisions. They say: "I can't pay 11 or 12 percent for money because I cannot make a profit." So, they do not invest in additional plant equipment to produce additional goods and services for our economy, because it is not profitable to do so.

That is one form. Other forms are people paying an extraordinary amount for money, as they are now, based on any historical comparison. These are the considerations you have to make. Only you do it not with your econometric models, you do it based on what is actually happening in the marketplace.

Senator BENTSEN. Mr. Secretary, I promised to have you out of here by 11:30.

Secretary SIMON. I talk too much.

Senator BENTSEN. I understand Senator Packwood's frustration in listening to the varying views of economists always saying: "on the other hand."

I can remember Harry Truman's statement that what this country needs is a good one-armed economist. [General laughter.]

I think the broad range of questions that were given to you, Mr. Secretary, shows a great interest and concern by members of this committee on the subject that is before us.

We appreciate very much your contribution this morning. Thank you, Mr. Secretary.

Secretary SIMON. Thank you, Mr. Chairman.

[The prepared statement of Secretary Simon follows. Hearing continued on p. 48.]

STATEMENT BY THE HONORABLE WILLIAM E. SIMON, SECRETARY OF THE TREASURY

Mr. Chairman and members of this distinguished committee: I welcome this opportunity to appear before you this morning on a subject of timely and urgent concern: our capital investment needs for the future.

For several months, many economic policy makers in Washington have been preoccupied with the problems of ending the recession, slowing the rate of inflation and steering the nation back to a course of stable, durable economic growth. Today there are many signs that the economic slide is gradually decelerating, and we can be increasingly confident that we will be on the road to recovery before the end of this year.

As we emerge from the recession, it is especially important that we now begin to focus greater public attention on the longer-range problems of our country. While the process of recovery will require careful and vigilant management, we must be equally concerned whether the period of the recovery and beyond will bring sustained economic progress or a sorrowful repetition of the boom and bust cycles of the past.

Certainly there is no subject more central to our hopes for the future than our ability and our willingness to meet the capital investment needs of coming years. Those needs are impressively large, and they will demand a full-scale effort. In my testimony this morning, I want to draw upon an abundance of documentary evidence showing that the United States has not been keeping pace in its capital investments and that we must devote more of our resources to this purpose if

we are to achieve our most basic economic dreams for the future. To summarize, the record shows that:

During the 1960s, the United States had the worst record of capital investment among the major industrialized nations of the Free World.

Correspondingly, our records of productivity growth and overall economic growth during this period were also among the lowest of the major industrialized nations.

As other nations have channeled relatively more of their resources into capital investment and have acquired more modern plants and equipment, they have eroded our competitive edge in world markets.

Our record on capital investments reflects the heavy emphasis we are placing on personal consumption and government spending as opposed to savings and capital formation.

Our record also reflects a precipitous decline in corporate profits since the mid-1960s.

While the U.S. economy remains sufficiently large and dynamic to overcome our investment record of recent years, our future economic growth will be tied much more directly to the adequacy of our capital investments.

Estimates of future needs vary, but it is relatively clear that in coming years we will have to devote approximately three times as much money to capital investments as we have in the recent past.

It is an economic fact of life that increased productivity is the only way to increase our standard of living. For the sake of future economic growth—jobs, real income and reasonable price stability—the inescapable conclusion is that government policies must become more supportive of capital investment and that we must make a fundamental shift in our domestic policies away from continued growth in personal consumption and government spending and toward greater savings, capital formation and investment.

Some analysts have concluded that it will not be possible to meet our future capital investment needs. I disagree. I firmly believe that we are capable of achieving our basic investment goals, but I also believe that they represent one of the most formidable economic challenges of the decade ahead.

I. CAPITAL INVESTMENT EXPERIENCE

The beginning point for our consideration of capital investment—and one that should be of keen concern to everyone—is the pattern of economic growth during the decade of the 1960s. The average annual rate of real economic growth during that period for the twenty nations belonging to the Organization of Economic Cooperation and Development (OECD) ranged from a high of 11.1 percent for Japan, to a median of about 5 percent for Australia, the Netherlands, and Norway, to a low of 2.8 percent for the United Kingdom. The United States, during this time experienced an average growth rate of 4 percent a year—17th among the 20 nations (Table 1).

Of the many economic, political and social factors that influence economic growth rates, none is more important than the level of capital investment. Economists generally agree that the factors affecting growth include: (1) the accumulated base of capital goods; (2) the current pace of new capital investments; (3) the effective application of new technology; (4) the quality of the national labor force—its education, training, discipline and commitment; (5) the infrastructure of transportation, communication, financial and service facilities; (6) access to industrial raw materials; (7) managerial skills; and (8) the organization of the economic variables—along with other specific factors not listed—varies from country to country and changes over time. It is also possible to substitute one, or a combination, of these productivity variables for specific inadequacies. Most analysts agree, however, that a strong rate of new capital investment is required to generate sustained growth. In fact, the effectiveness of all of the other factors that determine productivity are heavily dependent upon the quantity and quality of capital goods made available by new investment.

The United States retains a position of economic leadership because it has been blessed over a long period of time with a favorable mix of all of the important economic variables, along with political stability and improving social mobility. For many years our advantageous ratio of capital to labor has been acknowledged as the basis of the remarkable rise of the U.S. economy. Even

now spending for plant and equipment continues to increase and these outlays still exceed the amounts invested elsewhere because of the large size of the U.S. economy (Table 2). In 1974, gross private domestic fixed investment totaled $195.6 billion, up from $194.0 billion in 1973 and $131.7 billion in 1970. Investments in business structures and producers' durable equipment totaled $149.6 billion in 1974, up from $130.8 billion in 1973 and $100.6 billion in 1970.

Nonetheless, even though plant and equipment expenditures will continue in the future as the economy grows, it is unrealistic to assume that the historical patterns of investment and productivity will be adequate to meet the priorities of the future. And I certainly am not suggesting that we can fulfill every claim presented by society. The disappointing record of Federal deficits in fourteen of the last fifteen years ending with FY 1975—or forty out of the last forty-eight years—and the unfortunate boom and bust pattern of economic performance over the past decade indicate that we have not been able to effectively identify and manage our national economic priorities. Some analysts have claimed that future economic growth will release unused resources to fulfill new claims against the national output. To the contrary, the intensity of claims for available resources will likely increase in the future. The assertion that additional government spending programs can be added without disrupting the allocation of resources in the private sector has been refuted by the events of the past decade, particularly the increasing inflation pressures and shortages of materials and production capacity.

Comparative Rates of Investment

Recognizing the relatively low rate of U.S. economic growth in the 1960s, it is worthwhile to look now at the relative rate of capital investment in this country. Although the amounts of capital investment continue to increase in the United States and our capital-to-labor ratio is still relatively high, other nations during recent years have allocated a substantially larger share of their resources to new capital formation. Furthermore, the gap between the U.S. level of investment, measured as a share of national output, and the commitments of other leading industrial nations has increased. A study prepared by the Department of the Treasury indicates that total U.S. fixed investment as a share of national output during the time period 1960 through 1973 was 17.5 percent. The U.S. figure ranks last among a group of eleven major industrial nations; our investment rate was 7.2 percentage points below the average commitment of the entire group. When only nonresidential investment is considered the level of commitment is naturally lower for every nation but the relative position of the United States is not changed.

INVESTMENT AS PERCENT OF REAL NATIONAL OUTPUT 1960-73 [1]

	Total fixed [2]	Nonresidential fixed
Japan	35.0	29.0
West Germany	25.8	20.0
France	24.5	18.2
Canada	21.8	17.4
Italy	20.5	14.4
United Kingdom	18.5	15.2
United States	17.5	13.6
11 OECD countries	24.7	19.4

[1] OECD concepts of investment and national product. The OECD concept includes nondefense government outlays for machinery and equipment in the private investment total which required special adjustment in the U.S. national accounts for comparability. National output is defined in this study as "gross domestic product," rather than the more familiar measure of gross national product, to conform with OECD definitions.

[2] Including residential.

Source: U.S. Department of the Treasury.

The reduced pace of capital investment in the U.S. economy has also been emphasized by Professor Paul W. McCracken, former Chairman of the Council of Economic Advisers and now Senior Consultant to the Department of the Treasury. Using historical figures, reported in constant dollars, for the amount of nonresidential capital formation per person added to the labor force, he estimates that commitments in the United States during the 1970s are 22 percent below the level reported in the 1956 to 1965 decade. In terms of business capital investment per worker, the United States still maintains a considerably higher capital to

labor ratio than in Europe and Japan. However, our advantage has declined as other nations have increased their capital investments per worker. The Department of Commerce estimates that since 1960 the existing base of plant and equipment assets has nearly doubled in France and Germany and more than tripled in Japan.[1] The cumulative total of such assets in the United States increased at most by about 50 percent during the same period.

Gross nonresidential fixed investment per person added to civilian labor force

[In 1958 dollars]

Period:	Amount
1956 to 1960	$49,500
1961 to 1965	55,300
1966 to 1970	46,400
1971 to 1974	[1] 41,000

[1] Estimate based on incomplete data for 1974.

Source: Statement of Paul W. McCracken before the Committee on Ways and Means, Jan. 29, 1975. Basic data from the Departments of Commerce and Labor.

Factors Influencing U.S. Rate of Capital Investment

In evaluating the relatively slower rate of capital investment in the United States, several moderating factors should be considered.

First, the unusually large size of the U.S. economy and its relatively advanced stage of development, including the accumulated total of previous capital investments, creates a different investment environment. In 1974 the U.S. national output was $1.4 trillion, which is approximately equal to 90 percent of the combined total for the nine countries in the European Economic Community and Japan. Having already created such an impressive productive capacity it is to be expected that our rate of additional growth might be lower than the development rates of other nations who are striving to achieve our relatively advanced level of economic activity.

A *second* and even more important influence has been the historical priority placed on consumption within the U.S. economy. We are a consumption-oriented society and this pattern has been developing for several decades. The emphasis on consumption has undoubtedly caused much of the rapid development of the U.S. economy because it has created a strong demand for goods and services needed to sustain output, employment and investment. In 1974 personal consumption totaled $877.0 billion, or 63 percent of our gross national product; total government purchases of goods and services totaled $308.8 billion, or 22 percent; gross private domestic investment, which includes the change in inventories, was $208.9 billion, or 15 percent; and net exports of goods and services amounted to $2.0 billion or 0.1 percent of total national output. Personal and government consumption outlays have long dominated the GNP totals, and this pattern of economic activity is deeply ingrained in our society. As a result, despite our high per capita incomes, the accumulations of gross savings flows required for capital investment are lower in the United States than elsewhere. It is also important to note that the level of gross private savings in the United States has remained stable throughout the postwar era.

AVERAGE ANNUAL GROSS SAVINGS FLOWS AS A PERCENT OF GROSS NATIONAL PRODUCT

	1955-59	1960-64	1965-69	1970-74
Gross private saving	15.9	15.4	15.9	15.8
Personal saving	4.5	3.8	4.5	5.5
Undistributed corporate profits	3.4	2.8	3.1	2.8
Inventory valuation adjustment	−.3	0	−.3	−1.2
Capital consumption allowances	8.3	8.8	8.7	8.7
U.S. Government surplus	−.1	.2	−.2	−1.1
State and local government surplus	.3	.1	0	.5

Source: Department of Commerce, Bureau of Economic Analysis.

[1] *An Overview of Investment: The United States and Major Foreign Economies*, International Economic Policy and Research Report, U.S. Department of Commerce, Domestic and International Business Administration, October 1974, p. 9.

These figures are subject to differing interpretations. Some analysts have claimed that it will not be possible to attract enough savings to meet future involvement needs. This negative conclusion assumes that the capital needed to increase plant and equipment capacity will be preempted or diverted to meet the consumption preferences of the private and public sectors. I would hope that the severe output, inflation, unemployment and balance-of-payments distortions of the past decade would be a useful warning against such a result. It should be apparent from the experience of recent years that we must invest adequate funds in new plant and equipment—as well as in education and training—in order to increase our Nation's productivity and thereby raise our standard of living. Failure to provide necessary productive capacity to meet the Nation's economic goals is certain to have undesirable effects upon our society over the long run.

Other analysts have used the same gross savings figures to claim that there will not be any particular strain in handling our future investment needs. They believe that as investors are provided with a sufficiently high return on their investments, they will increase savings to meet the higher demand for capital This conclusion seems to be based on two questionable assumptions: (1) that the existing savings ratio of the past decade is adequate for both past and future capital investment needs; and, (2) that each sector in the economy can obtained its minimum investment needs within the total outlays financed.

I do not agree that past investment levels have been fully adequate. Experience has demonstrated that inflation and unemployment problems have been created in part by capacity shortages. Many of our current difficulties are the direct result of the energy and raw materials strains that developed in early 1974 and eventually contributed to our current recession and related unemployment. The continuous deterioration of our international trade balance during the 1960s, when the dollar was overvalued, was also at least partly the result of the loss of competitiveness for U.S. products and increased reliance on foreign sources of goods. As you will see in a moment, I think there is also clear evidence that in order to meet future needs, the Nation must increase its capital investment as a claim against national output. Unfortunately, specific investment needs have not been adequately fulfilled in many sectors of the economy, even though generally outlays have increased. We must also be concerned about the capacity of our capital markets to provide adequate financing. Economists often assume that the supply of investment funds will automatically match the demand for capital if interest rates and equity yields are attractive. Our financial markets are very efficient in collecting savings and allocating the funds. However, we should be more sensitive to the disruptive impact of high interest rates. Even though financial markets may be functioning well in allocating the available capital, specific sectors of the economy may not be able to obtain the investment funds needed, particularly at interest rates they can afford. The periodic problem of providing adequate mortgage financing at reasonable interest rates is one example of the limitations within the market. The difficulty in obtaining equity financing is another. Whether or not industry will be able to acquire the investment funds needed will be heavily influenced by future actions of the government. National policies cannot ignore financial realities by diverting capital into deficit financing and disrupting the goals of stable monetary policy without inhibiting the necessary process of capital formation. The costs of capital and its availability for private sector needs are heavily dependent on these public fiscal and monetary actions. While the financial markets are very resilient and responsive to changing credit and equity needs, they are not entirely immune to the disruptive impact of government policies.

A *third* important factor affecting the pattern of U.S. investment compared with other nations is the relatively large share of total capital outlays we commit to the services category, which includes housing, government and other services. According to a study published by the Organization for Economic Cooperation and Development (OECD), the United States allocated 70 percent of its total investment to the services category during the 1969 to 1971 time period. The U.S. figure is significantly higher than that reported by the other five major industrial nations included in the study (Table 3). Accordingly, the U.S. share of investment committed to the manufacturing sector, 19.7 percent, was considerably lower than the figures reported by France (27.8 percent), West Germany (25.2 percent), Japan (26.8 percent), and the United Kingdom (23.8 percent). Our heavy investment in the services category tends, of course, to

emphasize. This arrangement may satisfy immediate consumer preferences, but we must weigh those preferences against long-term concerns about domestic productivity and international competitiveness.

A *fourth* in influence on the pattern of capital investment in the United States is the relatively large share of our investment that must be used for replacement and modernization of existing facilities. It is estimated that 62 percent of U.S. capital investment during the time period 1960 to 1971 was used for replacement needs, compared to the United Kingdom, 61 percent; Canada, 52 percent; France, 54 percent; West Germany, 53 percent; and Japan, 31 percent. The divergent pattern reflects the advanced status of economic development in some nations and the postwar experience of Europe and Japan in restoring their devastated industrial facilities following World War II. The Department of Commerce estimates that 60 to 70 percent of the U.S. stock of plant and equipment has been added since 1960, compared to approximately 75 percent of the capital goods of West Germany and France and 85 percent of Japan's industrial capacity. It should be emphasized that this heavy replacement requirement does provide a continuing opportunity to introduce new technology into the U.S. economic system. Since the annual value of U.S. capital investment is so large, it cannot be assumed that the entire U.S. industrial system is technologically obsolete, even though some specific sectors have suffered a sharp competitive deterioration. Nevertheless, the otherwise imposing outlays for replacement and modernization do not add to the total productive capacity of our economy.

A *fifth* and final factor influencing the national rate of capital investment is the pattern of government policies. Government can affect investment either directly through the incentives it provides or indirectly through various tax and regulatory policies and its own pattern of spending.

A review of the diversified economic incentives available in other nations indicates the very active investment role played by many foreign governments. Basic industries are frequently controlled by the government with total, or at least dominant, public ownership. Special financial and operating assistance is also frequently provided for preferred private companies to assist their development if it is considered to be in the national interest. The United States has avoided most of the capital allocation and special incentive programs used in other countries. I strongly favor this private sector approach and believe that it has been a positive factor in the development of our economy.

There are some Federal programs which provide direct financial support through the Economic Development Administration, the Small Business Administration and 100 different government credit programs, but the major influence of Federal Government on capital investment comes through the Federal budget. Government budget decisions now represent approximately one-third of the total GNP and this figure will rise even higher if spending trends of the past twenty years are continued. The government also influences private sector activities which stimulate investment. For example, the FY 1976 budget prepared by the President calls for outlays of $4.6 billion on general science, space and technology programs, $2.2 billion on energy activities and $9.4 billion for environmental and natural resources. Part of these outlays will involve capital investment needs.

The Government is also exercising increased influence over private investment decisions through the growing number of safety, health and environmental standards. Precise estimates are difficult, but it has been estimated that during 1972, 8 percent of the textile industry's capital investments and 12 percent of the steel industry's investments were related to health and safety standards mandated by the government. While such standards may be highly desirable, we should recognize that these investments do not increase the Nation's total productive capacity.

Many State and local governments also provide special incentive programs to attract capital investment into specific geographical areas. Such incentives include capital grants, advantageous credit arrangements, relocation and manpower training grants, special site and building assistance, infrastructure investments, and preferred tax and utility arrangements. While such incentives have influenced the location of some facilities, the total amount of capital investment has probably not been increased.

The private sector continues to be the best means of increasing capital investment in the United States and our government has fortunately not attempted to control the pattern of such investments.

Negative Results of Inadequate Capital Investment

While the historical pattern of capital investment in the United States may satisfy our immediate goals, there are serious economic risks in having a slow rate of capital investment for an extended period of time. The emphasis on immediate consumption has occurred because American consumers have historically preferred to spend 91 percent of their disposable after-tax income. The government has basically supported this independence of choice although its tax and spending policies have unfortunately exercised an increasing influence on private decisions. But we must now question the future adequacy of past investment patterns if we are to adequately prepare for the economic future of our great nation.

Various studies have indicated the close relationship between capital investment and various measures of economic growth and productivity. A dynamic economy is needed to create jobs by applying new technology and expanding production capacity. A productive labor force is also necessary for producing goods and services to meet rising demands for an improved standard of living and as a means of holding down inflation. When productivity increases, the effects of rising wages are offset so that unit labor costs can be held down and prices are more stable. Inadequate capital investment also limits new job opportunities and creates unemployment. Specific examples of production capacity shortages became painfully apparent to the Cost of Living Council (COLC) as it administered the program of wage and price controls from August 1971 until June 1974. Recognizing the inflation pressures created by these numerous capacity contraints, the COLC followed a definite policy of requiring specific capital investment commitments from private industry as a basis for price decontrol decisions. The COLC also became very concerned about future inflation problems that could result from raw materials shortages and increasing capacity shortages in several basic industries as economic growth occurs. Unfortunately, productivity gains in the United States have been disappointing, particularly when compared with the experience of other leading nations.

PRODUCTIVITY GROWTH, 1960-73 (AVERAGE ANNUAL RATE)

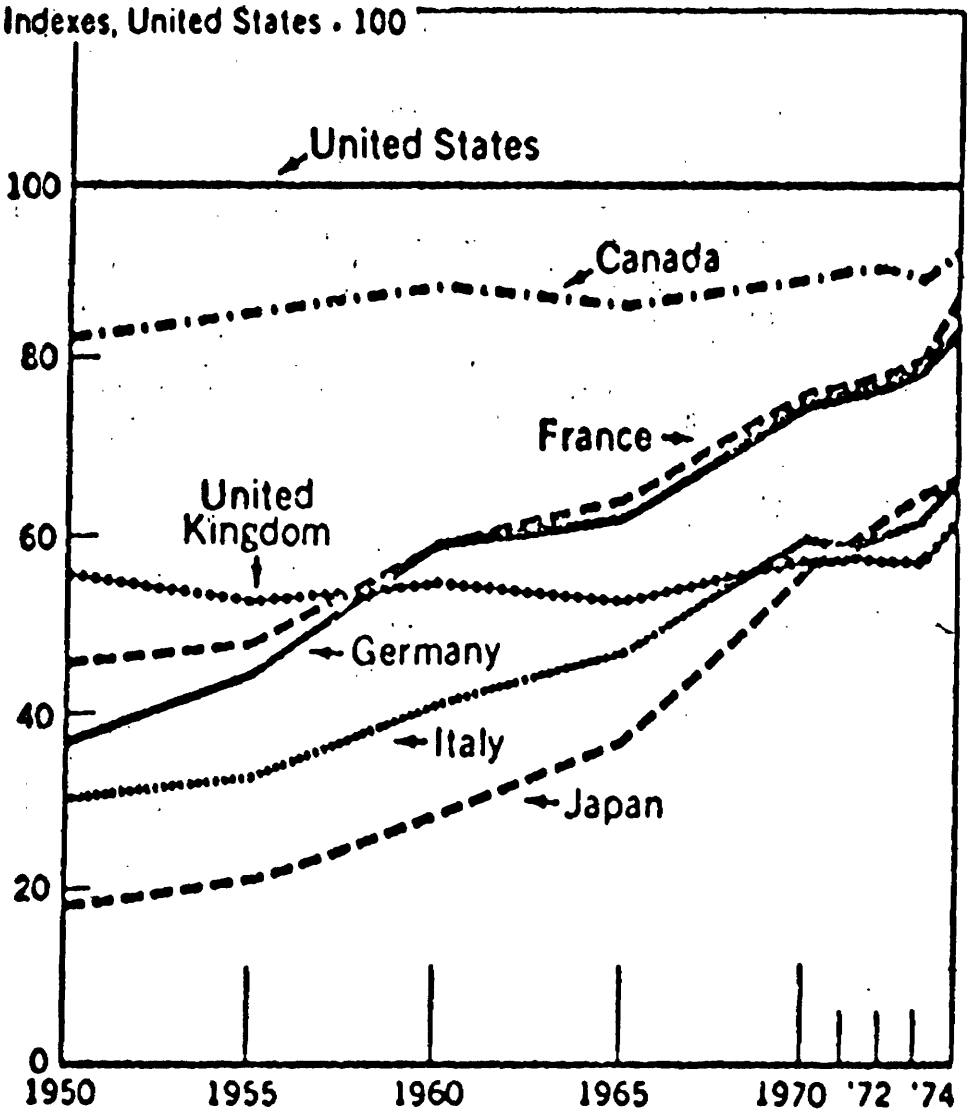
	Gross domestic product per employed person	Manufacturing output per man-hour
United States	2.1	3.3
Japan	9.2	10.5
West Germany	5.4	5.8
France	5.2	6.0
Canada	2.4	4.3
Italy	5.7	6.4
United Kingdom	2.8	4.0
11 OECD nations	[1] 5.2	6.1

[1] Average for 6 OECD countries listed.

Source: Department of the Treasury.

The rapid growth of the U.S. economy to its present size and the relatively low level of inflation until the late 1960's has been based on the creativity and productivity of the system. Americans have greatly benefitted from this growth, not only in personal economic gains but in terms of national security and international leadership. Continued prosperity, however, cannot be taken for granted; it must be earned. We must be willing to allocate more of our resources to the future and fewer to satisfying immediate demands. This is a difficult concept for some to accept because they prefer current consumption. With so many needs still unsatisfied in a land of relative plenty, this feeling is understandable. Our ability to fulfill these needs will only be restricted, however, if we now fail to prepare for the future. The simple truism that we cannot consume more than we produce should be obvious, but we sometimes ignore it in setting national priorities. And we can no longer afford to ignore the fact that as the real output of other nations has increased more rapidly than our own, our competitive advantage has gradually been eroded.

Real Output per Employed Civilian 1950-'74



II. FUTURE CAPITAL INVESTMENT REQUIREMENTS

Economic projections are always difficult, but estimating future capital needs is particularly uncertain at this time because costs and priorities continue to change rapidly. It is obvious, however, that future capital requirements will be enormous—larger than anything we have ever faced before. Clearly we will need to increase the quantity and quality of housing; develop new energy resources; improve the quality of our environment; rehabilitate the existing transportation system and develop a better urban transportation system; continue the mechanization of agriculture; construct new office buildings, communications systems, medical facilities, schools and other facilities; and meet the massive needs for new plant and equipment. In all of these sectors we must not only replace and modernize existing facilities but also add new capacity, particularly in many of our most basic industries.

The Department of Commerce estimates that capital requirements for producers' durable equipment and nonresidential structures will total $3.4 trillion

during the 1974 to 1985 period. If annual outlays for residential construction, which have averaged $50 billion during the past four years, are added to this figure, the total capital needs rise to well over $4 trillion. Details of their estimate include:

GROSS PRIVATE DOMESTIC NONRESIDENTIAL FIXED INVESTMENT

[In billions of current dollars]

	1974	1985	Cumulative 1974–85
Total producer's durable equipment	100.0	276.7	2,188.8
Nonresidential structures	54.7	151.3	1,197.3
Total	154.7	428.0	3,386.0

A similar study performed by the General Electric Company confirms the massive size of future capital requirements. Assuming a real GNP growth rate of 4 percent and an inflation rate of 5 percent, General Electric expects gross private domestic investment, including residential housing, to total $4½ trillion over the 1974 to 1985 time period.

The General Electric and Commerce studies are consistent if housing outlays are added to the Department of Commerce totals. Both estimates are limited to private investment and exclude the large government expenditures required for roads, dams, government facilities, schools, pollution abatement outlays, and many other projects.

Assuming, then, that the cumulative investment needs between 1974 and 1985 will range from $4 to $4½ trillion, the point to remember is this: over the most recent period of the same length, 1962 through 1973, our total outlays for capital investment in the United States were $1½ trillion. Thus, our capital investment needs in coming years are approximately three times the level of the recent past. That is perhaps our best measure of our challenge ahead.

Both of the studies I have mentioned are necessarily based on many uncertain projections and arbitrary assumptions about a continuing close relationship between investment and economic growth. But even if some of these assumptions prove to be erroneous—as they will—and new investment requirements arise—as always happens—the actual results will not materially change the following conclusions:

1. Capital requirements for gross private domestic investment will be in excess of $4 trillion during the 1974 to 1985 time period.

2. The future rate of inflation will be a crucial factor in determining the amount of future investment because it will influence both the price of assets acquired and the economic incentives for future investment.

3. The achievement of national capital investment goals is possible if we are willing to increase the share of national resources committed.

Energy Investment Requirements

One area of capital investment that is particularly critical for the future is energy. To achieve greater self sufficiency in energy, enormous capital investments will be required. We basically have two alternatives. The first one is to meet our increased energy investment requirements by reducing outlays in other sectors. While energy priorities are indeed important, it would be most unfortunate to disrupt the entire economic system in this way. A second—and more desirable—approach is to include these new requirements within an enlarged total investment goal. Our purpose should not be to redistribute the economic pie, but to continue enlarging it so that everyone will have a bigger share.

Recognizing that the ultimate cost of energy investment needs will be influenced by many variables, it appears that capital requirements over the next decade will total about $1 trillion stated in current dollars to include the effects of inflation. Energy investments will comprise an important share of the total capital requirements discussed above but their financing is manageable if they are given a high priority as part of a comprehensive national energy program. The specific amounts to be spent in each category will depend upon the energy policies adopted and dynamic developments within the economy. Nevertheless, the range of possible needs is indicated in four separate studies prepared by the Federal Energy Administration, National Petroleum Council, National Academy

of Engineering and Arthur D. Little, Inc. All four studies are stated in *constant 1973 dollars* to make them comparable. If necessary adjustments are made for potential inflation and the increased needs that have been identified since the studies were prepared the resulting capital needs expressed in current dollars, will approximate $1 trillion between now and 1985.

COMPARISON OF CAPITAL REQUIREMENTS ESTIMATES[1]: TOTAL DOLLARS CUMULATIVE 1975-85

[In billions of 1973 dollars]

	NPC[1]	NAE[2]	ADL[3]	FEA accelerated supply
Oil and gas (including refining)	133	149	122	98.4
Coal	8	18	6	11.9
Synthetic fuels	10	19	6	.6
Nuclear	7	93	84	138.5
Electric powerplants (excluding nuclear)	137	53	43	60.3
Electric transmission	42	125	90	116.2
Transportation	43	.....	43	[4] 25.5
Other[5]	.....	.....	8	2.2
Total	380	457	396	454.0

[1] U.S. Energy Outlook, a summary report of the National Petroleum Council, Washington, D.C., December 1972 (average of 4 supply cases).
[2] U.S. Energy Prospects, "An Engineering Viewpoint," National Academy of Engineering, Washington, D.C., 1974.
[3] Arthur D. Little estimates based upon an energy conservation scenario.
[4] Does not include investments required for tanker fleets, but does include $5,500,000,000 targeted for Trans-Alaska oil pipeline.
[5] Solar, geothermal, municipal waste treatment plants, and shale oil.

Source: Federal Energy Administration, "Project Independence Report," November 1974, p. 282.

The overall impact of energy requirements is summarized in a special report issued by the Chase Manhattan Bank in March of 1975. The Energy Economics Division of the bank is noted for the quality of its special reports. Over twenty years ago that division predicted that an energy shortage would develop in the United States if certain policy adjustments were not made. One of the major concerns of these reports over the years has been the chronic underinvestment in energy resources which became apparent in the late 1950's. The conclusion of the most recent Chase Manhattan Bank report is particularly perceptive:

"Although the relationship between investment and supply of energy is an elementary principle that applies to any and all sources of primary energy, it is nevertheless one that is not well understood. In fact, the lack of understanding was responsible for the incredibly unenlightened regulation and many other political actions about the world that had the two-pronged effect of preventing the generation of sufficient capital funds and discouraging the investment of money that actually was available. And the current energy shortage is the consequence. Yet, even today, after so much damage has been done, there is still a widespread failure to recognize the relationship between investment and supply. Instead, two distinctly different attitudes generally prevail. Many apparently continue to believe they can somehow again have enough energy without paying all the associated costs. Others, obviously, are resigned to the prospect of a permanent shortage and see conservation as the only avenue of partial relief. Neither attitude is realistic, of course. The world still does not lack basic energy resources remaining to be developed. And it is conceivable that eventually there can again be enough to serve all its needs but only if the necessary investment is made first. If it is not, a permanent shortage will indeed be the certain outcome."

Source: The Chase Manhattan Bank, Energy Economics Division, "How Much Oil—How Much Investment," A Special Petroleum Report, March 1975.

The report goes on to emphasize—correctly, I believe—that a permanent shortage is intolerable because it would so constrict total economic growth that the growth in labor force—even at the more moderate pace expected in the 1980s—could not be absorbed. The resulting unemployment problems would cause severe economic problems in addition to threatening our political and social stability.

Future investments in energy resources will naturally be determined by total demand over time. Estimates have already changed dramatically as costs have risen and conservation efforts have increased. However, these developments are so recent that it is difficult to predict future demand until a national energy policy is agreed upon and the various energy incentives and disincentives are

identified. The Chase Manhattan analysts had originally projected a continued growth in the world's demand for energy at an average annual rate of 5 percent which is the same pace as recorded from 1955 to 1970. Admitting the unusual degree of uncertainty, the bank has now lowered its projection to an annual rate of 4.2 percent with a strong warning that energy forecasts have historically erred on the conservative side. Oil consumption is expected to grow at a more rapid annual rate of 4.5 percent over the 1970 to 1985 period, resulting in a cumulative consumption of 375 billion barrels, nearly two and a half times more than in the 1955 to 1970 period. North America is expected to remain the world's largest consumer of total energy and oil, but the growth rate for this area may be lower because of a slower population growth and our potential for conservation savings.

Turning to the financial requirements for the petroleum industry, Chase Manhattan Bank estimates a world-wide need for $400 billion to find 600 billion barrels of oil between 1970 and 1985. This is more than two and a half times the actual investment for this purpose during the 1955 to 1970 period. An additional $370 billion will be needed between 1970 and 1985 for world-wide development of refineries and processing facilities, tankers, pipelines, environmental equipment and the necessary marketing facilities. The total of $770 billion is nearly three times the actual commitment in the preceding fifteen year period. Finally, another $400 billion will be required for other investments, payment of dividends, debt repayments and additions to working capital.

The total financial needs of the world's petroleum industry from 1970 to 1985 are estimated by the bank to be $1.2 trillion *stated in constant 1970 dollars.* Inflation will of course increase the dollar amounts required. If inflation averages 5 percent over the time period, the world petroleum industry financial needs would rise from $1.2 to $1.6 trillion. With 10 percent inflation, the figure would increase to $2.2 trillion.

With regard to financing these world-wide petroleum industry requirements, the bank estimates the following distribution of potential sources based on the $1.2 trillion constant dollar estimate: (1) Communist nations, $225 billion; (2) new capital market issues, $240 billion; (3) capital recovery allowances, $260 billion; and (4) profits, $460 billion. These figures must be adjusted upward according to whatever rate of inflation occurs.

This brief listing of sources obviously conceals many difficult financial challenges. The world's capital markets will already be absorbing large public and private financing demands. Government policies may reduce capital recovery allowances permitted for computing tax liabilities. And the assumption that oil industry profits will be large enough to cover such a large share of the total is questionable. Commenting on the public's reaction to oil industry profits in 1973 and 1974 after fifteen years of average performance, the bank report states:

"As emphasized earlier, there cannot possibly be enough energy of any kind without adequate investment. And investment cannot be adequate without sufficient profits. But profits are labeled excessive and restraints are proposed without apparent consideration of the need for profits as a source of investment funds. As indicated earlier, the industry will need at least $845 billion of profits between 1970 and 1985 if the world experiences a 10 percent rate of inflation. But in the first four years of the period the industry generated no more than $60 billion of profits, only 7 percent of the required amount. Even in the highly unlikely event of no further inflation, the $60 billion would represent but 13 percent of the industry's total needs for the fifteen year period."

III. GOVERNMENT POLICIES

While our economy is capable of financing its large private capital investment requirements, our success in meeting that goal is heavily dependent upon the shape of government policies. It is absolutely imperative that government policies become more supportive. A continuation of the severe fiscal and monetary distortions of the past decade would undoubtedly prevent the achievement of our basic goals. Inflation must be controlled, and the government must avoid disrupting the capital markets if the private sector is to obtain the financing required. In fact, public officials must balance the Federal budget over time and record occasional surpluses in order to free up capital resources to fulfill existing private investment claims. Instead of reducing private investment to release resources for government social programs, we should concentrate on balancing the budget over time so that the future flow of savings is not diverted away from private investment.

Unfortunately, the Federal Government has reported a deficit in fourteen out of the past fifteen years ending with FY 1975. During the single decade FY 1960 through FY 1974, the cumulative Federal deficits totaled $103 billion. Net borrowings for supporting over one hundred "off-budget" Federal programs totaled another $137 billion during that decade. As a result, the Federal Government withdrew one quarter of a trillion dollars out of the capital markets. But this record is only a prelude to our present situation when Treasury financing requirements will total about $75 billion in calendar year 1975 in order to finance the massive Federal deficits expected. While much of the current deficit results from the recession, which has caused tax revenue losses, increased unemployment compensation benefits and other outlays resulting from the "automatic stabilizers" used to fight recession, a review of the budget details indicates that traditional spending programs are also rising rapidly and new programs are proposed almost every day. As indicated in Table 4, the spending figures included in the original budget submitted by the President last February called for outlays of $313.4 billion in Federal spending in FY 1975 and $349.4 billion in FY 1976. Recent projectsions by the Office of Management and Budget indicate that FY 1975 outlays will be $324.2 billion, an increase of 20.8 percent over FY 1974 outlays. It should be obvious that government spending—both for temporary stimulus and traditional programs—is increasing at a rate that is creating serious resource allocation problems far into the future and that these pressures will not conveniently disappear as we gradually emerge from the recession later this year.

Looking beyond the recession problems of 1975, we seem to face the dilemma of having an apparently irresistible force of growing government spending meeting the immovable object of future capital investment requirements. But we should no longer consider the growth of government spending and related deficits to be an irresistible force. To do so will inevitably lead to even more serious economic problems of unemployment, reduced real gains in our national standard-of-living and even more inflation resulting from inadequate physical capacity and reduced productivity. We must recognize the basic reality that when we apply too much pressure on our capacity to produce goods and services, the inevitable result is inflation and shortages. The underlying growth trends of the U.S. economy will continue to provide for further economic progress, but we cannot realistically expect to satisfy every new claim within our economy by simply shifting resources from the private to the public sector. Adding new government commitments is not feasible if the total productive capacity of the economy is exceeded. This guideline has been frequently violated as total demand has increased too rapidly for the economic system to absorb. When this happens the economy begins a boom and bust sequence with severe inflation and unemployment distortions. Nor can we wish away the problem by claiming that there is plenty of slack in the 1975 recession and that we can ignore problems of overheating the economy until later years. The escalaiton of government spending levels summarized in Table 4 has already seriously eroded our future fiscal flexibility and the lagged impact of current spending decisions will directly affect the future. In short, if we are to achieve our crucial goal of adding at least $4 trillion of private capital investment by 1985, we must first establish more moderate and sustainable fiscal and monetary policies.

Tax Policies

Federal tax policies affect capital investment decisions by determining the after-tax earnings available for investment and by establishing incentives or disincentives for future investment. An OECD study of tax policies indicates that total government tax collections in the United States during the years 1968, 1969, and 1970 were a smaller proportion of the gross national product than in most other industrial nations. The U.S. figure of 27.9 percent for those three years was above that of Switzerland (21.5) and Japan (19.4 percent) but below the levels reported for many European nations, ranging from Italy (30.1 percent) to Sweden (43.0 percent). Since the study was completed, the United States undertook major tax policy changes in 1971 and in March of 1975, but the comparative relationships have probably not changed very much. There is, however, a major difference in the distribution of the tax burden. As indicated in Table 5, only 18.1 percent of the U.S. tax revenues in 1971 were provided by taxes on the consumption of goods and services. Other industrial nations relied much more heavily on consumption taxes: France, 34.8 percent; West Germany, 28.1 percent; United Kingdom, 26.6 percent; Canada, 28.7 percent; and Japan 20.7 percent.

The definite tilt toward personal and corporate income taxes in the United States is consistent with our historical preference for immediate consumption. It is not my purpose to criticize this historical priority, but the future requirements for capital investment indicate that tax policies should be reviewed. Just such a review has been underway in the Department of the Treasury in preparing for the tax law changes completed last month and in anticipation of a joint review with the Congress in the coming months of possible tax reform initiatives. I do not want to make any specific recommendatons this morning because we are still working on our analysis and recommendations. We will want to review the options with Congress before specific actions are suggested. I will merely refer to some of the policy areas that need to be reviewed:

1. *Corporate income tax*—These taxes directly influence the cash flow available for investment. The rate has vacillated slightly above or below the 50 percent level for many years. While a reduction in the rate of taxation would probably be the most straight-forward approach to enhancing investment incentives, any change would represent a major shift in policy and would require extensive Congressional consideration. The Tax Reduction Act of 1975 did increase the corporate surtax exemption from $25,000 to $50,000 and decrease the "normal" tax from 22 to 20 percent on the first $25,000 of earnings. These changes, however, do not affect the tax impact on the great bulk of corporate earnings subject to the corporate surtax.

As part of this on-going review of tax policies we also need to consider the influence on investment of our two-tier system of corporate taxation in which income is taxed once at the corporate level and again at the shareholder level. This approach discriminates against corporate investors generally and small equity investors particularly. An individual in the 20 percent tax bracket in effect pays 48 percent at the corporate level and then an additional 20 percent on what is left for a total tax burden of 58.4 percent, or nearly three times his individual rate. If the individual is in the 70 percent bracket, he pays 48 percent at the corporate level and then an additional 70 percent on what is left. His total tax burden is 84.4 percent. If the same business could be conducted in a non-corporate form, the investors would pay only 20 and 70 percent respectively.

Our tax system puts a great penalty on companies that must incorporate. Companies that do incorporate are those that have large capital needs that must be raised from many persons. We should keep in mind that our system of taxation bears more heavily on corporations than do the tax systems of almost every other major industrial nation. In the last few years our major trading partners have largely eliminated the classical two-tiered system of corporate taxation. Through a variety of mechanisms they have adopted systems of "integrating" the personal and individual income taxes so that the double taxation element is radically lessened.

2. *Investment Tax Credit (ITC).*—Business firms have strongly supported the ITC as a major stimulus to additional capital investment. Empirical studies do indicate that the amount of investment in machinery and equipment has increased when the ITC has been put into effect and has declined when it is suspended. Some critics believe, however, that the ITC simply influenced the timing and types of investment rather than increasing the total amount. Whichever view is correct, there was strong support for the investment tax credit provision in the Tax Reduction Act of 1975 which increased the credit to 10 percent for two years and removed the lower percentage limitation for utilities. Unfortunately, the investment tax credit has had an uncertain status once it was initiated January 1, 1962 and businessmen are justifiably concerned about the stability of an incentive which has already been removed twice and then reinstated.

3. *Depreciation guidelines.*—The amount of capital recovery charges permitted for tax purposes also influences the after-tax earnings available for private investment. In 1954 the Internal Revenue Tax Code was changed to permit depreciation charges to be made on an accelerated basis. The official guidelines were again liberalized in 1962, and in 1971 the Asset Depreciation Range (ADR)—along with the investment tax credit—was added to the regulations.

The ADR rules allow companies to select a time period for calculating depreciation within a range of 20 percent above or below the Treasury guideline which specifies useful life periods for various assets. Despite these adjustments, American businesses complain that they have a competitive disadvantage compared with some other nations. The figures summarized in Table 6 do indicate that American firms using both the ADR and the investment tax credit can

recover 55 percent of the value of new investments during the first three years. By comparison, the allowances in other nations are as follows: Canada, 100 percent; France, 90.3 percent; Japan, 63.9 percent; United Kingdom, 100 percent; and West Germany, 49.6 percent. It should be added that the U.S. position becomes more comparable by the seventh year. Various business groups have proposed further liberalization, such as a wider ADR percentage, but further consideration should be part of the general tax reform analysis involving the Department of the Treasury and the Congress.

4. *Special Incentives.*—The government is frequently asked to provide special incentives in the form of reduced or delayed taxes, accelerated depreciation schedules, capital grants or other benefits to enhance the rate of return on capital investments. While such incentives are usually requested on the basis that they will contribute to the achievement of some national priority, it is usually difficult to justify such special treatment. When special advantages are given to a specific industry or geographical region, others become relatively disadvantaged and it is very difficult for government authorities to determine which claims should be favored, particularly in a dynamic economy where priorities can change rapidly. While there may be a few specific situations where the government should intervene in the allocation of resources which is now handled efficiently by the private markets, my overwhelming preference is to avoid the economic distortions which are found to occur.

Corporate Profitability

The final area of concern that I want to address here is the future outlook for corporate profitability. Such profits are, of course, the major incentive for additional investment and an important source of funds for financing outlays, along with various external sources. In a fundamental sense profits are the driving force of our system—the engine that pulls the economic train for the 85 percent of our work force still in the private sector—and they are just as much a "cost" of doing business as payments to workers, supplies of materials and services, taxes, etc.

Unfortunately, corporate profits are too often thought of as an unnecessary claim required by greedy businessmen rather than the basic incentive in our economic system. Public opinion surveys in the 1930s and in more recent years are consistent in indicating that the general public thinks that profits account for approximately 28 percent of the sales dollar. The fact is, however, that profits account for approximately 5 cents out of each dollar of sales. Actual earnings of business firms are thus far below what the general public—and some Members of Congress—perceive them to be. In fact, corporate profits will have to improve substantially in order to provide the necessary incentives and to make the necessary contribution to future investment outlays. My concern is that the negative attitudes about profits held by many Americans might become an unfortunate part of public policy. We must avoid legislation and regulation that is punitive of profits honestly earned. The result could only be that capital formation would be inhibited, and the real purchasing power of wage earners would rise more slowly. We must always be alert to the fact that profits translate into jobs, higher wages, and an increased standard of living for all of our people.

One important reason why there is so much misunderstanding about corporate profitability is that our accounting system has not yet been able to adapt to the disruptive effects of the double-digit rate of inflation we have suffered. Inflation hurts investment by increasing the prices of new assets and eroding the purchasing power of corporate earnings. Taxes must be paid on reported earnings even though these figures are exaggerated by inventory valuation profits and the inadequacy of capital recovery allowances, which are based on the historical costs of existing assets rather than the inflated outlays required for new assets. Inflation also disrupts investment by discouraging savings once the general public recognizes that the purchasing power of such commitments is eroded so quickly.

Fortunately, the Department of Commerce publishes figures which attempt to adjust for the distorting effects of inventory valuation, the effects of accelerated depreciation methods and the understatement of capital recovery allowances based on historical cost asset values. The results of these adjustments are summarized in Table 7. These figures clearly indicate that adjusted after-tax profits of nonfinancial corporations as a share of national income and of the value of corporate output are far lower than the public opinion polls would suggest. Furthermore from a peak in 1965 through 1973 the relative share of corporate after-tax profits has declined by one-half according to both measures. The same

discouraging pattern results when these adjusted earnings figures are compared to the replacement value of capital assets to determine the rate of return on invested capital. From a peak rate of return of 10 percent, in 1965 this measure declined to 5.4 percent in 1970 before recovering to a level of 6.1 percent in 1973. The sluggish economy of 1974 and 1975 will further reduce this figure. It is not unfair to say that the United States has been and remains today in a profits depression. Since the incentive for new investments ultimately depends upon sustaining an attractive rate of return on capital, this trend is particularly disturbing.

It should be emphasized that all of these comparisons have been stated in current dollars which conceals the negative impact of inflation on the purchasing power of retained earnings. Professor John Lintner of Harvard University recently reported that the retained earnings of U.S. nonfinancial corporations were 77 percent lower in 1973 than in 1965 if the figures are converted into constant dollars in order to remove the effects of inflation and if adjustments are made to remove the effects of inventory valuation gains and the underreporting of depreciation changes based on historical costs. Without these adjustments, reported retained earnings in 1973 were 43 percent above the 1965 figure.[8]

Because business firms cannot use "phantom" earnings to acquire capital assets, the future pace of private investment will depend upon the growth of real profits. The government can influence the economic incentives needed to stimulate investment through its tax policies, regulatory and administrative practices and various spending programs, but the private investment decision ultimately depends upon the rate of return expected and the availability of adequate financing at a reasonable cost. Government officials and the general public must recognize the basic importance of corporate profitability and the disruptive effects of excessive government spending pressures—pressures which create deficit financing requirements that take precedence over private investment needs in the capital markets. This problem has not received adequate attention.

IV. SUMMARY

As we strive to end the most severe economic recession in our postwar experience, my deep and abiding concern about the future adequacy of capital investment will perhaps appear to be ill-timed to some analysts. There is extensive slack in our economy with an unemployment rate near 9 percent and reduced rates of plant capacity utilization in many specific industries. The economic slide, however, will not last much longer, and we will again be reporting real growth gains before the end of the year. As the pace of economic activity accelerates, we will likely rediscover shortages of labor and production capacity. In fact, some industries still have high plant capacity utilization ratios, and many types of skilled labor will be difficult to find even in the early stages of economic recovery. In 1971 it was widely believed that extensive slack existed but the economy was again operating at a very high rate of capacity by 1972 and shortages and explosive inflation soon occurred.

Our statistics on plant capacity have always been uncertain measures, and current economic conditions have motivated the Department of Commerce to give top priority to a comprehensive survey of production capacity as a basis for preparing more meaningful estimates of plant capacity utilization rates. It is ironic that such a fundamental factor in preparing national economic policies has been based on such uncertain economic statistics.

Dr. Pierre Rinfret, President of a well known economic consulting firm, Rinfret Boston Associates, Inc., has published an impressive study of the national production capacity which indicates that our current government statistics grossly underestimate the rate of capacity utilization in American industry and that there is virtually no reserve capacity. His study estimates that the capacity utilization rate for manufacturing industries was 86.6 percent in 1974 (Table 8) a figure well above the government's estimate for 1974, of 78.9 percent. It should also be emphasized that the concept of operating at 100 percent of physical capacity is misleading. Over the last fifteen years the government figures indicate that manufacturing capacity utilization has averaged only 88 percent despite some periods of intense output. The highest figure reported by the government during these fifteen years was 91.9 percent for 1966. Most companies need to preserve

[8] Lintner, John, "Savings and Investment for Future Growth: 1975–76 and Beyond," presented at a colloquium on "Answers to Inflation and Recession: Economic Policies for a Modern Society," conducted by The Conference Board, Washington, D.C., April 8–9, 1975, p. 15.

some reserve capacity to handle unexpected output requirements and to substitute for operating assets which need repairs or replacement. Therefore, the existing government figures do not accurately measure the realistic level of capacity utilization.

Looking beyond the current problems of recession and sustaining an economic recovery, the additional capital investment of at least $4 trillion from 1974 to 1985 represents a major challenge to the future growth of our economy. We must also give careful attention to the problems of specific industries in attracting needed investment for balanced growth. I am confident that these basic goals can be accomplished. But the desired results will require government policies which will moderate inflation and balance the Federal budget over time in order to avoid diverting needed capital away from investment and into the financing of chronic government deficits. A continuation of the fiscal and monetary distortions of the past decade will only frustrate our capital investment efforts and lead to still more serious economic problems in the future.

Thank you.

TABLE 1.—AVERAGE ANNUAL RATE OF CHANGE IN REAL GROWTH FOR MEMBER NATIONS OF OECD, 1960-70

[In percent]

Japan	11.1	Norway	5.0
Greece	7.6	Belgium	4.9
Portugal	6.3	Denmark	4.9
Yugoslavia	6.7	West Germany	4.8
France	5.8	Austria	4.8
Italy	5.6	Iceland	4.3
Canada	5.2	Ireland	4.0
Finland	5.2	United States	4.0
Australia	5.1	Luxembourg	3.3
Netherlands	5.1	United Kingdom	2.8

Source: Organization for Economic Development and Cooperation.

TABLE 2.—GROSS PRIVATE DOMESTIC FIXED INVESTMENT, 1950-74

[In billions of dollars]

PART. A.—NOMINAL DOLLARS

Year	Total	Nonresidential structures and producers' durable equipment	Residential structures	Year	Total	Nonresidential structures and producers' durable equipment	Residential structures
1950	47.3	27.9	19.4	1963	81.3	54.3	27.0
1951	49.0	31.8	17.2	1964	88.2	61.1	27.1
1952	48.8	31.6	17.2	1965	98.5	71.3	27.2
1953	52.1	34.2	18.0	1966	106.6	81.6	25.0
1954	53.3	33.6	19.7	1967	108.4	83.3	25.1
1955	61.4	38.1	23.3	1968	118.9	88.8	30.1
1956	65.3	43.7	21.6	1969	131.1	98.5	32.6
1957	66.5	46.4	20.2	1970	131.7	100.6	31.2
1958	62.4	41.6	20.8	1971	147.4	104.6	42.8
1959	70.5	45.1	25.5	1972	170.8	116.8	54.0
1960	71.3	48.4	22.8	1973	194.0	136.8	57.2
1961	69.7	47.0	22.6	1974 [1]	195.6	149.6	46.0
1962	77.0	51.7	25.3				

PART. B.—CONSTANT 1958 DOLLARS

1950	61.0	37.5	23.5	1963	76.7	51.9	24.8
1951	59.0	39.6	19.5	1964	81.9	57.8	24.2
1952	57.2	38.3	18.9	1965	90.1	66.3	23.8
1953	60.2	40.7	19.6	1966	95.4	74.1	21.3
1954	61.4	39.6	21.7	1967	93.5	73.2	20.4
1955	69.0	43.9	25.1	1968	98.8	75.6	23.2
1956	69.5	47.3	22.2	1969	103.8	80.1	23.7
1957	67.6	47.4	20.2	1970	99.5	77.2	22.2
1958	62.4	41.6	20.8	1971	105.8	76.7	29.1
1959	68.8	44.1	24.7	1972	118.0	83.7	34.3
1960	68.9	47.1	21.9	1973	127.3	94.4	32.9
1961	67.0	45.5	21.6	1974 [1]	118.1	94.1	24.0
1962	73.4	49.7	23.8				

[1] Preliminary.

Source: Department of Commerce, Bureau of Economic Analysis.

TABLE 3.—OUTPUT AND INVESTMENT BY SECTOR 1969-71 AVERAGES

[Current price percents]

	United States	France	Germany	United Kingdom	Canada	Japan
PARTITION A						
Sector percentage of total output:						
Agriculture	3.0	5.9	3.2	2.6	3.9	[1] 7.3
Mining	1.6	.8	2.2	1.4	3.4	.9
Manufacturing	30.3	45.3	50.4	33.5	26.6	43.0
Utilities	2.3	1.8	2.3	2.8	2.4	2.0
General services	62.8	46.2	41.9	59.7	63.7	46.8
Dwellings	5.4	4.5	3.8	2.3	3.3	NA
Government	14.7	8.8	9.4	10.1	14.0	3.1
Other services	42.7	32.9	28.7	47.3	46.4	NA
Total	100.0	100.0	100.0	100.0	100.0	100.0
Sector percentage of total investment:						
Agriculture	3.8	4.6	[2] 5.3	2.6	5.5	5.9
Mining	1.0	.7	1.3	1.5	7.5	.9
Manufacturing	19.7	27.8	25.2	23.8	16.6	26.8
Utilities	5.2	3.9	5.0	8.6	9.5	3.9
General services	70.3	63.0	63.2	63.5	61.0	62.5
Dwellings [3]	19.9	26.3	22.2	15.1	21.5	17.9
Government	20.4	12.8	9.9	15.9	17.9	24.9
Other services	30.0	23.9	31.1	32.5	21.6	19.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
PARTITION B						
Sector ratios: Investment percentages divided by output percentages:						
Agriculture	1.3	.8	1.7	1.0	1.4	.8
Mining	.6	.9	.6	1.1	2.2	1.0
Manufacturing	.7	.6	.5	.7	.6	.6
Utilities	2.3	2.2	2.2	3.1	3.9	2.0
General services	1.1	1.4	1.5	1.1	1.0	1.3
Dwellings	3.7	5.8	5.8	6.6	6.5	NA
Government	1.9	1.5	1.1	1.6	1.3	8.0
Other services	.7	.7	1.1	.7	.5	NA

Source: OECD, "National Accounts of OECD Countries," 1960-71.

[1] Output averages of Japan are for 1969-70.
[2] Investment averages of Germany are for 1967-68.
[3] Investment in owner-occupied dwellings. For Canada, France, and the United Kingdom the figure is from residential investment, which differs slightly from the former category.

TABLE 4.—FEDERAL BUDGETS, CHANGES IN THE UNIFIED BUDGET OUTLAYS BY FISCAL YEARS, 1961-76

[Dollars in billions]

Fiscal year over preceding year	Federal outlays	Dollar increase	Percentage increase	Surplus or deficit
1961	$97.8	$5.6	6.1	−3.4
1962	106.8	9.0	9.2	−7.1
1963	111.3	4.5	4.2	−4.8
1964	118.6	7.3	6.1	−5.9
1965	118.4	−.2	----------	−1.6
1966	134.7	16.3	13.8	−3.8
1967	158.3	23.6	17.5	−8.7
1968	178.8	20.5	13.0	−25.2
1969	184.5	5.7	3.2	+3.2
1970	196.6	12.1	6.6	−2.8
1971	211.4	14.8	7.5	−23.0
1972	231.9	20.5	9.7	−23.2
1973	246.5	14.6	6.3	−14.3
1974	268.4	21.9	8.8	−3.5
1975 (estimate) [1]	313.4	45.0	16.8	−34.7
1975 (estimate) [2]	324.2	55.8	20.8	−42.2

[1] Last official budget estimates published Feb. 3, 1975.
[2] May estimate of OMB as to expected fiscal year 1975 outlays and most recent, May, Department of Treasury fiscal year 1975 receipts.

Source: Economic Report of the President, February 1975, table C-64, p. 324, for years 1961 through 1974.

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TABLE 5.—COMPARISON OF GENERAL TAX REVENUE SOURCES, 1971

Tax revenue by type	United States		France		Germany		United Kingdom		Canada		Japan	
	Value (millions)	Percent of total	Value (francs millions)	Percent of total	Value (DM millions)	Percent of total	Value (pounds millions)	Percent of total	Value (Canadian dollars millions)	Percent of total	Value (yen millions)	Percent of total
Corporate income and profit [1]	$30,234	10.4	18,747	5.8	11,655	4.5	1,558	7.8	3,080	10.2	2,977	18.8
Household income and profit [1]	98,176	33.6	32,492	10.1	70,295	26.9	6,668	33.2	10,221	33.9	3,802	24.0
Consumption taxes [2]	52,698	18.1	112,139	34.8	73,425	28.1	5,340	26.6	8,660	28.7	3,289	20.7
Social security contributions	60,286	20.7	134,802	41.9	88,430	33.8	2,828	14.1	2,463	8.2	3,174	20.0
Other taxes	50,301	17.2	23,916	7.4	17,655	6.7	3,685	18.3	5,710	19.0	2,612	16.5
Total	291,695	100.0	322,096	100.0	261,460	100.0	20,079	100.0	30,134	100.0	15,854	100.0
Comparsion excluding social security distributions:												
Corporate income and profit [1]		13.1		10.0		6.8		9.9		11.1		23.5
Household income and profit [1]		42.4		17.3		40.6		38.6		37.0		30.0
Consumption taxes [2]		22.8		59.9		42.4		31.0		31.3		25.9
Other taxes		21.7		12.8		10.2		21.4		20.6		20.6
Total	231,409	100.0	187,294	100.0	173,030	100.0	17,251	100.0	27,671	100.0	12,680	100.0

[1] Includes capital gains.

[2] Defined as taxes levied on transactions in goods and services on the basis of such intrinsic characteristics as value, weight, strength, etc. The source document provides further elaboration concerning tax category definitions.

Source: Revenue statistics of OECD member countries 1966–71, OECD.

TABLE 6.—COMPARATIVE COST RECOVERY ALLOWANCES FOR INDUSTRIAL MACHINERY AND EQUIPMENT

Country	Representative cost-recovery period (years)	1st taxable year	1st 3 taxable years	1st 7 taxable years
Canada	[1] 2	50.0	100.0	100.0
France	[2] 8	31.3	90.3	[3] 100.0
Japan	[4] 11	[5] 37.1	63.9	88.1
United Kingdom	1	100.0	100.0	100.0
Western Germany	[6] 9	[7] 16.7	49.6	[8] 88.8
United States:				
With investment credit but without ADR (accelerated depreciation range)	[9] 13	[10] 21.7	47.9	80.1
Without either investment credit or ADR	[9] 13	7.7	33.9	66.1
With both investment credit and ADR	[9] [11] 10½	[10] 23.5	54.7	88.5

[1] Beginning May 1972 machinery and equipment acquired for manufacturing or processing of goods in Canada could be written off over 2 years (50 percent per year).
[2] 250 percent declining balance method multiplied by a factor of 2 to give effect to multiple shift operations.
[3] Method changed to straight line in 4th taxable year. Straight line rate applied to original cost in such year.
[4] Modified double declining balance method; 18.9 percent per Japanese Government rate table multiplied by a factor of 1.28 to give effect to multiple shift operations.
[5] Includes special 1st year allowance of 25 percent; allowance reduces recoverable base cost in 2d and succeeding taxable years.
[6] The average cost recovery period for machinery and equipment in Western Germany is 8 to 10 years to which additional allowances are permitted for multiple shift operations: 25 percent of allowance for 2-shift operations and 50 percent of allowance for 3-shift operations. Allowances may be further increased when plant is located in certain areas such as Berlin, areas bordering on iron curtain countries, and undeveloped areas.
Cost recovery allowances based on an average cost recovery period of 9 years. The double declining balance method is used. A 25 percent additional allowance for 2-shift operations is taken into account beginning with the 5th year when the method is changed to straight line. The coorporate depreciation rate thus computed is slightly over the maximum 20 percent rate permitted on a declining balance method to reflect that:
(A) The straight line method produces more depreciation than does the double declining balance method for certain short-lived assets; and
(B) Items of machinery and equipment costing under U.S. $200 can be expensed.
No other incentives have been taken into account.
[7] Full year allowance in 1st taxable year for assets acquired in 1st half of such year; half year allowance for assets acquired in 2d half.
[8] Method changed to straight line in 5th taxable year.
[9] Double declining balance method.
[10] Includes 14 percent allowance equivalent to 7 percent investment credit at effectve 50 percent income tax rate. Credit does not reduce recoverable base cost.
[11] 13-year recovery period reduced by 20 percent and rounded to nearest ½ year.

Source: Statement of Arthur Anderson & Co. before the Committee on Ways and Means, U.S. House of Representatives, Apr. 18, 1973.

TABLE 7.—DOMESTIC PROFITS OF NONFINANCIAL CORPORATIONS, REPORTED AND ADJUSTED, 1950-73

[Billions of dollars]

Year	Nonfinancial domestic profits of nonfinancial corporations	Adjustments			Adjusted domestic profits of nonfinancial corporations	Tax liability	Adjusted aftertax profits of domestic nonfinancial corporations	National income	Adjusted aftertax profits of domestic corporations as percent of national income	Gross product originating in nonfinancial corporations	Adjusted aftertax profits of nonfinancial corporations as percent of gross product originating in nonfinancial corporations
		For inventory profits or losses	To standardize depreciation method [1]	To standardize depreciation on replacement cost basis [2]							
1950	38.5	−5.0	−0.4	−3.6	29.5	16.7	12.8	241.1	5.3	151.7	8.4
1951	39.1	−1.2	−.2	−4.4	33.4	21.0	12.3	278.0	4.4	174.3	7.1
1952	33.8	1.0	0	−4.6	30.2	17.8	12.4	291.4	4.3	182.0	6.8
1953	34.9	−1.0	.6	−4.3	30.2	18.5	11.7	304.7	3.8	194.7	6.0
1954	32.1	−.3	1.5	−4.1	29.2	15.7	13.5	303.1	4.4	191.6	6.9
1955	42.0	−1.7	2.7	−4.2	39.0	19.8	19.2	331.0	5.7	216.3	8.8
1956c	41.8	−2.7	2.9	−5.1	36.8	19.8	17.0	350.8	4.9	231.2	7.4
1957	39.8	−1.5	3.3	−5.7	35.8	18.9	16.9	366.1	4.6	241.9	7.0
1958	33.7	−.3	3.2	−5.6	30.9	16.3	14.6	367.8	4.0	236.0	6.3
1959	43.2	−.5	3.5	−5.5	40.7	20.8	19.9	400.0	5.0	263.7	7.6
1960	40.1	.2	3.4	−5.1	38.6	19.5	19.1	414.5	4.6	273.1	6.9
1961	40.3	−.1	3.1	−4.5	38.8	19.8	19.0	427.3	4.4	278.4	6.8
1962	44.7	.3	5.3	−4.1	46.2	20.9	25.3	457.7	5.5	302.8	8.4
1963	49.1	−.5	5.2	−3.7	50.1	22.9	27.2	481.9	5.6	320.0	8.5
1964	55.8	−.5	5.2	−3.5	57.0	24.3	32.7	518.1	6.3	346.0	9.4
1965	65.8	−1.7	5.7	−3.8	66.0	27.6	38.4	564.3	6.8	377.6	10.2
1966	71.2	−1.8	5.9	−4.2	71.2	30.1	41.1	620.6	6.6	413.0	9.9
1967	66.2	−1.1	6.0	−4.8	66.3	28.4	37.9	653.6	5.8	430.8	8.8
1968	72.4	−3.3	6.3	−5.4	70.0	34.0	36.0	711.1	5.0	469.9	7.6
1969	68.0	−5.1	7.4	−7.8	62.5	33.7	28.8	766.0	3.8	504.3	5.7
1970	55.7	−4.8	7.6	−9.1	49.5	27.6	21.9	800.5	2.7	519.1	4.2
1971	63.2	−4.9	8.2	−10.1	56.4	29.8	26.6	857.7	3.1	555.1	4.8
1972	76.3	−7.0	9.4	−11.4	67.3	33.4	33.9	946.5	3.6	614.3	5.5
1973	95.8	−17.6	10.2	−12.5	75.9	40.7	35.2	1,065.6	3.3	684.3	5.1

[1] The adjustment to standardize depreciation method is equal to the difference between tax depreciation and depreciation calculated assuming a straight-line depreciation formula and 85 percent of the Internal Revenue Service's 1942 edition of bulletin F service lives.

[2] The adjustment to put depreciation on replacement cost basis is equal to the difference between depreciation as calculated on the assumptions stated in the preceding note and as calculated using the same assumptions but on a current rather than historical cost basis. Numbers in this and following table may not add because of rounding.

Source: Department of Commerce, Bureau of Economic Analysis.

TABLE 8.—CAPACITY UTILIZATION: MARCH 1975

Industry	Utilization rate	Is this level of operation higher, lower, or about the same as in 1974? (percent distribution)		
		Higher	Lower	Same
All industries [1]	84.5	13.2	45.0	41.7
Manufacturing	86.6	14.2	51.3	34.4
Nonmanufacturing [1]	78.6	10.5	28.1	61.4
Durable goods	86.6	12.8	50.0	37.2
Primary metals	89.7	8.7	39.1	52.2
Iron and steel	90.5	11.8	23.5	64.7
Nonferrous metals	88.0	0	83.3	16.7
Electrical machinery	87.2	50.0	0	50.0
Nonelectrical machinery	94.5	15.0	40.0	45.0
Transportation equipment	75.3	23.5	58.8	17.6
Motor vehicles and parts	79.2	11.1	77.8	11.1
Aerospace	67.2	42.9	42.9	14.3
Stone, clay and glass	77.7	0	72.7	27.3
Other durable goods	85.7	0	72.7	27.3
Nondurable goods	86.7	16.2	52.9	30.9
Food and beverage	89.2	23.5	17.6	58.8
Textiles	72.5	0	100.0	0
Paper	87.9	0	80.0	20.0
Chemicals	82.3	33.3	50.0	16.7
Petroleum	89.7	22.2	22.2	55.6
Rubber	80.4	0	100.0	0
Other nondurable goods	82.1	14.3	57.1	28.6
Nonmanufacturing [1]	78.6	10.5	28.1	61.4
Mining	94.8	0	0	100.0
Railroad	87.1	0	75.0	25.0
Air transportation	81.0	0	66.7	33.3
Other transportation	89.4	0	50.0	50.0
Public utilities	76.6	12.5	22.5	65.0
Electric	74.3	12.5	18.8	68.8
Gas and other	86.0	12.5	37.5	50.0
Commercial and other	78.0	16.7	16.7	66.7

[1] Excludes communication.

Source: 1975 Capital Investment Surveys; Rinfret Boston Associates, Inc. March 1975, Perspective—5.

Senator BENTSEN. I want to say to the Assistant Secretary of State, Secretary Enders, we are very appreciative of your patience and we are appreciative of your attendance this morning. And rather than any further delays to your testimony, if you would, present it now.

STATEMENT OF THOMAS O. ENDERS, ASSISTANT SECRETARY OF STATE FOR ECONOMIC AND BUSINESS AFFAIRS

Mr. ENDERS. Thank you very much, Mr. Chairman. I have a prepared statement. Perhaps I could submit it to you, sir, for the record, and perhaps you would let me summarize it for you and give some of the reasoning behind it.

Senator BENTSEN. I think that would be better. Without objection, it will be done that way.

Mr. ENDERS. Mr. Chairman, when those of us that worked on the President's energy proposals sat down to define the level of vulnerability that we thought was acceptable for this country in the future in order to make a recommendation to the President, we decided that that vulnerability could be defined as a level of imports which could be covered (1) by quick acting conservation measures, and (2) by drawings from storage.

Now after some analysis we came to the conclusion that quick acting conservation measures in this country might diminish our demand for imports by 1 or 2 million barrels a day and that we could store perhaps economically 1.4 billion barrels of oil, enough to, let us say,

have 8 million barrels a day of drawings for a period of a year with some left over for the military. That led to the conclusion that an acceptable level of vulnerability was on the order of 4 or 5 million barrels a day imports in 1985.

Now in examining the conditions under which such a level could be achieved, a number of proposals for conservation were laid out, a number of proposals for accelerating the development of the Outer Continental Shelf and Alaskan oil. It soon became apparent, however, Mr. Chairman, that no credible program resulting in a level of vulnerability, a level of imports of 4 or 5 million barrels a day, could be put together which did not also allow for some measure of protection of American energy industry, some measure of border protection against the eventuality that you mentioned just a moment ago of predatory pricing fluctuations by the cartel or against the eventuality that the long-term price for oil traded in international markets would fall again to reasonably low levels, thereby calling into question the energy development in the United States.

The measures put together in the President's program could reach a level of 4 to 5 million barrels a day of imports by 1985, provided that prices stayed roughly in the range of $7 to $11, the range that had been used for analysis in the Project Independence blueprint. However, should prices fall radically below that, there would be an increase in consumption and a strong decrease in production by American energy producers that would result in very substantially higher levels of import and therefore, very substantially higher levels of vulnerability.

So I think the first concept that underlay these proposals put forward by the President was that if in fact we are to reach an acceptable level of vulnerability, we must be prepared at some time and in some way to provide a measure of protection to our domestic energy industry.

Now with this in mind, the President proposed title IX of the Energy Independence Act of 1975 to authorize and require tariffs, import quotas, or price floors to protect our domestic energy prices at levels which would achieve energy independence.

Now the exact manner, the level, the way in which that protection will eventually be provided are questions which have not been decided within the administration, and of course have not been submitted to the Congress.

Senator BENTSEN. Are you saying that the question of a price floor, as Secretary Kissinger discussed before the National Press Club, is not an administration position, and has not been decided on as a policy?

You stated some alternatives and then you said, as I understood it, you said the decision had not been made.

Mr. ENDERS. Mr. Chairman, let me distinguish two things which perhaps from your earlier remarks to Secretary Simon could be confounded in this discussion.

One is the border protection, whether by tariffs, variable levies or quotas which the United States and then other industrial countries will give to their domestic energy industries. And the other would be a question of an eventual negotiation with OPEC of a commodity agreement as implied by the passage that you cited in Secretary Kissinger's speech.

I would like first to address the former because it is the most important, the most significant, and the most active. The latter is not, in fact, the essence of the approach that is now being pursued.

Senator BENTSEN. I am not sure I followed all of that, Mr. Secretary.

Mr. ENDERS. There are two problems, Mr. Chairman. The first problem is how to protect energy industries in the United States and in the other industrialized countries.

Senator BENTSEN. All right.

Mr. ENDERS. And that is the principal problem that Secretary Kissinger addressed in the passages before the one that you read to us at the start of these hearings.

Senator BENTSEN. Do I understand then from what you are saying that in his February statement before the National Press Club he was not dealing with the question of protecting the development of alternative energy sources here?

Mr. ENDERS. On the contrary, sir. Most of the speech——

Senator BENTSEN. So that was the purpose.

Mr. ENDERS. Most of the speech was dealing with the development of alternative sources in the United States and in other industrialized countries.

Senator BENTSEN. That was the purpose.

Mr. ENDERS. That was the purpose of the speech.

Senator BENTSEN. All right.

Mr. ENDERS. Perhaps this will be a bit clearer when I have gone on just a moment.

Senator BENTSEN. All right.

Mr. ENDERS. So the first point I would like to make, Mr. Chairman, is that it was the judgment of the administration that over time no program for reaching an acceptable level of vulnerability to oil interruptions would be credible without providing for a measure of protection for domestic oil and other energy industries.

Now the second point is what are the international implications of this? What are the implications vis-a-vis other industrialized countries? And there are three.

The first is, Mr. Chairman, that because energy developments are so enormously expensive, Secretary Simon spoke of a trillion dollar investment requirement over a 10-year period. Some other estimates are somewhat lower but they are all enormous and they all represent resources which are taken away from other uses in order to achieve energy production. We do not want to be the country that makes the largest effort to replace energy imported from overseas in this country where other countries make a lesser effort, thereby creating a situation in which the United States alone among industrialized countries tends to lock itself onto an inevitably higher cost energy track while other countries, perhaps benefiting from the effect on prices that our energy developments have here, could ultimately get a free ride in lower energy costs when finally the price breaks. There must be burden sharing. We can benefit by the Project Independence efforts of other countries, just as they can benefit by ours. And we want to make sure that just as we undertake this effort, they do also.

Now the second thing, quite clearly, I think perhaps I can dramatize by referring to our experience in the 1960's, Mr. Chairman. At that time we had a measure of protection in this country in the form of

quotas that resulted in higher energy costs within the country. It resulted in some stimulus to our domestic energy industry. It also resulted in a substantial disadvantage to American industry that exported overseas; notably, the petrochemical industry, that have, in fact, access to higher cost feedstocks than its competitors overseas. But this was an element that worked throughout our industrial competitiveness.

So our position then vis-a-vis foreign countries, other industrialized countries, suggests that we have an interest, that they take the same measure of protection of energy resources that we take, and that they do so for the three reasons. It assures that they will also undertake Project Independence-like energy efforts which will help bring down the price of oil, ultimately. It also means that there will be a greater equality of industrial costs and no competitive disadvantage when prices ultimately do come down. And it assures that there will be no free ride, either.

So, Mr. Chairman, vis-a-vis the industrial countries—not the producing countries, the industrial countries—we have an interest in adopting a common approach to the protection of domestic energy industry.

Now we have been negotiating for a number of months in an effort to lay the basis for such a common approach. And here is where the concept of a minimum import price or a floor price enters the discussion.

In order to make comparable the measures of protection taken by foreign industrial countries and the United States we need a common measure, and the common measure that has emerged in these discussions is the notion of a price below which imported energy, particularly oil, would not be sold in our economy. We have reached a tentative agreement on this concept. Each country under this concept would be free to determine by its own national means, whether it were tariffs, quotas, or variable levies, or some other device, including the use of a Federal monopoly on imported oil, the way in which this commitment would be executed. But the basic concept is that each country would insure that imported oil was not sold in its own domestic economy below that agreed level, the same level for all industrialized countries.

Now, as I say, this is a preliminary agreement on an economic concept. It is not an agreement on a price. It is an agreement on a process to elaborate the concept and ultimately to come to an agreement on the level of protection that would be provided. That is to say, the price level at which this protection would be granted.

Now, Mr. Chairman, a number of other approaches have been suggested for the United States and for other industrialized countries; in particular, an approach that has been suggested is deficiency payments. People say, "Why do you not allow for the possibility that when prices break, if they do break below the level at which, say, Alaskan oil can be produced in an economic manner, consumers get the benefit of the lower prices and the Federal Government will step in and provide a subsidy that makes up the difference between the market price and the level at which, say, that Alaskan oil becomes economic to produce?"

Now this approach has attractions. It very well may be the approach that should be adopted for a few high cost energy sources like shale

oil, like synthetic fuels in general, which are relatively discrete, new developing industries and come in at very high prices like $15 a barrel.

On the other hand, if you try to use it for your basic energy developments, you run into three problems. The first problem is that it is impossible on this basis to achieve your self-sufficiency goals because if the price dropped down to very low levels, we would restimulate consumption and even though you were maintaining these subsidies for your domestic energy industry, you could not meet the kind of invulnerability goals that the President has been talking about and which are largely accepted, I think, in the Congress and in the public.

Second, Mr. Chairman, you would run into a financing problem in the Federal Government of enormous magnitude. You would need many billions of dollars to provide these subsidies and the process of appropriation and the process of supervision of these subsidies would present an enormous burden on the administration and on the Congress.

Finally, I think it is fair to say that this would represent an unprecedented, massive intervention into the private enterprise system. You would not be subsidizing only a few firms; you would be subsidizing several thousands of enterprises on a large scale.

I have been talking about protection of energy development in this country and in other industrialized countries. You asked, Senator, about the question of a commodity agreement approach to oil. This was a subsidiary idea that was thrown out in Secretary Kissinger's speech. It was put there because we did not wish to give the impression that the United States was not prepared ultimately at some level and in some way to negotiate with the producers. It was a very carefully hedged statement.

I think it is fair to say that the producers have shown no interest in a negotiation on prices and stability of supply. And this proposal is not at this stage an active one.

Mr. Chairman, these concepts are expressed somewhat more fully in the statement that I have submitted to you. Perhaps I should leave it there and perhaps now it would be useful to go to questions.

Senator BENTSEN. Again, I am not sure I followed you on your last point. Did I understand you to say that the floor price is now not an active proposal?

Mr. ENDERS. We get into a confusion of terminology here. In an earlier part of the speech, Dr. Kissinger referred to a common tariff to be imposed by all industrialized countries around their energy market or a common floor price for imported oil below which oil would not be sold in their economies.

Senator BENTSEN. I understand that but I am having trouble relating your last comment.

Mr. ENDERS. Now that concept of common protection possibly by a common minimum protected price for imported oil for the consuming countries is still very actively under consideration and development.

What is not under consideration and development because it has received no response is the concept of a commodity agreement with the producers. I am distinguishing two things, what the industrialized countries do to protect their own industry and any negotiations they have with the producing countries.

Senator BENTSEN. I see.

Now let me ask you this because this has a very material effect, obviously, on the economy of this country if something like this were carried out. And you were talking about some tentative agreements at this point.

Before this proposal was made or submitted to the International Energy Agency in February, did the administration discuss this with the Congress and with the appropriate committees, and if so, which ones?

Mr. ENDERS. Before the proposal was submitted for tentative agreement to the International Energy Agency—tentative agreement was reached on March 20 of this year—there were very broad consultations with Members of Congress.

Senator BENTSEN. Were those consultations made when you got into the question of tariffs—were those consultations made with this committee?

Mr. ENDERS. That is correct, Senator.

Senator BENTSEN. They were?

Mr. ENDERS. Not as a committee, but with the chairman of this committee, and with the staff of this committee. I think altogether, perhaps 40 or 50 Senators and Representatives were contacted for their reaction.

Senator BENTSEN. That is very interesting. Senator Dole?

Senator DOLE. Mr. Chairman, I do not have any questions.

Senator BENTSEN. Thank you very much. Senator Packwood?

Senator PACKWOOD. Mr. Secretary, are you really assuming that if we enter into these agreements with all of these countries, we have no better record of energy conservation than we had in the past, while most of the European countries have a substantially better one, and that they will all stick with this agreement, even subject to tremendous internal political pressures to break out, and try to import the oil at a lower price?

Mr. ENDERS. Senator, the agreement I am talking about would not prevent any country, including the United States, from buying imported oil at a lower price. What it would involve is measures by tariffs, by quotas, by departments and agencies——

Senator PACKWOOD. I understand that.

Mr. ENDERS [continuing]. To step up the price.

Senator PACKWOOD. And I will add one thing further; and pass on the price to the consumer without any additional——

Senator BENTSEN. Excuse me, Senator Packwood. I have to leave. I would like you to chair the meeting.

Senator PACKWOOD. I would be pleased to.

Senator BENTSEN. I would just like a parting comment. I do not know who are those members of the committee, other than possibly the chairman, that you consulted with. I just talked to members of the staff. And they said they certainly were not consulted. I would be interested in seeing those names.

Mr. ENDERS. I would be glad to submit the names.

Senator BENTSEN. Thank you.

[The following was subsequently submitted for the record:]

JUNE 3, 1975.

Hon. LLOYD BENSTEN,
U.S. Senate.

DEAR SENATOR BENSTEN: During the hearing before the Senate Finance Subcommittee on Energy and Financial Markets on May 7 you inquired about consultations by officers of the Department of State with Congress on the concept of a minimum safeguard price for imported petroleum.

Over the past year we have consulted with a great many Senators and Representatives on a wide variety of energy related issues. The discussions devoted specifically to the concept of a minimum safeguard or "floor" price took place in March, just prior to the International Energy Agency meeting that month.

At that time Deputy Assistant Secretary Julius Katz and I discussed the issue informally with a number of Senators, including the Chairman and ranking minority member of the Finace Committee and the Interior and Insular Affairs Committee. Mr. MacKenzie of the Department's Bureau of Congressional Relations spoke with Mr. Bushell of your staff and conveyed our interest in consulting with you and that informal group of first term Senators, which we understand meets with you from time to time. Mr. Bushell advised that this group was primarily interested in internal Senate matters, explaining that we would probably have an opportunity to discuss energy matters at hearings held by your subcommittee in the near future.

We shall continue to make every effort to consult as broadly as possible initiatives in the international energy sphere. Of course, I shall be pleased to discuss these or other matters with you, whenever you wish.

Sincerely,

THOMAS O. ENDERS,
Assistant Secretary for
Economic and Business Affairs.

Senator PACKWOOD [presiding]. Do you have any faith in the countries to stick with it? If one of them would tumble, and pass along the price break to the consumer without any equivalent of government subsidy, and as soon as one broke the rest of them would.

Mr. ENDERS. I would like to say two things about that, Senator. One is that every country has an interest in not going back to the situation of the 1960's, when we all became overly dependent on very inexpensive imported oil, thereby damaging our domestic energy industry and creating a situation that the cartel exploited in the great explosion of 1973. And that interest is not only an interest of the United States, it is an interest which all other industrial countries have. That does not mean that, inevitably and under all circumstances, they can hold that policy. But that is their interest, and that is the way they see it, and I think they will make an effort to hold that policy.

Senator PACKWOOD. I think it would come down just the other way around, especially in a parliamentary country. You would have an opposition demanding for an end to the price stabilization, and they would be overthrown, and a government voted in that would absolutely scrap the agreement.

Mr. ENDERS. The second thing—I will come back to that, but I would like to make a second comment on that; is that you are no worse off if, in the end, some countries do break it, and you do not succeed, than you would be if, in fact, you take on the whole burden here, with the United States locking itself into a high energy course, and with no agreement on how the other countries are going to behave, and protect their own energy industry. In that case, then, you have got right from the start the situation that you predict.

Senator PACKWOOD. Do I presume in this plan that the assumption is that oil, especially imported oil, will always and forever be the cheapest form of energy, and that the supply is endless?

Mr. ENDERS. No, sir. Are you talking about oil within the United States?

Senator PACKWOOD. No, not oil within the United States. But this whole plan is premised on the assumption that any kind of energy we might develop here can be undercut by cheaper imported oil. that we would never develop anything cheaper. And that is the thing we must ever be protected against.

Mr. ENDERS. Well, the notion here is that, since oil costs about 25 cents a barrel to produce in the Persian Gulf, that that oil is inevitably and always going to be cheaper in production costs than anything we could ever produce.

Senator PACKWOOD. Than anything we could ever produce?

Mr. ENDERS. I do not think we will ever get 25 cents a barrel on anything. Do you, Senator?

Senator PACKWOOD. I am not sure. But I would never say never.

Mr. ENDERS. Well, certainly not in the next 10 years.

Senator PACKWOOD. And you presume that the oil is never going to run out; that inevitably, it will not go higher because of simply a reduced supply.

Mr. ENDERS. Well, I think that possibly in the very long term, it will. But when it comes to the planning horizon we are dealing with here, maybe in 10 years it would not.

Senator PACKWOOD. All this country really needs is an energy surplus, not an oil surplus. The energy is reasonably transferable.

Mr. ENDERS. It needs an energy surplus.

Senator PACKWOOD. I have no other questions. Thank you, Mr. Secretary.

Mr. ENDERS. Thank you very much, Senator.

Senator PACKWOOD. We are recessed until 10 o'clock in the morning.

[The prepared statement of Mr. Enders follows:]

STATEMENT BY THOMAS O. ENDERS, ASSISTANT SECRETARY OF STATE FOR ECONOMIC AND BUSINESS AFFAIRS

Mr. Chairman, I am pleased to be with you today to discuss our energy policy and particularly factors associated with the necessary investment in the energy sector.

We start from the premise that the present level of American dependence on imported oil is excessive and that, without substantial efforts in the U.S. and other major consuming countries, the future vulnerability of the U.S. will be unacceptably high. It is more than eighteen months since the October embargo demonstrated our vulnerability to the manipulation of our oil supply and oil prices. The situation remains grave, and the work needed to correct it is enormous.

THE NEED FOR CAPITAL

The Project Independence Report estimated that more than 450 billion 1973 dollars would be required between 1975 and 1985 to meet the needs of our energy sector (under an accelerated supply scenario).

Although energy investments will be massive during this period, the total capital pool expected to be available for energy is also substantial. According to the Project Independence Report, projected investment in coal, oil, gas and utilities would constitute less than 23 percent of business fixed investment during the period 1975 to 1985, an amount consistent with the energy sector's historic share.

While there may be enough investment resources to support the projected energy investment in the aggregate, this committee is well aware, though, that any project or sector must compete in the market place with other projects and sectors

to command a share of the capital available at any given time. Specific sectors of the energy industry may not be able to maintain their traditional share of investment because of constraints on equity financing, long-term debt and short-run liabilities. In addition, the peculiar nature of the international energy market, in which a small group of oil producing countries have concerted to establish and maintain a severely inflated price, may itself serve as a disincentive to investment in domestic energy sources.

THE PROBLEM OF DOWNWARD PRICE RISK

Oil is traded internationally at the price dictated by a handful of producing governments which have agreed together to reap $10.12 for each barrel of oil they sell. This figure compares with production costs in the range of $.10 to $.25 a barrel in the most productive oil exporting countries.

The great spread between production costs and the cartel price illustrates the potential for declines in the world price, either motivated by the predatory objective of eliminating energy investment in the consuming countries—where costs are substantially higher—or resulting from the collapse of the cartel.

This threat is a deterrent to investors in alternative energy sources that involve costs well below the current international price of oil but far higher than production costs for oil in the OPEC countries. Without some assurance that cheap imported oil will not be sold domestically below a certain safeguard level, investors and financiers are frequently reluctant to undertake the larger, capital intensive investments needed to reduce our dependence on imported oil in the future.

THE PRESIDENT'S PROGRAM

President Ford took account of the need "to provide the critical stability for our domestic energy production in the face of world price uncertainty" in his State of the Union message in January. At that time, the President announced his intention to seek legislation, now proposed in Title IX of the "Energy Independence Act of 1975," to "authorize and require tariffs, import quotas or price floors to protect our energy prices at levels which will achieve energy independence."

Such an approach will remove an element of uncertainty for investors in domestic energy sources and also serve to retain consumption when world oil prices fall. Both these effects will contribute substantially to our objectives of greater energy independence. According to data projected for the Project Independence Blueprint, a drop in the price of oil in 1985 from $7.50 to $4.50 a barrel (in constant 1974 dollars), in the absence of a safeguard, or floor, price, would increase oil consumption by about 5 MMBD while it would reduce domestic production by some 11 MMBD. As a result, imports would increase from less than 6 MMBD to more than 21 MMBD, i.e. from about one-fourth of our needs to about three-fourths of our total oil consumption.

The "Energy Development Security Act" (Title IX) would authorize and direct the President to adopt appropriate measures to prevent the domestic prices of imported petroleum from falling to levels that would substantially deter the development and exploitation of petroleum resources or would threaten to cause a substantial increase in petroleum consumption. This authority is an essential element of any comprehensive program to deal credibly with our energy problem.

INTERNATIONAL DIMENSIONS OF A SOLUTION

The market for energy is a world market. Consequently, we have a major interest in the ways other major consuming countries approach their energy problems and they have a stake in our energy programs, for several reasons.

First, we do not want to be the only country making the tough decisions and committing scarce resources to programs to encourage more energy production in our own territory. If all major consumers do what they can to exploit their domestic energy resources, we will hasten improvements in the supply/demand balance in world energy markets.

Second, having committed ourselves to do what is required to achieve greater self-sufficiency in energy, we do not want to find ourselves alone someday on a high-cost energy track while industry in other countries again has access to low-cost imported oil. This situation could place our industry at a competitive disadvantage in world markets, partly as the paradoxical result of the success of our own programs to reduce dependence on imported oil.

Finally, in the absence of a common approach to achieve a price at which imported oil will be sold in the domestic markets of the industrialized countries, a break in the world price could kick off a sharp resurgence in the world demand for oil. This result, made possible in large part by American efforts, could undo the very success of our efforts. The cycle would begin again of growing reliance on cheap oil from unreliable sources, and we would have the conditions for a return to high world prices.

INTERNATIONAL ACTION TO ACCELERATE ENERGY DEVELOPMENT

For these reasons, we have been negotiating with other members of the International Energy Agency to develop a coordinated system of cooperation in the accelerated development of new energy. A preliminary agreement in the IEA recognizes the need for governmental action in providing three interrelated policies:

A framework of cooperation to provide specific incentives to investment on a project-by-project basis in energy production, especially synthetics and other high cost fuels.

A comprehensive energy research and development program under which parties in two or more IEA countries would cooperate on a project-by-project basis.

An agreement to encourage and safeguard investment in the bulk of conventional energy sources through the establishment of a common minimum price below which we would not allow imported oil to be sold within our economies.

Each IEA country will be free to implement its commitment to the common minimum safeguard price by a measure of its own choosing—a tariff, a quota, or a variable levy. These measures would not have to be applied until the world price of petroleum fell below an agreed level, which remains to be established on the basis of technical analysis.

Obviously, given our interest in a common approach among industrialized countries, we cannot defer negotiations to establish such an approach until prices soften greatly or actually break. To achieve the desired results, this commitment must be in place before the price falls so that investors can make the critical investment decisions now and so that we are not forced to build a dike in the midst of a flood.

One should be clear in discussing the safeguard price that it will not prevent our economies from enjoying the benefits of the lower international price for oil if and when it falls below the minimum safeguard price. Importing countries would pay the exporting countries no more than the world price, however low it might fall, capturing the balance of payments and income gains of the lower price while maintaining the minimum price internally to protect domestic investment. Users of oil in importing countries would receive the benefit of any drop in world prices down to the level of the minimum safeguard price. The government would get the benefit of any drop below the safeguard minimum through, for example, tariff revenues. These funds would be available for public purposes.

OTHER APPROACHES

Obviously, a minimum safeguard price is not the only means available to protect our domestic energy investments. Other policies have been suggested and the Administration has examined other approaches. I would like to comment on two other policies which have been proposed for dealing with the phenomenon of downward price risk.

A deficiency payments scheme has been suggested by some as their preferred approach. If this policy were adopted and the world price of oil fell below a specified level, the government would compensate domestic producers. Such compensation could be based on the difference between a reference price and the prevailing market price, or it could be based on the difference between a firm's production costs and the market price.

The first system is far simpler to administer because it would not entail the enormous cost-accounting task inherent in operating a scheme based on actual production costs, and it would retain an incentive for any firm to operate efficiently. It is, however, apt to be far more expensive than the latter system, in which some firms would receive only a portion of the difference between the reference price and the market price, because their costs could be assumed to be well below the reference price.

We have calculated some estimates of the cost of operating a deficiency payments scheme. Our figures are calculated for payments based on production costs. Such deficiency payments would be lower than those associated with the full spread between a reference price and the market price.

If we assume that in 1985 the world price of oil drops from $7.50 to $4.50 a barrel, in constant 1974 dollars, the Treasury would have to expend an estimated $8.7 billion a year to meet its commitments under this kind of deficiency payments scheme. Conversely, under the minimum safeguard price, the Treasury could collect some $6.1 billion in revenues from the tariff, variable levy or other device employed to implement our commitment to a safeguard price.

There are other differences in the approaches. Under a common minimum safeguard price, the U.S. balance of trade would enjoy a $6.1 billion annual improvement. The full benefit of the price drop would be felt in the trade balance, because the volume of imports would not change. Under a deficiency payments scheme, however, consumer prices for energy would fall, demand for energy in general and oil in particular would be stimulated and oil imports would nearly double in volume. As a result, the payments gain associated with the fall in the world price would be more than offset by the additional outlays for the larger volume of imports. The result would be an annual loss in our trade balance of $2.3 billion. The net difference in the trade results between the two options amounts, therefore, to $8.4 billion dollars a year.

In short, the benefits citizens would enjoy as consumers under a deficiency payments scheme would have to be weighed against the liabilities they would incur as taxpayers under that scheme as compared with a common minimum safeguard price. More serious, in many respects, would be the reversal of progress we expect to have achieved by 1985 in substantially reducing our dependence on imported oil. This reversal would be felt in terms of both increased vulnerability (with the possibility of very substantial losses of GNP and employment in case of an embargo) and a deterioration in our trade balance.

Another approach that has been proposed to protect against downward price risk is for the Government to conclude long term purchase contracts with domestic investors in energy. Such contracts would give producers an option to sell their output to the Government at a specified price. Thus firms would be assured that they would be able to sell their production at prices no lower than the contracted level but above that level if the market price were higher. The Government would apply its energy purchases to its own needs or sell the excess, at a loss, at the lower market price. Conceptually, this approach is only a variation of the deficiency payments scheme, pegged to a reference price. It has all of the same difficulties associated with deficiency payments plus the inefficiencies inherent in a large governmental operation in the market.

A common minimum safeguard price will work on our problems of both supply and demand when world oil prices fall. It is a vital element in our program to achieve our two essential objectives: a substantial decrease in the international price of oil and substantial U.S. self-sufficiency in energy.

[Whereupon, at 12 noon, the subcommittee recessed, to reconvene at 10 a.m., Thursday, May 8, 1975.]

CAPITAL REQUIREMENTS OF ENERGY INDEPENDENCE

WEDNESDAY, MAY 8, 1975

U.S. SENATE,
SUBCOMMITTEES ON FINANCIAL MARKETS AND
ON ENERGY OF THE COMMITTEE ON FINANCE,
Washington, D.C.

The joint subcommittees met, pursuant to notice, at 10:05 a.m., in room 2221, Dirksen Senate Office Building, Senator Mike Gravel, presiding.

Present: Senators Gravel (chairman of the Subcommittee on Energy), Bentsen (chairman of the Subcommittee on Financial Markets), Dole, and Packwood.

Senator GRAVEL. The hearings will come to order.

Today is a continuation of the hearings we initiated yesterday in a joint hearing between the Subcommittee on Financial Markets and the Subcommittee on Energy with respect to the capital needs of the energy industry in this country, an issue that is obviously very important if our country is to develop self-sufficiency in satisfying its energy needs.

This morning we are privileged to have several witnesses. The first is chairman of the board of the First National Bank of Chicago, Mr. Gaylord Freeman.

Mr. Freeman, would you please come forward and sit at the table? If you wish to be joined by an associate you certainly may invite him to the table. It is our pleasure to have you here, and please proceed as you feel comfortable.

STATEMENT OF GAYLORD FREEMAN, CHAIRMAN OF THE BOARD, FIRST CHICAGO CORP. AND THE FIRST NATIONAL BANK OF CHICAGO, ACCOMPANIED BY JOHN MOVOVICH

Mr. FREEMAN. Thank you. I am pleased to be here.

I would like to correct the record, as I have to so many times, and point out it is not the First National City Bank, but it is just "the First National Bank."

I am pleased to be here and pleased to have my associate John Movovich who has done a great deal of statistical work with me, and I may have to call on him later.

You have propounded seven separate and specific questions. I have attempted to answer them as best I can in the 34 pages of testimony. I am sure you do not want me to read those 34 pages, so I will cover them as best as possible.

The first question is, "What are the capital needs of the energy sector during the next decade?" It is our estimate they will total

about $750 billion. This is somewhat less than the estimates that have been made by the New York Stock Exchange, by the economists at General Electric, and compares with, I think, the $1 trillion that was suggested by Secretary Simon yesterday. I will not go into the components unless you ask for them later.

The second question is, "What are the present and projected capabilities of the private sector to meet these needs?" Investment funds can come only from three sources: foreign investment, funds created by the central bank—the Federal Reserve—and savings. We cannot expect any inflow of foreign investment. For the last 30 years since the end of the war, there has been a net outflow of funds every year except 1968. Last year there was inflow from the oil producing and exporting countries, OPEC, but overall it was again a net outflow.

For the first quarter of this year, there has been a somehow increased inflow from the OPEC nations, but we do not expect that to continue and indeed expect to have an outflow of capital from the United States to the rest of the world in each of the next 10 years, very likely some outflow to the OPEC countries because they are expending a great deal in their own countries, and their intake is likely to decline.

Senator GRAVEL. Would it bother you if I interrupt you?

Mr. FREEMAN. No.

Senator GRAVEL. I am fascinated by the statement you are making with respect to OPEC money not coming in in such quantity that there would be a net inflow. Where would you project that money is going?

Mr. FREEMAN. It may be coming in in way of payment for goods. It will not be coming in as investment money. The countries are spending tremendous sums. Recently, Iran had to collect all of its deposits in the United States, or almost all of them to meet their expenses. Iran, for instance, is spending tremendous sums on military equipment. Saudi Arabia is spending money at a very high rate in the development of their country. I am not being critical, but they are using their funds, and they will have a decline in their funds in all probability.

Senator GRAVEL. Saudi Arabia also?

Mr. FREEMAN. Yes.

Senator GRAVEL. In my mind I had broken it down between countries who can consume at a certain level, like Iran, Kuwait, Egypt, the consumptive states, and countries who could not spend all the money they had and had to invest it, like the Trucial States, Saudi Arabia and Libya.

Mr. FREEMAN. I think that is true of the Trucial States. I do not know about Libya. I know Saudi Arabia is increasing its expenditures in the development of whole new areas of the country, creating large agricultural districts that require not only highways and schools, but tremendous investments in electric generating equipment, pumping, irrigation, and I do not see very much outflow of capital from Saudi to the United States over the decade we are talking about. I do not think we can count on any inflow of foreign funds.

That leads to the second question, will there be investment funds created by the Federal Reserve? This has been what we have been doing for the last 10 years. The Congress has seen fit to spend or appropriate considerably more than it has raised in the form of

revenues to the extent of $102 billion, and we have not induced the public to buy those bonds to make up the deficit, but have relied on the Federal Reserve which has created an increase in the money supply of $111 billion in that period, so for the past 10 years all the deficits have been made up by increases in the money supply to the Federal Reserve.

This has in fact created a nice boom, which we like, but it also created inflation, which we did not like. I would be very hopeful that we would not try to increase the money supply in order to provide the capital funds necessary for the expansion of our energy side.

That leaves the third alternative which is savings. Savings is the only dependable source of capital investment. Savings can be by the Government, by individuals, and by corporations. Socialist countries rely heavily on government savings, and we use them too. Our highways, our schools, military structures, our national parks, things of that kind are in a sense capital investments by the Federal Government. The majority of our public prefers to see manufacturing and production financed and controlled privately rather than by the Government, so we must turn to private and corporate savings. Private savings are influenced by a variety of things which in turn are largely impacted by the Federal Government: the level of employment, hours worked per week, wage rates, all go into the determination of personal income, which as you know, per capita disposable income now is running for the first quarter $4,777 at an annual rate.

It is also influenced by the amount of Federal income and social security taxes which are deductible from the income to determine the disposable income, and the disposable income from that is deducted from consumer expenditures. What is left is savings, so a great many of the Federal programs impact the development of the ultimate personal savings. They are influenced in turn by the alternative rates that they can earn in savings accounts of one kind or another, and the investments of those savings depend on the return of the investment.

This is true with corporate savings, too. Corporate savings are merely retained earnings. Those are influenced, of course, by governmental price and tax policy.

If we continue the present practice of very large annual deficits and the Government has to continue to borrow the tremendous sums that it is borrowing now, there will be not much in the way of private capital development. In 1975 and 1976 budget years, the expenditures will exceed anticipated revenues by about $110 billion. Secretary Simon may have changed that figure a little bit yesterday, increasing it in his estimate. That is $110 billion, 60 percent of all personal savings, and if the Government which really has a prior claim on investment markets priced up 60 percent of the potential savings of reinvestment, that is not going to leave very much for the balance of industry including the increase in our energy.

The consequence I think we would have to conclude on that point is that it is probably possible for the private sector to meet the needs for the development of conventional domestic sources of energy if, but only if, the Congress (1) moderates its legislative discouragement of savings and investment; (2) holds down expenditures so as to move closer to a balanced budget; and (3) remove price controls on energy supplies.

The third question is, "Is there a need for Government loan guarantees or special tax incentives?"

Senator GRAVEL. Excuse me, Mr. Freeman. How would the Government grab the $160 billion of private savings in its activity? How would it get hold of it?

Mr. FREEMAN. The Government gets hold of it by selling the Government bonds. This morning with that 8 percent rate, that will take savings out of savings account, out of all other alternative forms of investment. I am not objecting to that. It is quite appropriate, but if a government with a deficit has to finance——

Senator GRAVEL. I appreciate that, but when it does that, it goes into the marketplace. In order to make itself competitive, it then offers a higher interest rate to attract the money, and that bids up the interest rate for other activities in society, doesn't it?

Mr. FREEMAN. Yes.

Senator GRAVEL. The way we in Government get our hands on that money through financing is by bidding up the interest rate?

Mr. FREEMAN. Yes, that is true, and it has a very material effect, sir. If it were not for the Government deficit financing today, our level of long-term interest rates would be much lower than it is now, and the level of short-term rates would be somewhat lower too because the increase in the long-term rate has a tendency to drag up the short-term rates as well.

Our third question was, "Is there a need for Government loan guarantees or special tax incentives?" And I believe the answer to that is "No." I think that we can develop enough energy from what we might describe as conventional sources. If the Government concluded that we could not, if it felt that it had to fall into producing petroleum from oil shale and tar sands, two sources the cost of which are far from known today, then I think there would have to be some Government financing or aid, but in the absence of that requirement I believe that there is no additional loan guarantee or tax incentive necessary to produce the oil, coal, the gas, the electric energy that we need.

I would strongly urge—that is the next question really: If so, what approach would you favor? I do not think it is so, so I do not favor an approach. If you thought you needed to develop the oil shale, then I would think that the privilege of immediate writeoff of all investment in oil shale plus some take or pay contracts may produce that, but I do not think that is necessary.

What would be most helpful would be to remove, or gradually erase, preferably remove, the $5.25 ceiling on what is described as "old oil." If we removed the price ceiling, there would be no need for any additional incentives nor guarantees.

Our fifth question is, "Are the prospects for private capitalization of energy development adversely affected by potential changes in world oil prices?" Yes; they are, but we have been living through many variations in the price of oil and have been able in the past to obtain financing. I do not see this as a decisive element in the equation.

Six, is there a need for a minimum oil import price or some other device to protect high cost energy investment in the United States? Yes, I think there is if we really want to see the development of our energy in anything like the extent we have been discussing. I would

prefer a limit on the quantity of imports rather than the designation of a minimum price for several reasons.

I think the limitation on the quantity of imports as distinguished from the minimum price would have the effect of leading to somewhat higher prices, which to my mind is a good thing.

Second, I believe that it would take the heat off the Congress or the administration because if you set a minimum price, the public will feel you have set a price that is considerably too high rather than having it done by the market, and the limitation on the quantity of the import would be helpful to us in terms of reducing the drain on our balance of payments.

The seventh question is, what alternative policies might be pursued? A very undesirable policy, but the one which is very likely to be pursued, is continued spending by the Federal Government in excessive revenues, a modernization of that debt created by the Federal Reserve of additional moneys to take care of that debt, a consequent acceleration of our inflation over the period of the whole decade, and consequent disastrous depression.

This is what we have done for the past 10 years, and I am sure that the Congress will be under considerable pressure to continue that in the future. I do not say this critically. It is merely to recognize that the public likes spending. They do not recognize that they are paying for it, and this inevitably causes increased pressure.

It was the anticipation of this that led the English historian of the last century to write in 1839:

A democracy cannot exist as a permanent form of government and can only exist until the voters discover that they can vote themselves largesse from the public treasury. From that moment on, the majority always votes for the candidates promising the most benefits from the treasury with the result that a democracy always collapses over loose fiscal policy, always followed by a dictatorship.

Senator GRAVEL. When did he write that?

Mr. FREEMAN. In 1839. It may have been 100 years ahead in England, but what he foresaw is developing. We do not believe it is inevitable, but we know there is a risk of that. The only way to prevent it from occurring is through the courage of our legislators, their willingness to assume a leadership of the thought in their constituencies rather than just to follow the emotional energy of their communities, and that is a very difficult thing to do.

These are my prepared comments. I have prepared a card which I would like to call your attention to that tries to explore this whole problem as a part of the larger problem of our need for additional expenditures for plant and equipment. I would read that if I might. I am turning to the second page.

We all want our people to live better, which is to say we want them to enjoy more goods and services. To enjoy more goods and services obviously requires the production of those additional goods and services. To produce more goods and services, we must either work harder or work longer or use more efficient tools including energy.

Inasmuch as the people do not want to work harder or work longer, we can only live better if we have more efficient tools. To obtain more efficient tools, we must encourage saving and investment. That saving and investment can be done by the Government or it can be done by

the private sector. Because saving and investment by the Government preempts saving and investment by the private sector, it has been our tradition to look primarily to the private sector for saving and investment.

If we look to the private sector, there must be a high enough return to serve as an inducement to save, that is to forego the pleasure of spending for consumer goods and services. To encourage investment, there must be the prospect of a return, whether on a bond or a share of stock, of an amount sufficient to justify both the savings and the subjection of those savings to the risk inherent in such an investment.

Thus, we all have an interest in legislation and regulation that encourages savings and investment. In fact, the Government has not encouraged it, but through its expenditures, taxation, and regulatory policies have actively discouraged both savings and investment.

This inadequate investment has caused a decline in the amount of tools per worker with a consequent decline in our living standard. Thus, for our people to live better, the Congress must reduce expenditures and encourage more private savings and investment.

Senator GRAVEL. This is very well done and very well said.

Mr. FREEMAN. I hope I could get some distribution to the people who will read it.

Senator GRAVEL. You read it with a certain poetic style, I must say.

Mr. FREEMAN. I read it with conviction.

Senator GRAVEL. I have two questions. The first relates to savings, consumption, and taxation. Generally, it seems more worthwhile from one point of view to go out and consume since part of the cost of the consumption can be handled as a deduction from taxes, as in the case of house mortgages and the like.

What would be, do you think, the efficacy of a policy to give consumers an incentive to save? For example, if the person makes x number of dollars of interest in income, perhaps the first $700 or $500 would not be taxable. Do you think this would be a realistic incentive for the average person?

Mr. FREEMAN. I think it would be useful directly and I think it would be useful as evidence of a public policy to encourage savings. That was one of the proposals made by the President, I think, following the summit meeting. It did not meet with very wide acceptance in the Congress. It would also involve a difficult issue, and that is how much, how large an amount of savings would still be given that advantage. At that point I think that there would be a great deal of political difficulty, but I think that it would be a useful move, any move to increase savings, but there are many possible ones, that it would be very helpful in the future by society.

Senator GRAVEL. How about sharing some of the existing devices? Let us take municipal bonds. It is very difficult for the average person to buy municipal bonds. Suppose you were to arrange that municipal bonds came in small denominations, so if a worker wants to get a small tax-free bond, he could do it. The way it is now, it is essentially a device of the wealthy and of banking institutions, not the device of the average working man.

Mr. FREEMAN. I think that is true. We are seeing now the creation of mutual funds in which the fund buys, municipal bonds, an individual can for a few dollars buy a share in that fund. The one difficulty with

that is that while the laws permit that and permit that tax-exempt quality to follow through to the owner of the stock, that is only true as to the original bloc of municipal bonds. If they sell any or buy others or if some of those mature and the fund uses the proceeds to buy others, then the tax exemption to the stockholder is destroyed.

If that could be changed by congressional legislation, it would give a great impetus to people of more modest means having the advantage of a tax exemption. It would be a big help to the cities.

Senator GRAVEL. You stated by and large that public policy thus far has discouraged savings. Would you have any recommendations to make as to some significant action we could undertake that might have a salutary effect.

Mr. FREEMAN. Well, in the first place, the laws limit the amount the saver can get for savings. The laws restrict what a bank or a savings and loan association can pay on savings and this reduces the incentive to save. There is also some difference, at least in the higher brackets, difference in the tax treatment, taxes on earned income are subject to a ceiling, whereas taxes on interest income or investment income is not subject to that ceiling. These are different ways in which the Government discourages savings.

Senator GRAVEL. You mentioned that our capital needs were probably about $715 billion and in the last decade we saw the Government usurp about $111 billion.

Is that correct?

Mr. FREEMAN. No; the $111 billion is in the next 2 years. This year and next year the deficits will aggregate $110 billion, which is 60 percent of all of the private savings during those 2 years.

So if we could finance the Government deficit by selling Government bonds to the people, this would take 60 percent of all of their savings, leaving 40 percent for the whole gamut of industry, including energy. We are preempting, the Government is preempting the market.

Senator GRAVEL. What is happening then, is that these investments will not be made in the marketplace.

Mr. FREEMAN. They will not be if we continue the deficit, sir.

Senator GRAVEL. The Congress' motivation in passing the rebate was to get money in the hands of people so they could get the economy moving.

Mr. FREEMAN. Yes.

Senator GRAVEL. We created a deficit in so doing.

Mr. FREEMAN. Yes.

Senator GRAVEL. Aren't we really chasing our tail? We have given consumers money to spend but because there will not be sufficient capital to expand the economic base of the Nation we will not get the economy moving.

Mr. FREEMAN. The tax rebate I thought was justified as a one-shot stimulant. I had been against the tax reduction in 1964, which did not come until the economy was already reviving. I was disappointed at the provision for the tax reduction in this legislation because it was presumably for 1 year, but next year, the election year, it is hard to believe that it will be terminated and it will be hard for the Congress to terminate thereafter. This means that we will just have larger deficits and we will have to not only finance the deficits, we will have

to finance the interest on those deficits, which now amounts to a very large sum.

Senator GRAVEL. If we try to do that, it will have to be through the second device you spoke of, funds created by the central bank, which is going to have an inflationary push.

What you are predicting then, is that we will not control inflation. I am not trying to trap you in that statement. But just as a general conclusion, that seems the direction we are going in.

Mr. FREEMAN. That is right. You gentlemen in the Congress have a greater responsibility today as you have ever had, and a very difficult one. You really have the obligation to attempt to lead your constituencies away from their natural emotional reactions of wanting more from the Government largesse and educate them to the fact that we really cannot afford a deficit. Their choice is either much increased taxes or reduced Government expenditure.

I think if the majority of the people were faced with that, they would elect for reduced Government expenditures. I am impressed and saddened when I look back at 1964, the year that we greatly increased our involvement in Vietnam, we had the largest budget in the history of the country at $118.5 billion. In this coming year's budget we spent more than that just for transfer payments, which would be $118.7 billion alone. The average worker in the automobile industry or steel industry earns about $12,000. He pays about $1,000 income tax. If he understood how much of his income is spent for that increased amount of transfer payment, he would vote against it. In the first place since most of his income tax is done through deduction, he is really not conscious of the amount he paid and he is not informed as to the distribution of what he does pay. So there is not popular support for limiting these transfer payments.

Of course there is always a vocal group that would like to have them increased. I think until we can convince the workers and until the labor unions looking out for the members recognize the burden that is imposed on their members by these transfer payments, it is going to be very difficult for you to do anything in the way of limiting it, or the Government will have to take over the financing. There is not going to be enough left for the individual private saver nor for the corporations.

I know you do not want to hear about corporate earnings at great length, and this is an emotional issue but the oil companies for decade 1964 through 1973 had on the average net returns, on equity ownership, stockholders' equity of 11.3 or 11.4 percent. This was less than the average return of all manufacturers, less only by an eyelash, 11.5, 11.6. In 1974 the oil companies' earnings were up substantially taking just the top 17, the largest 17, their earnings went to 18½ percent on net worth. People say these are excessive earnings or they say they are obscene earnings. In fact, they did not have those earnings.

I would like to tell you a little story I am sure you would understand, but it helps here. If earnings of the oil companies were not that large because they were selling oil that cost them $2 or $3 or $4 at an increased price of $5.25, but now that they replaced that oil, they have to pay $7, $8, $10 to replace it, yet people said that they had a big profit.

Just think, if you and your wife had a home that you paid $50,000 for and your wife wanted to have an apartment instead so you sold the house for $75,000. After you had been in the apartment for 3 or 4 months your wife did not like it and said she wanted the old house back. So you went to the man who bought it from you for $75,000 and you had to pay him $100,000 to get it back. And you did not have the money so you went in debt for $25,000. At the end of that year you would have the assets that you had at the beginning of the year, but you would have an additional liability of $25,000. But people would say, but you made a 50 percent profit on your investment on the house. That is obscene.

This is exactly what happened to the oil companies. They did not have a profit on the sale of that low-priced oil because they had to replace it at a very much higher cost.

I would urge you to recognize that the oil companies did not have excessive profits in 1974 and the profits they did have were temporary because in the first quarter of this year their earnings, again on an annual basis, had dropped to 10.5 percent return on stockholders equity. The oil companies have not had excessive profits.

Senator GRAVEL. Thank you very much, Mr. Freeman.

Senator Dole.

Senator DOLE. Thank you, Mr. Chairman. I tried to scan the statement hurriedly. Other witnesses and many studies, I have learned from staff, have asserted that capital recovery will constitute an important source of capital for the energy industry.

Given this fact, how do you assess the impact of the virtual repeal of the percentage depletion allowance, and do we need some additional capital recovery increases?

Mr. FREEMAN. The repeal of the depletion allowance, I suppose, was a response to a popular desire to punish the oil companies. Of course it was a very shortsighted thing to discourage development just when we needed more development, but I assume that that is past and there is not much chance of saving it, changing it.

I think the oil companies can do all right even without the oil depletion allowance, if you would remove the price limitation of $5.25 on the old oil. I think that that ceiling should be removed immediately. Politically, it might be more acceptable to increase it in stages over a few years. Intellectually, it is ridiculous to severely limit the price of something that you want to have increased.

I understand the argument that the profit on the new oil is sufficient. I think the profit on the new oil is sufficient to encourage additional development but it is not sufficient to finance it.

If a company has a good deal of old oil at $5.25, even though it is encouraged to explore and develop additional oil at $10 a barrel, it does not have the cash flow to finance its development, as we were just saying. If it has to sell $5.25 oil that it replaces at $7, $8, $9 or $10 a barrel, it is losing money there. It takes away its profit on the new oil and has the effect of reducing its cash flow to the point where it cannot provide by retained earnings enough to expand and it cannot attract new investments. You do not see any rush of investors' money into the oil companies. You have seen the oil companies stocks. They declined over the last couple of years. They have not risen. They have declined. The investment bankers are not going to finance the expan-

sion of our energy needs unless there is some further opportunity for earnings in the industry. This is not only true in the oil industry; it is doubly true in the electric utilities. The electric utility industry is the most capital intensive industry in the country. It requires $4 of investment for every dollar of additional annual sales. The electric utilities are just not earning enough to attract the additional capital.

This last year or more over $10½ billion was canceled by the utilities. We will not lend it to them. The public will not buy their bonds even at rates of 10 percent. We do not need aid to these companies; we just need a reduction in the handicaps.

Senator DOLE. In other words, if the energy industry has to compete with other industries in the private sector and Government for capital, even given the severity of the energy problem, you are suggesting we do not need any special incentives for those engaged in the energy sector.

Mr. FREEMAN. No; I do not believe we need any gift, any assistance, any incentive, any special preference in the oil industry except to take away the handicaps of the price limitations. We do not have those price limitations on the other segments of our economy. Why should we have them on the oil industry? In the utilities, I know the history of public regulation, but you know its actual application. Utilities have raised their rates and the public did not like that, but they have not raised their rates commensurate with their additional costs. They cannot attract the capital. The private side of industry does not need any help. It just needs to take the weights off the horse, reduce the handicap, let them run in free competition. And the energy section of our economy will be able to raise the money that it needs although it has to raise a considerably higher proportion of the total plant and equipment expenditures.

Senator DOLE. You indicated that last year there was a great stampede in the Congress to see who could harpoon the oil companies first, and most frequently. There was a great deal of politics mixed up with the energy problem. Hopefully that has subsided. It may have with the so-called "obscene" profits down in the oil industry. These profits did trigger the emotions of the American people as the price of gasoline, as you indicate in your statement, jumped 20 cents a gallon, and the profits of the big oil companies were on the rise.

It was pretty difficult, with the polls showing 80 percent of the public thought that oil companies' profits were excessive. To get practical about that, if you are running for election that year, you do not run around defending Exxon and other major oil companies. If you do you may have that as a full-time job.

Mr. FREEMAN. I have a good friend, Major of Indianapolis, who ran for the Senate last year. He is a conservative in fiscal terms, a very fine, honest man. Either, because of or despite that fact, he told me that when he was running against Senator Bayh, he said every small community he went to people wanted to punish the oil companies. They did not want to hear anything but the fact that they wanted to punish the oil companies.

I can understand the problem of the Congressmen or the Senators. It is a very difficult situation. But it is really not too dramatic to say that the future of the country depends on the capacity of our elected representatives to assert a leadership position rather than just follow the emotional reaction of the people.

Senator DOLE. I commend both Senator Bentsen and Senator Gravel for these hearings. I think there is a potential leadership in the Congress, and I think we are going to face up to the problem. I do believe the emotions have at least leveled off to the point where we can talk rationally about some of the problems.

I am staggered by the figures in your statement and in other statements about the billions of dollars we need between now and 1985. I'll bet I could go to Kansas and talk to 100 people, and they would not believe me, that 10 percent of this is needed.

I believe that hopefully it has changed. I think these hearings may be one step forward, indicative of the fact that we are willing to discuss the problem calmly and rationally, and hopefully with something concrete in mind.

I share your view if the companies maintain reasonable profits. I do not really think that the oil companies or any other company is looking for any gift, subsidy, or any other incentive which would give it a special privilege.

Mr. FREEMAN. I think that is right, and we have a very competitive oil industry, so we are not likely to see that abused by excessive profits.

Senator DOLE. We have a problem in some States where you have the majors who have sort of abandoned States like Kansas and others; and we have independent oil and gas producers. I do not suggest that they need incentives either, but they do have some protection; even though the depletion was virtually repealed, it does protect the smaller producers. But if they could be assured that the handicap would not be placed on their industry, I think most of them would say even the depletion allowance we have now could be done away with. Just let us compete in a free market.

I do not advocate that, but I think they would be willing to live with it. If they had some certainty they would not have all the other effects.

Mr. FREEMAN. If it were to be removed, they may urge to remove it in stages, so it would not be too severe an immediate blow.

Senator DOLE. That is how it would work. Hopefully it would reach a plateau.

Thank you.

Senator GRAVEL. Senator Bentsen?

Senator BENTSEN. Thank you very much, Mr. Chairman.

Mr. Freeman, I apologize for not being here for your testimony. I was testifying before another committee while you were testifying here. I know of your great experience in this field, and we are pleased to have you as a witness. I know your bank was a pioneer in the financing of the search for fossil fuels and the reputation that your institution has had in that regard.

With respect to some of these things that have happened on utilities, the cancellation of, I think you said, over $10 billion of additional investment, and realizing the time frame in which these plants are built, how long it takes to get one onstream and operating, are we not in a position where we are just going to have some brownouts 4 or 5 years from now?

Mr. FREEMAN. Yes; we had delayed the increase not only as a result of the high cost of money in the last year and a half which led to the abandonment of many of the projects, but the electric utilities in Chi-

cago, with which I am familiar, recently built a nuclear plant on the Mississippi River. Before they could put it into operation, they had to get the approval of 27 different governmental agencies. It did not take as long as it took to build the plant, but it took a year. It took over a year because they are still not permitted to operate at full scale.

I understand what is the concern of the environmentalists—I share it but if we are to have as much regulation as we do Federal, State, in terms of rates, and then in addition the multiplicity of additional agencies, we are just not going to get the electric energy that we need, and we do need it, because particularly the nuclear energy—because if as we continue to hear—there was an article in the paper this morning about the limitations on our fossil fuel reserve—we have to depend on nuclear energy.

Senator BENTSEN. You were saying earlier that you did not feel that they needed any incentive to bring on this energy. But do we not run into a problem when we are talking about trying to develop new, alternative sources of energy such as gasified coal. Some of these alternative sources, on a Btu basis, would be equivalent to oil selling at more than $11 or $12 a barrel.

What happens if the Middle East countries decide to put some of those alternative energy sources out of business, and they, for a year or two, in order to break them, bring oil down to, say, $5 or $6? What do you do in order to encourage the capital investment in those plants?

Mr. FREEMAN. I tried to distinguish in my paper, Senator, between two types. I believe that though there are risks inherent in the production of oil and gas and conventional wells, I think we would survive any temporary decline in price. We went through bringing in east Texas fields when it dropped below $1 a barrel, we never lost a dime, and very few did, I think.

I think that we could handle the regular production all right. But the production from the oil shale and the tar sands if it happened as a national policy we decided those should be developed, then there would have to be some governmental assistance of one kind or another.

Senator BENTSEN. Do we have to take the approach that we did on synthetic rubber, for example, during World War II?

Mr. FREEMAN. Of course, we had the existence of the war as an excuse to have Government assistance. I do not think that the oil companies themselves feel that it is necessary to develop the oil shale or tar sands. But if the Government concluded that for its protection, or the public's protection, we should develop the oil shale, then I think it would have to give, in effect, a very fast writeoff of investment, plus take-or-pay contracts.

Senator BENTSEN. A coal gasification plant, for example?

Mr. FREEMAN. The same would be true there.

Senator BENTSEN. Let me ask you another question that concerns me very much.

I agree with you that we cannot have continuing deficits without wrecking the economy. Yet I know that much of this deficit we are facing now is a direct result of recession, of people being off payrolls, drawing unemployment compensation, not paying taxes; and then I look at predicted unemployment rates for the next couple of years of approximately 8 percent, and it seems to me we ought to be able to do better than that.

I do not think that there is anything that is more frustrating to a person than to graduate from high school or college and be told that society has no productive role for that person to fill, and we are looking at well over 8 million people out of work. It seems to me that we have developed a very serious, not just an economic problem, but a social problem and there ought to be ways to see that these people are productively employed. We must not accept levels of 8 and 9 percent unemployment.

Would you comment on that?

Mr. FREEMAN. I do not think we have to accept the prospect of continued levels of unemployment with those numbers. We have done several things that are unwise to my mind. I think our continuous rise in the minimum wage, although I understand the purpose and it is a logical purpose it certainly makes it much more difficult for new entrance into the labor force, particularly those with no skills and relatively little education. This is particularly hard on the blacks. If they could be paid—I do not mean the black—but any people could be paid less than the established wage rate, more of them would have jobs. They might not be great jobs, but they would be jobs and they would have some income.

I believe that we must take care of our unemployed and in a decent way. But I think that we have expanded this taking care far beyond what it should be. I am impressed with the number of college students now that have food stamps, and this is a part of the game, now, that as soon as you leave home you go on the Government dole through your college years.

I am impressed with the extent of the transfer payments as a part of our overall economy. The one fact that our transfer payments in the 1976 budget exceeds the total budget for 1964, which is the highest year we have ever had, transfer payments alone amount to $118.7 million. We are doing more than we need to do for many people.

Senator BENTSEN. I am concerned with the level of transfer payments. I have also been on many a college campus in the last year. Frankly I think that the college campus is a lot different than it was 4 or 5 years ago. When you speak of students now, on food stamps, I know of some. But I am impressed with the great number of students who are concerned about the economy, who want to work by doing their very best to qualify themselves. The questions I get on the college campus today sure are a lot different than I got 4 or 5 years ago. Students are deeply concerned about this economy, about our institutions and about making our institutions work effectively. They are concerned that there is a place for them to fill in society as they get out.

They are working very hard to try to qualify themselves for that. They are a different bunch, I think.

Mr. FREEMAN. It is a problem that we all struggle with and do not feel that we have the solution. But we have great natural resources; we have the people; we have the capital; we have some frustration and discouragement in putting them together to produce the goods and services that we need.

In that little yellow card I tried, not very successfully, in a graphic way to relate the decline in per capita savings to show that this has led to declines in the amount of tools per worker, and that in turn leads to a decline in per capita disposable income.

Senator BENTSEN. I do not argue with that at all.

The question of the lack of capital investment in this country for manufacturing capacity is of deep concern to me. We had testimony yesterday that our Nation invests the smallest percentage in manufacturing capacity compared to any industrialized nation in the world. Next to us is England, and we can see the problems they are having at the present time.

If we are going to compete in the world market, we have to have the latest in technology and the most modern manufacturing capacity possible. It costs over $25,000 in capital investment to create one new job in manufacturing.

We talk about being a service-oriented society, and over 40 percent of our GNP being related to that. We are not going to take care of our balance of trade; we are not going to keep our dollars sound just by taking in other people's wash. We have to have that manufacturing capacity. That means creation of jobs in this country. That is what I am striving to find ways to do.

Mr. FREEMAN. We have done one thing wrong. This is not the fault of the Congress. It is the fault of the whole society. We have really, since the end of the war, put great emphasis on consumer goods, the production for consumption, enjoyment of consumer goods to the expense of saving. We have done this in part by our laws, in part by business. Our banks encourage the use of credit cards. We make loans for consumer purposes. All of the department stores and mail-order houses encourage the use of credit. This is the emphasis on consumption of consumer goods as against savings, and it has been delightful. But, as a family the American people just have to recognize that they have to reduce their consumption and save a little bit more in order to provide both the jobs and the increased consumer goods in subsequent periods. We have been doing for 10 years what we are doing just now, where we are rebating taxes in order to encourage the production of washing machines, televisions, and automobiles. We know it is the wrong thing in the long run, but we just want to get the economy on an even keel.

After we get it on the even keel, if we have self-discipline in our country, then we ought to try to shift more of the income into investment and less into consumer goods.

Senator BENTSEN. Thank you very much, Mr. Chairman.

Senator GRAVEL. Thank you very much, Mr. Freeman.

I think you have had a very fine testimony.

Excuse me, I did not see Senator Packwood come in. I apologize.

Senator PACKWOOD. Mr. Freeman made reference to Secretary Simon's statement yesterday, and it was a good statement, an excellent statement. He laid heavy emphasis on the fact that although our total taxation in this country is not greater than Europe's they rely more heavily on productive capacity than consumptive capacity.

Your orange card makes reference to consumption and encouraging savings. Considering the total taxload is not going to be reduced, what would you suggest shifting to in order to leave more money for savings?

Mr. FREEMAN. The relatively difficult shift, from the Congress point of view, to more taxation upon consumption, so the Federal sales tax on televisions, washing machines, dishwashers, and automobiles——

Senator PACKWOOD. General value-added tax?

Mr. FREEMAN. I do not know whether I would go so far as to recommend the value-added tax. The value-added tax is very complicated and it does—it weaves itself out through the structure. If we adopt the whole concept of value-added tax instead of an income tax, that would be a big change and affect all of our institutions.

Senator PACKWOOD. Personal income, or corporate?

Mr. FREEMAN. Both.

Senator PACKWOOD. That would be a heck of a value-added tax, if we have that much money.

Mr. FREEMAN. Yes, it would; but it comes ultimately from the same base.

Senator PACKWOOD. You are saying if it is a total substitute for both it would be a good tax, if it were a tradeoff.

Mr. FREEMAN. I think it would be a fairer and useful system. But I am not unaware of that tremendous impact it would have on the way we do business today. So many of our institutions, our corporations, our family arrangements are set up on the basis of existing tax laws. If we completely substitute a whole new structure of taxes, I think you would hear complaints from every one of your constituents because he would understand what it was doing bad to him and he would not understand what it was doing good. As a practical matter, we are a long way from making that change.

I do agree with you that either the Federal sales tax or value-added tax on consumer goods would be highly desirable, highly desirable.

Senator PACKWOOD. Thank you very much.

Senator GRAVEL. Thank you very much.

[The prepared statement of Mr. Freeman follows:]

PREPARED STATEMENT OF GAYLORD FREEMAN, CHAIRMAN OF THE BOARD, FIRST CHICAGO CORPORATION AND THE FIRST NATIONAL BANK OF CHICAGO

The Sub-Committee has posed a series of questions relating to the capability of the private marketplace to provide the funds needed to develop new and additional sources of energy over the next decade.

This is neither an easy exercise nor a pleasant one. Energy is important, but it is important only as a component of the total tools—along with machinery for manufacturing, construction, and transportation—which convert human energy into more effective production. It is but one element of the total tools which enable man to produce more (without longer hours or harder work) and hence to live better. As a consequence, your examination of the financing of energy opens a pandora's box of disparate claims and the determination of priorities.

This is a formidable task, and I commend these Sub-Committees for undertaking a most difficult assignment.

Although lacking any special expertise in the field of energy, I am pleased to attempt an expression of my personal responses to your questions.

I. "WHAT ARE THE CAPITAL NEEDS OF THE ENERGY SECTOR DURING THE NEXT DECADE?"

An easy answer would be that no one knows. What are our needs today? They are dependent upon the price of the various products, rates of speed at which we are allowed to drive, the levels of temperature to which we heat our homes, the substitution of public for private transportation, etc. Thus any projection has to be based on a complex series of assumptions and, at times, involves extensive guessing.

The New York Stock Exchange, in its study entitled, THE CAPITAL NEEDS AND SAVINGS POTENTIAL OF THE U.S. ECONOMY, has estimated the energy requirements at $824 billion in current dollars, over the period 1974 to 1985, and the General Electric Company has estimated the current dollar requirements at about $772 billion over the same period.

Yesterday, the Secretary of the Treasury, in one of the most precise and well-reasoned economic statements that I have ever had the pleasure of reading, stated his estimate at approximately $1 trillion over the next decade.

Relying on material developed by individual corporations, associations, and other groups, largely customers of the bank in whom I have confidence, I would make the following rough estimates:

A. Oil and gas

From 1975 through 1985, the petroleum industry is expected to require approximately $315 billion for the production of new supplies of oil and gas. This figure is derived as follows:

Expenditures for crude oil and natural gas exploratory and developmental drilling, lease bonuses, and natural gas processing are anticipated to total about $228 billion.

Outlays for transportation of oil and gas supplies are expected to be approximately $22 billion. These include expenditures for the Alaskan pipeline, as well as other pipelines, tankers, and offshore super ports.

Manufacturing and other outlays, which are projected to be about $65 billion, consist of spending for refining and chemical plants (including expenditures for the installation of pollution control equipment), and the expansion and maintenance of marketing facilities.

Implicit in these projections is the expectation that demand for energy will grow less than the rates which we experienced in the past decade or so, but will instead increase at about a 3 to 3.5 percent per annum rate for oil, for example.

B. Utilities

Our friends in the electric utility field have expressed a wide variety of opinions, but the Technical Advisory Committee on Finance,[1] in its report to the Federal Power Commission, has arrived at a consensus that the aggregate capital needs for the electric utility industry will be approximately $390 billion from 1975 through 1985, assuming that the growth in the use of electric energy will be at rates averaging about 6 percent per year in the latter half of this decade and in the 1980's. This also assumes that by the late 1980's, about 60 percent of all new base-load generating capacity additions will be nuclear. However, the Committee goes on to state that total construction expenditures would not be greatly changed even if there were a moderate shift from nuclear to coal generation, because the cost differential between nuclear and fossil fuel base-load plants is not large enough (percentage-wise) to affect its predictions.

In addition, the capital requirements for the production and processing of uranium are anticipated to be from $10 to $15 billion.

C. Coal

Capital requirements for the production and transportation of coal, from both underground and surface mines, are estimated to be from $20 to $25 billion. This figure also includes outlays for synthetic fuels, such as shale oil, tar sands, and synthetic natural gas, as well as spending for coal gasification and liquefaction.

Our estimate of the total of these capital requirements, to meet the reasonable energy needs of our society in the decade ahead, would aggregate around $735 to $745 billion, which compares with Secretary Simon's estimate of approximately $1 trillion, General Electric's estimate of $772 billion, and the $824 billion forecast of the New York Stock Exchange. Although the differences between these estimates appear to be quite substantial in dollars, in many cases they reflect differing assumptions about the future. For our immediate purpose, I would suggest that we think in terms of something like an aggregate requirement of roughly $750 billion.

II. "WHAT ARE THE PRESENT AND PROJECTED CAPABILITIES OF THE PRIVATE SECTOR TO MEET THESE NEEDS?"

Investment capital comes only from three sources;

A. foreign investment,

B. additional funds created by the monetary authorities, or

C. savings (whether governmental, personal, or corporate).

A. Foreign investment

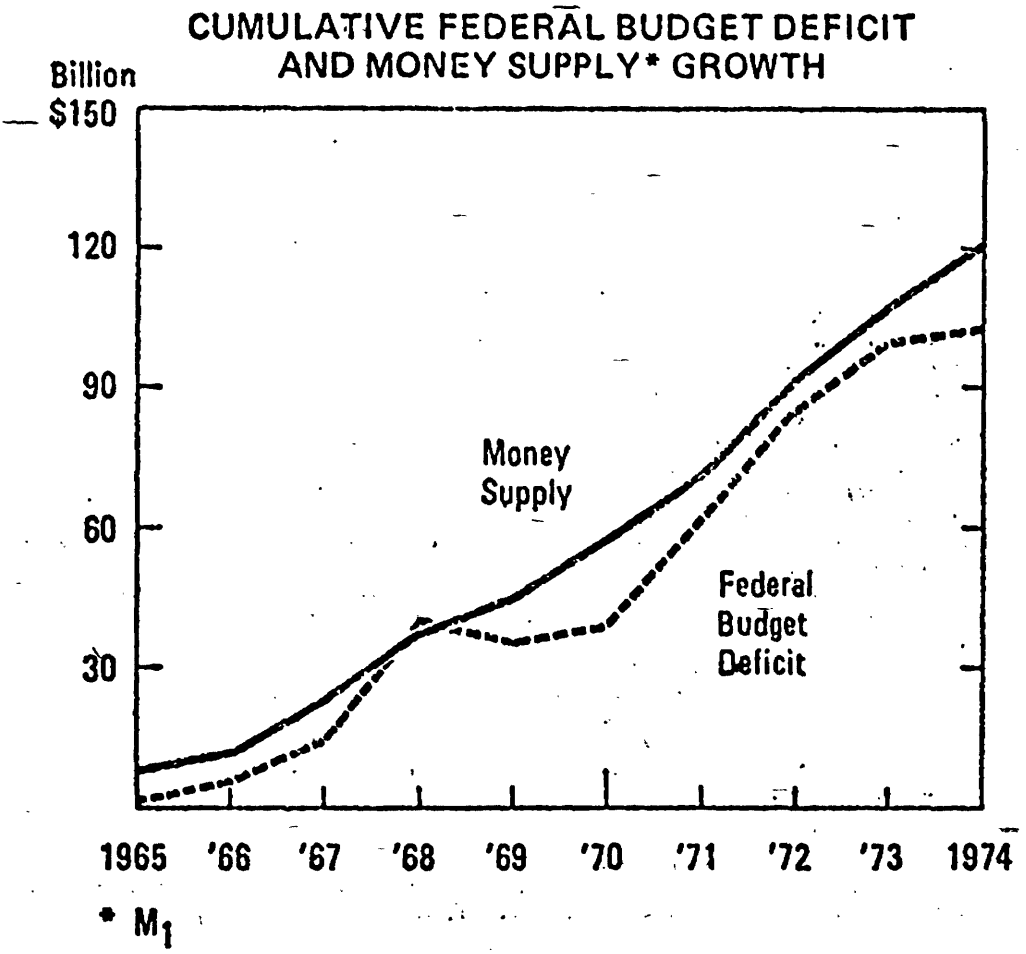
Foreign investment may not be a significant source of capital in the decade ahead. Since 1945, there has been only one year (1968) in which there has not

[1] "The Financial Outlook for the U.S. Electric Power Industry," A Report to the Federal Power Commission by the Technical Advisory Committee on Finance, December 1974, Gordon R. Corey, Chairman.

been a net outflow of private capital from the United States. In 1974, there was an inflow from the Organization of Petroleum Exporting Countries (OPEC) of perhaps $11 billion. Although there was some inflow in the first quarter of this year, it is not likely that the OPEC will invest any large amount in the United States during the balance of this year. It is more likely that the OPEC nations will continue to accelerate their imports of real goods and services, and the buildup of funds by OPEC for investment purposes may not be as large as has all too often been assumed. Of course, conditions may change in which case there might be a more rapid inflow of capital. But, considering all influences, I do not believe that we can safely rely on any significant foreign investment inflows as an aid to financing our domestic energy requirements.

B. Additional funds created by the monetary authorities

Over the past 10 years the Congress has appropriated annual expenditures far in excess of any prior period including World War II. But the Congress has seen fit to increase taxes to raise equivalent revenues. Thus, we have had deficits in nine of the ten years, from 1965 through 1974, which, in the aggregate, amount to $103 billion. If those deficits had been financed by the sale of bonds to the public, our citizens would have invested more in U.S. bonds and bought less TV's and automobiles. That would have been less pleasant temporarily, but it would have obviated our boom and probably would have avoided double-digit inflation. It also would have brought home to the people that what you in Congress were spending for them meant that they could not spend so much on what they wanted. However, we did not elect that course, but on the contrary, encouraged the Federal Reserve to increase the money supply in an amount adequate to finance the deficit.



In effect, we just printed the additional money. This way we appeared to have our cake and eat it too.

We certainly should not continue to follow a course of rapid money supply growth over a ten year period. There will, of course, be some increase in the money supply in any case. But I do hope that neither the Congress nor the Administration will put pressure on the Federal Reserve to increase the money supply at a rate inconsistent with stable prices: that would merely defer and then exacerbate our economic problems. We must instead moderate the growth of our money supply, maintain stable prices and encourage savings and investment.

C. Savings (government, individual, and corporate)

The only satisfactory source of capital is savings. Those savings can be obtained in several ways.

1. By the government, through limiting expenditures below the level of revenues (or by borrowing additional sums from the public, which is a form of private savings),
2. By individuals, who forego consumer expenditures by spending less than their incomes,
3. By corporations, through retained earnings, or
4. By capital inflows from abroad.

Socialist societies emphasize savings and investment by the government. We do a good bit of that here—our highways, schools, and national parks are all capital assets acquired through savings (in one form or another) by our governments. There are some of our people who would welcome the government's investing in the additional capital assets needed to increase our sources of energy. However, I believe that a majority of our people would prefer to have the needed assets financed by private and corporate savings—to the extent that this can be done. That leads to a basic question.

Are private and corporate savings likely to be adequate to do the job? This depends on:

(a) The level of private savings and
(b) The competition from other available investments.

(a) *The level of private savings.*

(i) *Individual savings.*—Individual savings can be simply defined as disposable income minus private consumption expenditures on goods and services. But that definition hides a great variety of influences. Disposable income is income minus taxes so the extent of disposable income depends:

First, on the level of income, which depends upon the extent of employment, hours worked and wage rates, and

Second, on the amount paid in taxes (income taxes and social security taxes).

From the net amount we have to deduct consumer expenditures. These in turn depend upon the level of prices and the relative attractiveness of the alternative to spending—which is to say, saving.

The desirability of that alternative, saving, depends in part on the rate of interest to the rate of inflation. The saver can get interest on a savings account (which is regulated by the government) or on a government bond, or on other investments (influenced by price regulations, taxes, etc.). But the expectation of inflation tends to discourage savings; the expectation of stable prices tends to encourage savings.

It is thus apparent that your policies as they affect the levels of employment, taxes, interest rates, corporate earnings, and inflation, largely determine the rates of personal saving.

(ii) *Corporate savings.*—The same is even more apparent as to corporate savings, which is to say retained earnings, for they are greatly influenced by government price and tax policies.

I am sure that you don't want a long statement on this emotional issue, but the fact is that the oil companies and utilities have not been enjoying excessive or "obscene" profits.

1. Oil companies

During the decade ending 1978, the rate of return on stockholders' equity in the petroleum industry was slightly lower than that for all manufacturing, despite the great risks involved in oil exploration.

AFTER-TAX PROFITS AS A PERCENTAGE OF STOCKHOLDERS' EQUITY

	Petroleum and petroleum products	All manufacturing
1964	11.4	11.6
1965	11.8	13.0
1966	12.4	13.4
1967	12.6	11.7
1968	12.2	12.1
1969	11.7	11.5
1970	11.0	9.3
1971	10.3	9.7
1972	8.7	10.6
1973	11.7	12.8
1964-73 (average)	11.4	11.6

Source: Federal Trade Commission, Quarterly Financial Report for Manufacturing Corporations.

Public concern over oil company profits arose largely in 1974, when oil company profits rose sharply, though temporarily, as a consequence of the fourfold increase in the price of crude imposed by the OPEC. It was understandably difficult for the consumer to accept a 20¢ per gallon rise in gasoline prices at a time that petroleum profits had increased substantially. Few could understand or believe that only about 2¢ of that 20¢ increase represented after-tax corporate profits, and that the remainder flowed to increased costs of goods and services, wages, increased taxes, and to higher prices for crude oil, especially to foreign producers.

Although reported earnings of the major domestic and international oil companies rose sharply in 1974 to an average return of almost 18.5% on stockholders' equity, this greatly overstated the true facts. Approximately 60 percent of their sales were at the government-imposed ceiling price of $5.25 a barrel, but unless the companies are to be liquidated, they must replace that oil at much higher costs, up to $10 a barrel. Thus, the 1974 profits were not only overstated, they were very temporary. Already they have fallen and for the first quarter of this year averaged 10.5 percent on equity (annual rate) for this group of companies.

The pre-1974 average return of 11 percent on stockholders' equity occurred in a decade in which the U.S. eventually began to consume more domestic oil and natural gas than it replaced. This "overuse" and "under-replacement" occurred because domestic price incentives were constrained by Federal actions. In this climate, the 11 percent earnings pattern was adequate to attract the capital needed for the development of the limited number of domestic prospects—but certainly not for the aggressive domestic energy expansion which we now require.

The capital generation problem should not be confused with the adequacy of incentives. New oil is priced high enough to attract sufficient capital to encourage producers to find and develop new supplies of oil in the coming years. But the maintenance of the $5.25 ceiling on the price of "old" crude (a level far below replacement cost) hinders this development, and therein lies a major part of the problem. U.S. petroleum capital generation probably will not be increased significantly in the near future either by foreign earnings, by revenue from new and released oil by earnings from new discoveries (because of long lead times). Rather, we need to consider allowing the price of old oil to rise. This could be done in stages over a given period of time, although my preference would be for decontrolling all oil prices (as well as natural gas prices) now.

2. Utilities

The electric utility industry faces special problems in gaining access to available supplies of capital, for it is the most capital intensive of all American industries. To produce a dollar's worth of electricity per year, at least $4 must be invested—double the amount the gas industry requires, and nearly four times the oil industry's needs per dollar of annual revenue.

Moreover, the utilities must acquire more than half of the added capital they require by selling new securities in the capital markets. And, at least 20 percent of the capital to be raised externally will have to be raised through the sale of common equity securities—on the order of $3 billion in each of the next five years.

In order to obtain these huge sums, particularly the necessary common equity money, electric utilities must offer adequate returns. In an inflationary period, this means paying higher rates of interest on debt securities and providing higher earnings on equity. Yet, it is in just such a period that old regulatory patterns inhibit the price increases that will be necessary to meet these requirements.

It seems clear that if the electric power industry is to supply an increasing share of the nation's energy needs (as a result of the growing shortages of oil and gas), it will have to raise about $15 billion of new money annually during the next five years, while the figures will have to increase an average $20 billion annually over the decade of the 1980's. About 60 percent of the industry's capital needs must be provided by the capital markets, rather than through internal cash generation. Moreover, the failure of charges to consumers of electricity to keep pace with cost increases over the past decade has caused returns on electric equities to decline just when money costs have been rising and ever-increasing amounts of capital must be raised.

There are two remedies for this situation.

First, to attract the $3 billion per year of needed new investment, the price of electricity must be allowed to rise sufficiently to once again make electric utility stocks attractive.

Second, we must offer rewards to the small investor (who is traditionally the one most likely to invest in electric utility stocks) for additional savings and investment.

It is a characteristic of electric utility common stocks that a very large portion of the earnings on these stocks is paid out in the form of cash dividends. Other industries plow back most of their earnings into the business. Not so the electric utilities because a substantial proportion of their stockholders are small investors who are believed to seek dividend income. It is important to attract more of the utilities' cash dividend money back into the electric business—through the reinvestment of dividends. Among the possibilities which should be given serious consideration is the tax-free reinvestment of dividends, thus helping utilities to raise their huge requirements for new equity money.

It is my opinion that if the Congress can approach the problem realistically and, on average, the government can balance its budget over the coming decade, the anti-inflationary impact on prices and on expectations would encourage private savings in amounts adequate to provide the capital investment necessary for the development of additional energy from conventional domestic sources, both those now known and those likely to be discovered. If the dollar amount for energy capital spending seems large ($750 billion), we must remember that during the past decade, when the emphasis was on consumer expenditures rather than savings, we invested $788 billion in total plant and equipment in this country. If we revised that amount for the inflation during the decade and restated it in terms of 1974 dollars, the total investment would amount to $965 billion. This indicates that our present requirements, although very large, are not completely out of line with what we have done in the past.

If there are no changes in federal and/or state laws or any move toward a balanced budget, there will *not* be adequate private financing to achieve our energy goals.

If, however, the

(i) Congress

Encourages saving and investment,

Allows oil and gas prices to be established by the market, and

By self-discipline limits its expenditures to the level of federal revenues so as not to create additional government borrowing, and

(ii) State commissions permit the utilities to raise rates in relation to costs, then there will probably be adequate private investment to finance the needed increase in our energy supply.

(b) *The competition from other sources.*

The capital needs for energy will have to compete with the needs for other types of tools, the whole scale of needed investment in plant and equipment. This is estimated to aggregate approximately $3.3 trillion over the next decade, of which the energy requirement constitutes slightly less than 1/4. The access to capital among the competing sectors will largely be determined by the relative earnings opportunities. However, there is another form of capital need that competes on a privileged basis, and that is government borrowing to finance continued budgetary deficits.

In the preceding paragraphs I have postulated a balanced budget. Desirable as that would be, you are not likely to follow that course. It is too tempting to push off onto future generations the cost of our present pleasures. Thus, in reality, you will be encouraged to continue to spend more than government revenue and cover the deficit by having the government borrow additional funds. If the government borrows these through the use of the Federal Reserve's printing press, we will have inflation, and private investment will be discouraged. If the government borrows from the people, they will have that much less to spend and invest, including investment in the securities of the oil, gas, and coal companies and utilities.

Our problem is one of setting priorities. We cannot have everything we like. We can have only what we produce, and we must determine how we are to divide that.

Consequently, it is probably possible for the private sector to meet the needs for the development of conventional domestic sources of energy if, but only if, the Congress:

(i) Moderates its legislative discouragement of savings and investment,
(ii) Holds down expenditures so as to move closer to a balanced budget, and
(iii) Removes price controls on energy supplies.

In the absence of such a program, we may not be able to finance the desired increase in energy from private sources.

III. "IS THERE A NEED FOR GOVERNMENT LOAN GUARANTEES OR SPECIAL TAX INCENTIVES?"

If the government were to take action along the lines just described, the private sector would probably be able to provide the necessary financing of domestic conventional resources. By referring to conventional resources, I seek to distinguish between conventional coal and nuclear sources and oil and gas from conventional wells, as distinguished from synthetic oil produced from oil shale and tar sands. Significant production from shale and tar sands will involve investments and operating costs as yet unknown. Responsible estimates of the price of producing crude oil from oil shale has risen from $7 to $8 per barrel in 1973 to $14 to $15 per barrel today. The fact is we do not know what these costs will be.

Under these circumstances it is unlikely that any responsible company could undertake to develop such sources on a commercial scale at this time, or that private financing would be available.

There is a considerable hazard to any extensive development today. It now appears that there may be a decline in the price of foreign crude in current dollars, and certainly in real terms in the next five years, which would reduce the price of the domestic product as well. Extensive off-shore development runs some risks of uneconomic results, but experienced oil companies, operating with sound principles, will be able to get the necessary funds for most such development. Funds will not be available for extensive development of oil shale or tar sands without some government assistance.

IV. "IF SO, WHAT APPROACH WOULD YOU FAVOR?"

Although I am not an expert in this field, I do not believe that, in the next 10 years, production from oil shale or tar sands will be necessary for an assured adequacy of energy. However, if the government concludes to the contrary, then perhaps it could obtain that assurance at least cost by entering into "take or pay" contracts with adequately experienced oil companies. As you know, virtually every business involves some risk, and oil company management is experienced in calculating and assuming risks every time it drills for oil or gas. I do not believe that we need a government oil corporation, nor do I believe that it would be necessary for the government to make the initial investment (although that may be required).

If the government would for a few years permit, in the year incurred, the write-off (against taxable income) of all exploratory and development expense in the production of liquid petroleum from oil shale, and follow that up with some contracts obligating it to purchase a fixed amount of the product at a stated price, this would probably induce a few companies to do the necessary developmental work and make the fixed investment.

The contracts could be drawn to encourage competition (by rewarding the low cost producer) and could specify that the government, at its option, could take the product (at the stated price) or pay the company the difference between the contract price and the market price (if lower).

V. "ARE THE PROSPECTS FOR PRIVATE CAPITALIZATION OF ENERGY DEVELOPMENT ADVERSELY AFFECTED BY POTENTIAL CHANGES IN WORLD OIL PRICES?"

Yes. The risk of fluctuation in prices of energy supplies—especially petroleum—tends to limit capital availability. Energy in the form of oil is readily transportable, and in a free market world prices affect domestic prices. The recent fourfold increase in the price of oil heightens the risk of price declines. The OPEC may not be able to maintain the present price level, but the success of their price action will be likely to encourage a continued effort to maintain that cartel. This suggests that we are not likely to see a drop in crude prices to anywhere near the $3.00 per barrel level of 1972. Thus, domestic producers are undoubtedly able to attract many more dollars of additional investment today than they would have been three years ago.

The risk of price fluctuation should not prevent adequate private financing—if the government permits market prices and adequate profits, and does not flood the capital market with competing capital absorbing obligations—that is, government bonds to finance deficits.

VI. "IS THERE A NEED FOR A MINIMUM OIL IMPORT PRICE OR SOME OTHER DEVICE TO PROTECT HIGH-COST ENERGY INVESTMENT IN THE UNITED STATES?"

I am not certain, but I do not believe that we need to impose a minimum price on energy supplies from conventional sources if prices are freely determined and profit incentives are not retarded. In such a climate, the domestic energy industries probably would be able to find and develop—at economically justifiable costs—adequate supplies of energy.

I would suggest a limitation of the physical quantity of oil imports, rather than a fixed minimum import price for three reasons:

a. It encourages a higher domestic price,

b. It takes the responsibility off the Congress (or the Administration) for "fixing" what to the American public will seem like a high price, and

c. It controls the payments outflow for oil.

VII. "WHAT ALTERNATIVE POLICIES MIGHT BE PURSUED?"

One undesirable but very real alternative would be for the government to continue a combination of excessive spending and a tilting of the economy toward consumer expenditures and away from saving and investment. Over this past decade just such a policy has caused our society to save less with consequent lower rates of investment, productivity, and growth. Secretary Simon's figures of yesterday clearly demonstrate that point.

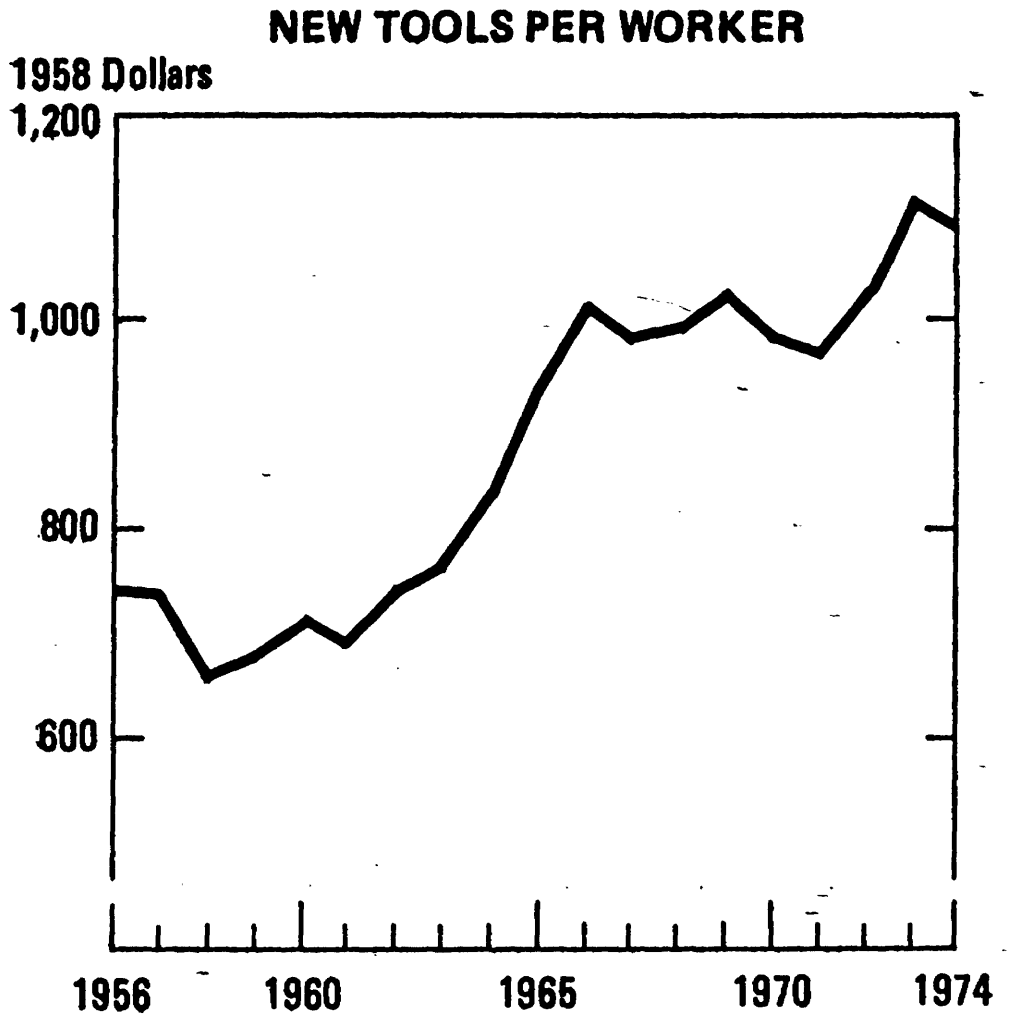
The legislative discouragement of savings has resulted in an actual decline in the tools available for our workers.

This in turn has impaired productivity and thus has contributed to declining standards of living.

As yet, I see no evidence that this will change.

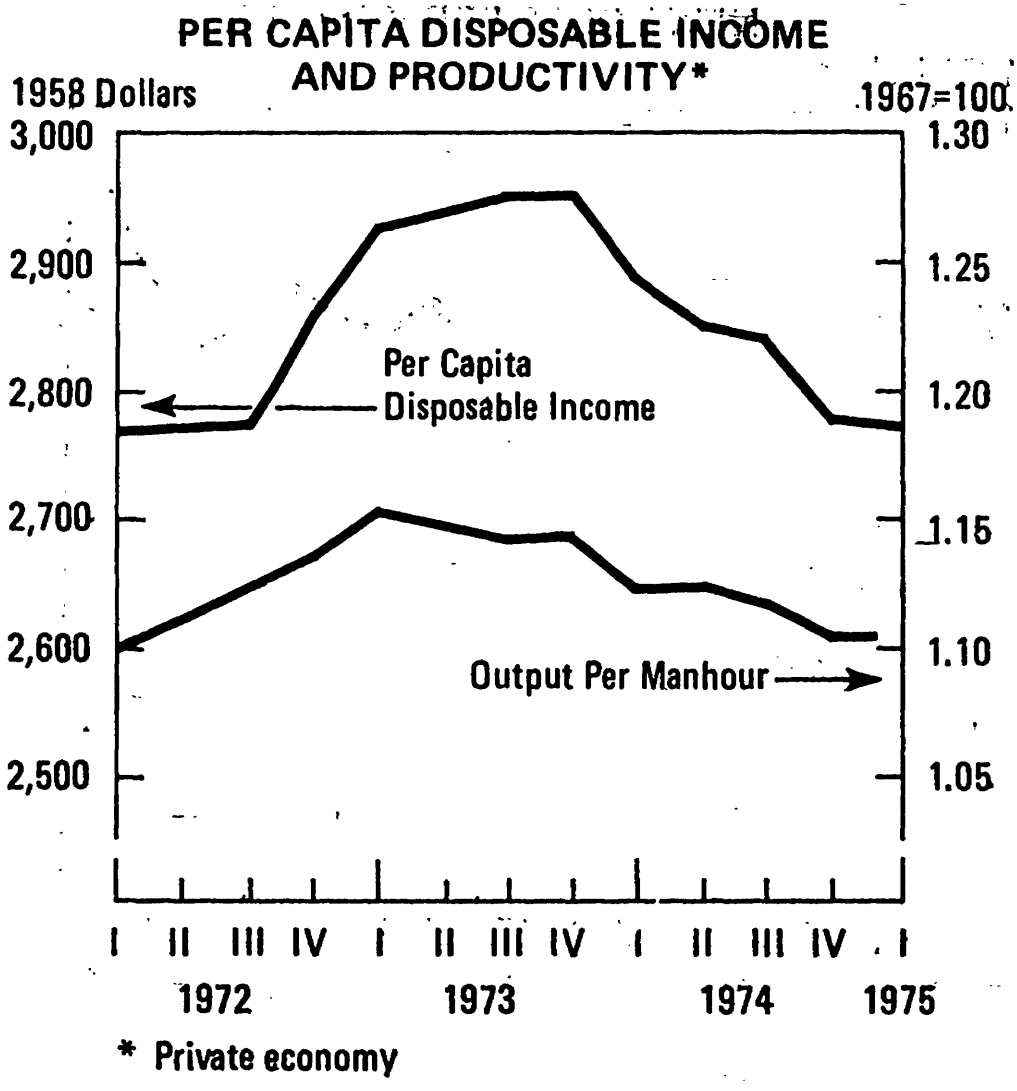
The figure for transfer payments in the 1976 budget alone exceeds the entire record-breaking budget of 1964—and the Congress will be under pressure to increase these further next year. If you continue to transfer an increasing share of income from the worker to the non-worker, personal savings will prove increasingly inadequate to finance any significant increase in the investments which are required to improve living standards.

The presently anticipated budget deficits for 1975 and 1976 will exceed the aggregate deficits of the preceding ten years. The $110 billion or so of additional government debt to be financed for just these two years will preempt over 60 percent of the savings of individuals for that period.



If Congress continues such deficits, private savings will obviously not be adequate to finance the growing federal debt and also provide the capital needed to develop sufficient additional energy. Thus, the real alternative is government financing of much of the needed facilities with funds derived from government debt to be monetized by the Federal Reserve. This would greatly increase inflation. I do not believe that this is a course which the people would endorse if they understood the issues. Unfortunately the emotional reaction to higher oil and electric prices has obscured the facts, and many citizens seem more determined to "punish" the oil companies than to overcome the cause—inadequate investment.

Throughout this statement I have referred to my impression of the duties and the responsibilities of the Congress and implied at least the possibility of its failing to take what I consider to be the proper course. This does not reflect a criticism of the Congress, but rather a recognition of the pressures to which the legislators are constantly subject. There is always a popular demand for more welfare, more benefits, more spending. Tax withholding tends to obscure the amount of income tax which the average worker pays. Even if the taxpayer is fully aware of the amount paid, he is not likely to know what proportion of his tax goes for transfer payments, interest on government debt, etc. Thus, benefits seem to be free.



It was the anticipation of this that caused Alexander Trotter, the English historian, to write in 1839:

"A democracy cannot exist as a permanent form of government and can only exist until the voters discover that they can vote themselves largesse from the public treasury. From that moment on, the majority always votes for the candidates promising the most benefits from the treasury with the result that a democracy always collapses over loose fiscal policy, always followed by a dictatorship."

You and I do not believe that such a result is inevitable, but we do know the risk, a risk that can only be averted by a courageous Congress composed of representatives who see their responsibility as one of thoughtful leadership of their electorates, rather than a mere reflection of the uninformed emotional reactions of a vocal segment of their constituency.

In essence, the problem is not one of the private sector, but one of responsible congressional leadership. Unless you are prepared to encourage private savings and investment, there will be a continued decline in the number of tools (including energy) per worker and, hence, a further decline in national living standards.

We can have adequate energy provided that you do not drain away our potential investment in less productive expenditures. Otherwise we cannot.

Senator GRAVEL. Our next witness is Dr. Adelman, Department of Economics, Massachusetts Institute of Technology. Please proceed.

STATEMENT OF PROF. M. A. ADELMAN, DEPARTMENT OF ECONOMICS, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Mr. ADELMAN. Thank you, Senator. I filed a statement, but in my oral comments I will confine myself to answering two of the questions that were addressed to me.

Are the prospects for private capitalization of energy development adversely affected by potential changes in world oil prices?

They are very adversely affected, because world oil prices are unstable, as long as they are set by the world oil cartel. The cartel is, by its nature, rigid and unstable. A price acceptable to most members at one moment becomes unacceptable later.

In the short run, the price could certainly be raised farther, even aside from inflation. The price will be raised if the exporting nations, or enough of them, think the higher revenues today are worth the possible loss of business in the future.

On the other hand, if significant competition breaks out among the members of the cartel, the price could fall to a fifth of its present value. The price may go up at some times and fall at others. Furthermore, the cartel may deliberately reduce price for a limited time, to discourage or stop entirely, investment in substitute energy sources.

In this way, we are getting the worst of all possible worlds. We are paying very high prices and yet the potential investment in energy is frightened off by the great risk of greater conventional or new energy sources.

The other question to which I address myself: Is there a need for a minimum import price or some other device to protect high cost energy investments in the United States?

On the unconventional energy investments, the answer, I think, is no. It is not necessary to subsidize all fossil fuels in order to obtain experience in producing some new types.

We ought to be talking about research grants or of such devices as take-or-pay-for contracts, of which Mr. Freeman was speaking.

If we turn to conventional energy sources, especially oil and gas, if anyone wants a nationalized oil and gas industry, there is much to be said in favor of a price floor, because that is probably the quickest way to obtain it. Aside from this, the basic objection to a price floor is that we do not know how much domestic supply of crude oil and natural gas will be forthcoming at a given price.

Estimates made by the FEA Project Independence report were too low, when compared with econometric studies of price supply relations. They are too high according to the judgmental forecast of most oil countries.

Where honest well-informed observers disagree so widely it is folly to suppose that any estimate is at all reliable. A national policy committing us to some definite price floor belongs in the world of fancy.

Aside from a domestic floor price, there is another type of minimum and that would be the one embodied in a long-term supply agreement between importing and exporting nations, whereby the importing country guarantees a minimum price, while the exporting countries promise them unlimited amounts of oil at that price.

The administration has been working toward this goal, a worldwide price-fixing agreement, for several years. But what we are dealing with

is a cartel of sovereign states; there is no way of enforcing any agreement.

Unlike contracts in ordinary trade, the soverign monopolist is constrained neither by competition, nor by law. Over the last few years, the oil-exporting nations have made many agreements. The record is clean. They have broken every one. I will ask you now to only examine the very recent history of suggested agreements with Saudi Arabia.

In October 1972, the Saudis proposed that they would get preferential access in return for a guaranteed price. Nothing much came of this, although the State Department said it was enthusiastic. This is not surprising since State had as much to do with drafting the proposal as had the Saudis.

A year later, after the great price explosion of December 1973, Government take of the oil price floor in the Persian Gulf was $7 per barrel for so-called equity oil owned by the companies.

The Government's share proved unexpectedly difficult to sell because in early 1974 demand for oil was unexpectedly weak. Accordingly, Saudi Arabia initiated the practice of requiring producing companies to take a share of the oil and at a considerably higher price. Thus, the amount due to the Government was raised from $7 to approximately $8.

This particular incident shows not only how a bargain was unilaterally changed, but also how mistaken it is to suppose that weakness of demand will somehow lead to a decrease in price.

The next unilateral action came in mid-June 1974, when Saudi Arabia changed its participation from 25 to 60 percent, thus, unilaterally, raising the average take to about $9.35. Any temptation to protest this action was forestalled by the repeated Saudi assurances that they really wanted lower prices, thus earning repeated praise for being large minded and statesmanlike. They promised an auction in August and the auction was canceled.

In September, Mr. Kissinger and President Ford made so-called tough speeches. The then Federal Energy Administrator, John C. Sawhill, when asked by the Senate Permanent Committee on Investigations, for the administration's plans to lower the price, answered that there was no plan at all.

Mr. Kissinger was angry, and Mr. Sawhill was soon out of office.

In October and again in November, Mr. Kissinger visited Saudi Arabia, received assurances from King Faisal himself that Saudi Arabia would try to bring down oil prices and, after each assurance, there was a further increase in price.

October 1974 was also noteworthy because the Saudi Petroleum Minister said its country would never reduce output. In March 1975, high-ranking U.S. officials expressed their dismay that the Saudis had pulled the rug out from under them by reducing output by one-third.

This rather dreary recital of promises made and cherished and broken is necessary only because there is such a deep yearning for some kind of agreement or settlement with the oil-producing nations. This hope has permitted our country to tolerate and even help the increase in prices, which is the original source of the problems we are wrestling with.

I believe that this committee and the Senate could make a great contribution by letting it be known that it will not tolerate any kind of long-term so-called agreement on a floor price for oil.

Senator GRAVEL. Thank you very much, Doctor. We realize—I assume you share that realization—that the prices set for oil in the Persian Gulf alter our market forces and as a result of that fact, if we permit a deregulation of gas and oil, obviously the prices will rise to the price level for imported oil. Of course, there is great pressure in the country not to allow that to happen, which causes a flight of capital either out of the country, or out of the energy industry.

Those are the problems we are focusing on here. What would be your reactions to deregulation in order to try to regain the capital so we can increase the domestic supply even though the price level would be guided by cartel action in the Middle East. If we had sufficient supply, we would not have to be the victims of that cartel.

Mr. ADELMAN. Senator, we are the victim of that cartel; as long as it is there, we will continue to be victimized by it. The only question is what we can do to minimize the impact.

Now, the high world price is a fact. It is an external fact, and our domestic oil and gas industry is competitive and simply adjusts to that externally set price. If we want to expand output, we have got to permit the price to rise to the point where there is sufficient inducement.

The regulation of natural gas prices at the wellhead has been one of the most grievous mistakes made in this country's economic policies, since World War II, and one of the longest and most stubbornly maintained.

The regulation of so-called old oil prices is, I think, harmful for two reasons. One, old oil is largely a misnomer. The great bulk of all fields are subject to continuing decline. The decline can be offset to a greater or lesser extent only by additional investment. And, if the price ceiling on old oil is maintained, investment will not be made.

The other harmful effect of the ceiling on old oil is that it renders very uncertain the price of new oil. There is nothing to prevent the Congress from putting a ceiling on the price of new oil. Indeed, ceilings or rollbacks are under active discussion today.

I would say, therefore, that if you want to have domestic output to the maximum possible extent, consistent with any given world oil price, then you should give first priority to removing controls on oil and on gas.

Senator GRAVEL. You do favor an import system similar to the House Ways and Means? Are you not afraid a quota is too rigid a system for an economy in recession? Would a quota system impair our economic recovery?

Mr. ADELMAN. Curiously enough, Senator, it is in times of recession that the quota is not rigid at all. Because when the demand decreases below the permitted amount, there is, in effect, no restriction. The rigidity is felt during times of recovery and of normal growth. And here it comes down to a matter of choice, and the choice that the legislature has got to make.

If you wish to restrict the supply of foreign oil in order to raise the price, then you will want to set the quota limit at a given level, and stick to it. If we do not want this to happen, if you see no particular virtue in a higher price, then you will want to keep the quota approximately at the level where it is today, plus the normal increments as the economy expands.

This, by the way, is not a difficult thing to do in practice. The Texas Railroad Commission did it for almost 30 years when they simply watched inventory and watched demand and increased or decreased production allowables in each State accordingly.

Their mandate was to stabilize the price, and they did—except at those times when they thought that they wanted to raise the price. But the job of governing imports to keep the domestic price steady, if that is your mandate, is an easier job than was theirs because they had to control the bulk of domestic production.

Their margin for maneuvering was set, basically, by inventories which were about a 45-day supply. But, inventories are about 120 days' supply of imports, and therefore the job is easier.

Senator GRAVEL. If the purpose of quotas is to raise prices, would not deregulation do the same thing? So that the price would rise to the international market level?

So why should we, as a matter of policy, establish quotas, unless we choose to protect ourselves from the capricious whim of dropping prices to create mischief in our economy? But that is another matter entirely.

The Congress seems to be following an inconsistent course. We do not want to deregulate since we do not want prices to rise, so we turn around to place quotas on imports so we can force the price to rise.

In both cases we get the Government coming into the marketplace without any appreciable gain. Why not just let them deregulate and stay out of the whole darn thing?

Mr. ADELMAN. Senator, you are right. You want to look at the purpose of any piece of legislation that is proposed. If you want to raise the prices for, say, the sake of conservation or any other reason, then reduction of imports is a good way to do it.

You will thereby be raising domestic prices above the international level. Now there may be some virtue in this, for purposes of conservation, but I think not—but I will not argue the matter.

If, however, you do not wish to do this, then quotas have only these two justifications. One, they would protect the domestic industry against fluctuations in price, whether intended or unintended. Both, in my opinion, are pretty likely because, as I have said, a cartel is basically an unstable mechanism. People who think we can count on a world of prices at the Persian Gulf of $7 or $11 or any figure—I think such people are deceiving themselves. There is no price that you can count on, even if the cartel does not act with malice aforethought, and, of course, they may.

So, when you place a quantitative restriction on oil imports and say, permit what would be demanded at current prices in the United States, you do not affect prices. You merely guarantee that there will not be the sudden, sharp shocks. Thereby you improve the investment climate.

There is another purpose for instituting the quota system. And that is that you can auction the quota tickets, and you can do it in such a way as to permit the exporting nations to compete behind each other's backs without their each knowing what the other is doing—bid for the tickets—and in this way not only bid up the value of tickets and bring some revenue into this country and reduce the economic burden, but also disrupt their own cartel understanding. The price of oil would be unaffected, consumers neither gaining nor losing; the Government would gain.

So you can get those two things out of quota, if you start out with the intention of not affecting the price thereby.

Senator GRAVEL. I will yield to my colleague.

Senator PACKWOOD. In your statement on page 2, you say: "Our capital markets are among the more efficient ones, and I see no difficulty in localizing the flow of savings." It is almost contrary to what the other witnesses have said so far about our system of taxation and the quantity of savings, either in the form of what we directly call savings or rolling corporate taxes.

You are convinced that we can capitalize our future needs through the present tax system and present saving system?

Mr. ADELMAN. Senator, I was speaking of the capital markets. I was not addressing the tax system at all.

Senator PACKWOOD. Do you see any need for any change in our method of taxation? We have been hearing these arguments about the European countries that levy taxes more heavily on consumption and less on producing facilities than the United States. Do you agree with this statement, and is it necessary that we copy them?

Mr. ADELMAN. Senator, Europe is a pretty diverse place, and some European countries do tax incomes more heavily than we do, and some tax it more lightly, and the results are pretty hard to appraise. The British in general tax income somewhat more heavily than we do. There are a number of so-called loopholes in the system which permit certain types of income to escape taxation. The system has not apparently worked very well for them.

Sweden is the one European country with an even higher standard of living than the United States. Their tax system is extremely egalitarian. It is arguable that their standard of living would be even higher if their tax system were less egalitarian.

My only point, however, is that there is a good deal more to look at than the tax system if we are concerned with a country's prosperity and its ability to mobilize capital.

Senator PACKWOOD. I am not sure I understand your answer. You do not accept the argument that, in general, with their consumption or value-added tax, Europe is levying a tax low on consumption and leaving more for investment and savings.

Mr. ADELMAN. I think that is true for European Common Market where the value-added tax has become an important source of revenue. It is not true of one member of that group, namely Great Britain, but I find that some are more or less egalitarian tax system bring a higher or lower level of capital formation, it is a pretty big logical jump, and I am not prepared to make.

Senator PACKWOOD. Thank you. No further questions.

Senator GRAVEL. Thank you very, very much, professor.

[The prepared statement of Mr. Adelman follows.]

TESTIMONY OF PROFESSOR M. A. ADELMAN, DEPARTMENT OF ECONOMICS AND ENERGY LABORATORY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

I am honored by the invitation of your Committee, and will try to answer the inquiries addressed to me.

I. What are the capital needs of the energy sector during the next decade?

I have made no estimates of the probable capital expenditures, which depend on energy demand, prices, and costs. There is no question that the spending will be extremely large, and will be a burden to the economy. For many years, the

energy industries were only about four percent of the national product but about twenty percent of total capital expenditures. Because of the explosive increase in oil prices which have led other prices up, and the desire for greater self-sufficiency, capital expenditures by the energy industries will probably be in the range twenty to forty percent. This means a large amount of capital not available for other sectors, such as housing, transportation, social services, manufacturing, et cetera. Interest rates will be bid up to where less profitable activities will be shut out of the market. Attempts to ration or allocate capital will not alleviate the burden, only add to it.

The continual upgrading of the likely prices of oil substitutes are a symptom of the upgrading of estimated capital expenditures by the fuels industries.

There is a perverse kind of silver lining, in that the electric power industry has cut back greatly on its expansion plans, both because of the slowdown in demand and because rate regulation is based on historical, not current, costs, and given the increase in capital requirements and also in interest rates, very little electric power construction is worth doing today. If this does not change, then capital spending estimates must be sharply downgraded, but of course it also means a shortage of electric power.

II. What are the present and projected capabilities of the private sector to meet those needs? Is there a need for government loan guarantees or special tax incentives?

The capital markets are among our more efficient ones, and I see no difficulty in mobilizing the flow of savings. In general, I see no need for government loan guarantees of special tax incentives. Some exceptions to this rule are discussed below.

III. Are the prospects for private capitalization of energy development adversely affected by potential changes in world oil prices?

The prospects for private capital expenditures for energy development are very adversely affected because world oil prices are unstable so long as they are set by the world oil cartel. I must dissent from forecasts of high prices, low prices, or current prices. A cartel is by its nature rigid and unstable, and a price acceptable to most members at one moment of time becomes inacceptable later. In the short run, the price could certainly be raised farther, even aside from inflation, and will be if the exporting nations think the higher revenues today worth the loss of business in the future. On the other hand, if significant competition breaks out among the members of the cartel, aggravated by small amounts of non-cartel capacity coming on stream, the price could fall to a fifth of its present value. The price may rise at some times and fall at others. Furthermore, the cartel may deliberately reduce prices for a limited time in order to kill or stop entirely investment in substitute energy sources.

Thus we are getting the worst of all possible worlds. We are paying very high prices, and yet potential investment is frightened off by the great risks of either conventional oil or new energy sources.

Paradoxically, the problem is more easily soluble for unconventional energy sources, because the decision involves much less money. The government should seek to negotiate with prospective operators of e.g. synthetic fuel plants whereby they receive e.g. a cost plus fixed fee for building and operating a given synthetic oil plant. Or we might write a turn-key contract with the builder, and agree with a refining company that they could have the new facilities at a negotiated price which they expect would give them an acceptable rate of return. Another variant: we could ask for bids by constructors and operators, who would be obligated to produce a certain amount of oil for which we would guarantee them a minimum return, with the understanding that if costs proved lower than expected they would earn a higher return.

There are many variations on this principle which is simple and important: knowledge of new methods must be bought, but it is not necessary to subsidize all fossil fuels in order to obtain experience of producing some new type.

IV. Is there a need for a minimum import price or some other device to protect high cost energy investments in the United States?

Unconventional energy investments have already been discussed in III above. High cost energy investments also need protection, but of a different kind. Neither a minimum oil import price nor a tariff are adequate and yet both may be far more expensive than necessary. They would be inadequate because the profits of the cartel nations are so enormous that they can absorb any tariff and undersell domestic oil, either deliberately or because the cartel cannot hold ranks. The only way to prevent this would be by raising the tariff or minimum by something ap-

proaching the per barrel profit of the Persian Gulf nations today, which would be an additional ten dollars per barrel.

A further objection is that we do not know how much domestic supply of crude oil or natural gas will be forthcoming at any given price. The continuing inflation in construction costs has aggravated the problem, but it would exist even with a stable general price level. We simply do not know, and do not appear about to know. The estimates made by the FEA Project Independence Report appear to be too low when compared with econometric studies of price-supply relations. They appear too high according to the judgmental forecasts of most oil companies. There is no way of reconciling this three-way disagreement, or of discrediting one or more of the estimates. Where honest, well-informed observors disagree so widely, it is folly to suppose that any estimate in current conditions of knowledge is at all reliable. Anyone who proposes national policy committing us to some definite price floor is living in a world of fantasy.

The only effective protection is a quantitative limit on imports. This should be the result of a calculation of the costs imposed on us by sudden curtailment of foreign supply, and of the cost of stockpiling. With this information, we could calculate how much a given amount of "insurance" was worth, and what kind of premium we were prepared to pay. In the absence of this kind of information, we can at least begin progress by limiting imports to approximately current levels. This is the approach of the Ways and Means Committee of the House of Representatives, and I think it is an excellent way to start, perhaps the only way. It protects domestic investors from any unplanned or malicious drop in the price of foreign oil, while not protecting them from any price reductions due to a breakthrough in technology or large discoveries of new oil and gas such as those on the North Slope of Alaska.

V. General comments on minimum oil import prices.

It is not clear to what "minimum oil import prices" the Department of State is trying to commit this country. One type would be maintenance of a minimum price in the United States, for domestically produced oil or imported oil, or both.

Another type of minimum oil price would be that embodied in a long-term supply agreement between importing and exporting nations, whereby the importing countries guaranteed a minimum price, while the exporting countries would promise unlimited amounts of oil at that price.

The Administration has been working toward this goal of a world-wide price fixing commodity agreement for several years. But since we are dealing with a cartel of sovereign states, it is literally impossible to negotiate because there is no way of enforcing the agreement. Unlike contracts in ordinary trade, the sovereign monopolist is constrained neither by competition nor by law. This seems to be obvious, and yet the experience of France shows how seductive is the idea of "dialogue", "cooperation", and "creating so dense a web of interdependent economic, political, social, and cultural relations that neither party will feel free to violate it." All that France got from this policy was the pleasure of paying above-market prices, and of feeling that somehow they were setting an example for the rest of the world. There is nothing peculiarly French, I fear, about their inability to see that when the Algerians repeatedly violated the agreement and finally expelled the French companies, this was no aberration but the normal result to be expected.

The second test of the proposition that there can be no agreement with a sovereign monopolist is to examine the recent history of suggested agreements with Saudi Arabia. One was proposed in October, 1972 whereby Saudi Arabia would get some kind of preferential access in return for a guaranteed price. Nothing much came of this, although the State Department said it was "enthusiastic" over the proposal. This was not surprising, since State had had at least as much to do with drafting the proposal as had the Saudis. What is more difficult is to understand the enthusiasm when the Tehran agreement of February, 1971 had already been violated more than once. In 1973, that agreement was formally destroyed, Sheik Yamani citing the doctrine of "changing circumstances" which had indeed been set out by an OPEC resolution in 1968. It is puzzling how anyone can read this resolution through and still believe that an agreement is possible. In December, 1973 government take, the real price floor in the Persian Gulf, was set at $7 per barrel for "equity" oil. Nothing was said about the twenty-five percent of the oil which was owned by the government; it was generally assumed that governments would sell it at the price set by the "equity" oil. But the government's share proved unexpectedy difficult to sell because in early 1974 demand for oil was unexpectedly weak. Accordingly, Saudi

Arabia initiated the practice of requiring the producing company to take its twenty-five percent of the oil, and at a considerably higher price. Thus the amount due to the government was raised from $7 to approximately $8 for the very reason that a weak demand inadvertently showed that the profit-maximizing price was higher than the current price. This particular incident shows not only how a bargain was unilaterally changed, but also how mistaken it is to suppose that weakness of demand will somehow lead to a decrease in price.

The next unilateral action came in mid-June when Saudi Arabia changed its participation from twenty-five to sixty percent, thus raising the average take to about $9.35 as of July 1. Any temptation to protest this unilateral action was forestalled by the repeated Saudi assurances that they really wanted lower prices, thus earning them repeated praise as being large-minded and statesmanlike, and by a promise to hold an auction in August whose effect could only have been to bring prices down and perhaps drastically. The auction was cancelled. In September, the displeasure of Mr. Kissinger was shown in his "tough" speech to the U.N. General Assembly, and President Ford's "tough" speech in Detroit. At this very time, however, the then Federal Energy Administrator John C. Sawhill when asked by the Senate Permanent Committee on Investigations for the Administration's plans to lower the price, answered that there was no plan at all for lowering prices. Mr. Kissinger's anger at this disclosure is well known, and Mr. Sawhill was soon out of a job. In October, and again in November, Mr. Kissinger visited Saudi Arabia, received assurances from King Faisal himself that Saudi Arabia would try to bring down world prices, and after each assurance there was a further increase in price, which by November was up about one dollar from its value on July 1.

October was also noteworthy because Sheik Yamani said his country would never reduce output to force up prices. Oil men at the meeting, to their credit be it said, immediately pointed out how meaningless this was: if sellers raised price, demand declines and they reduce output in response. But high-ranking U.S. officials did interpret the statement as being a pledge of no reduction in output, and in March stressed their dismay that the Saudis "had pulled the rug out from under them" by reducing output about a third.

This rather dreary recital of promises made and cherished and broken is necessary only because there is such a deep yearning for some kind of an agreement or settlement with the producing nations. This hope has permitted our country to tolerate and even help the increase in prices which is the original source of all the problems we are wrestling with.

I believe this Committee could make a great contribution by letting it be known that it will not tolerate any kind of long-term "agreement" on a floor price for oil. The general principle ought to be: what's bad for the cartel is good for the U.S.A., and vice versa. We should do nothing to help the cartel, and should look earnestly for ways whereby we can at least contain it, damage it, and possibly even destroy it. The House Ways and Means Committee appears to have approved a system of import quotas which if not weakened by too many special provisions and exemptions will help us by injecting some competition into the world oil market. The reasons for this expectation are stated in the Appendix to my testimony.

Senator GRAVEL. Our next witness is Mr. Fletcher L. Byrom, chairman of the board, Koppers.

STATEMENT OF FLETCHER L. BYROM, CHAIRMAN OF THE BOARD, KOPPERS CO., INC., PITTSBURGH, PA.

Mr. BYROM. I have submitted written testimony. If I may, rather than read it to you, I will briefly summarize it, and that might give us time to answer some questions.

I am chairman of the board and chief executive officer of the Koppers Co., which among other things is involved in the engineering and construction industry. We presently have capabilities for design, construction and start-up operations for coal gasification plants based upon known, commercially proved technologies, for what is referred to as medium Btu gas, or 300 Btu per cubic foot gas.

I do not intend to try to represent myself as an authority on all phases of energy or on the capital market. I think we do have some knowledge that will be a valuable input on coal gasification. I would like to put into perspective for you the fact that we are not really talking about a solution in its entirety to the energy crisis that we perceive on the basis of coal gasification alone. We do believe that the technology we have available today could make a very significant construction and startup operations for coal gasification plants based to 15 years, which we perceive to be a very significant crisis period.

Principally, what we are talking about is the potential replacement of natural gas which is now used in heavy industry. About a half to two-thirds of the total U.S. consumption of natural gas is used by industry. It is also used to produce ammonia fertilizers and methanol. It is also used to generate electric power. The rest of it, of course, is used for home heating, light industrial, and commercial applications.

We are not talking about a process that would necessarily replace pipeline quality gas. We are talking about a process that is perfectly feasible for heavy industrial use for the production of ammonia fertilizers, for the production of methanol and in a combined cycle process to produce electricity.

What we are talking about, again to put it into perspective, would be the energy-equivalent of possibly a million barrels of oil per day. In terms of capital funds to do this, the replacement would require about $8 billion for the coal gasification plants at present prices. This would require about 120 million tons of additional coal per year, and to put that in perspective, last year we mined about 600 million tons. It is estimated that it would take another $2.5 to $3.0 billion to open up the coal mines required, assuming that it was done with deep mines as well as strip mining.

Now, I would like to put out one other thing so that you will understand my testimony. Although the Koppers Co. as a construction company would obviously gain if coal gasification became an important process, it really is not all that crucial to us. I do not want to sound like an altruistic chief executive, but I am basically concerned with the energy problems of the country as I perceive them.

To put this in perspective, if we sold all the coal gasification plants that I could perceive under what I just told you, it might add about 50 cents a share to our earnings. Last year we made $8.16 so that the total potential per year from coal gasification is within the limits of predictability of our earnings. I am not all that uptight about it because of what it means to the company. I am very uptight about it in terms of what can be done, and I hate to see this country miss an opportunity to do something constructively toward a significant partial solution of its energy problems.

This is one of three processes available. Ours is one based on German World War II brown coal technology. We originally built a demonstration plant in 1950 out in Louisiana, Mo., where we used this process to make the gas which was used in the Fischer-Tropsch process to make liquid hydrocarbon and further upgrading it to produce gasoline.

Two years later in Finland, there was a commercial plant built to produce ammonia. The interesting thing about this process is that it can use any hydrocarbon available. It can use lignite; it can use

oil; it can use low-grade coal; it can use high-grade coal. It has been approved in terms of its environmental effects. It basically does not contribute to pollution, so you can use high-sulfur coal.

Since November of 1973, we have had all kinds of interest from essentially every kind of industry: heavy industry, potential fertilizer producers, and electric power utilities who are interested in combined cycle plants. We have performed paid feasibility studies; we have no orders. We have had all kinds of brides up to the altar. We have not gotten anybody married yet. We have a question as to why, and I think the answers are pretty clear to us.

Fundamentally, the problem is that this is a very high capital expenditure requirement, and the gas that we would produce is not cheap. Therefore, any major expenditure to build plants would be subject to economic impacts that basically are not predictable within the analysis that is available through the private system. We are talking about the use of coal gas, 300 Btu gas, for heavy industry. For example, if suddenly the value of the price of Midwestern oil would drop from $12, $14, $15 a barrel down to $6 a barrel, these industries would be caught with a very expensive plant and very expensive fuel, and they would just be in a mess. Everybody in heavy industry is afraid to go ahead with it on that basis.

In the case of ammonia, you have the problem of the potential production of ammonia fertilizers from the flared gas that is now being wasted in the Middle Eastern oilfields. I would be delighted to see low-cost fertilizers come to this country. On the other hand, I think that we have to recognize that we in industry just cannot predict what the price of ammonia will be on flared gas.

If you were assured that the price would be what it is today, the domestic gasification plants could be justified. If the price were to drop significantly, again, industry would be caught with a white elephant that could certainly mean disaster for their companies.

In the case of combined cycle plants, these would be ideally suitable for peak shaving by producing methanol from this gas that could be stored as a liquid. This would be just an ideal means for public utilities to be able to handle their peak periods, using gas turbines with the methanol as fuel, and steam heating plants using the exhaust gases from the turbine for their source of heat for steam generation. Again, if the fuel prices were to change significantly, these plants would be caught in a very bad situation. We have considerable support for our position and we offer to submit to your staff the supporting telegrams that we are receiving from some of our potential customers, saying yes, Mr. Byrom's position is the proper position.

We have a number of suggestions. One possibility is that there be a means by which a price subsidy could be established by the Government. That is to say, guaranteed minimum revenues which would provide for operation of the plant with an appropriate return on investment.

I would think that that would require a provision that if the subsidy became too great, the Government would have a right to buy itself out by taking over the plant at its depreciated value, possibly to hold it in standby against some later change in the oil cartel's attitude toward shipment or price.

All of the things that I am suggesting are possibilities where the various industries might require any one or all of them, but not neces-

sarily recommended for each case. I highly recommend accelerated amortization where it would be possible to write off the plant in 2 or 3 years. Further, possible use of an additional investment credit as an incentive by adding say 5 percent more investment credit, than the present law allows for these particular certified installations.

Senator Bentsen, I know, has talked about RFC type of financing for these kinds of projects. This is a possibility that we might look at.

Another suggestion that would be particularly useful, I think, for public utilities would be the possibility of permitting them to issue tax-free debentures, which might prove to be an interesting and very helpful basis for allowing the private system to be encouraged to invest in these kinds of facilities.

These are the kinds of recommendations that I submit to you. Possibly, you have some questions.

Senator GRAVEL. You made no mention of coal gasification plants' needs for water, yet many Western States are worried that there is not enough water for full-scale use of coal gasification.

How large a problem is the availability of water in your technology?

Mr. BYROM. It is a matter of some concern, we have felt, and we would be very happy to review this with any of the people on your staff who have concern in this connection. For what we are talking about, we do not think it is a problem.

Senator GRAVEL. What could be done to encourage the technology in your area with respect to imports, or what have you?

Mr. BYROM. We do not need encouragement for technology. We have a commercial process available. The problem is that the predictability of return on investment, the predictability of a viable investment within our profit system, is not there because of the things I mentioned.

But, I think this is the thing that is misunderstood: there is additional technology required only if you want to create pipeline-quality gas.

What we are saying is that there is a very major requirement in industries now using natural gas where our particular commercial process would be satisfactory. As an example, the steel industry presently consumes about 2 billion cubic feet a day of natural gas, which is equivalent to 2 trillion Btu a day. To replace this natural gas with medium-Btu gas—which is what we are talking about here—that is commercially feasible today would require about 167 four-headed gasifiers. It would require a capital investment of about $2½ to $3 billion.

New mines would be required to produce an additional 45 million tons of coal per year for the steel industry at a capital cost of about $1.125 billion.

So we are talking about something on the order of $4 billion to provide the steel industry with medium-Btu gas to replace the natural gas now being used. Of possible interest, this would be enough to heat about 3½ million homes in a climate such as Pennsylvania.

What we are concerned about is that in the early 1980's the natural gas is just not going to be available for home heating, for light commercial operations, and also for heavy industry. We are going to end up with a lot of plants being shut down because there is no energy available for them—or, we are going to end up with an awfully lot of people being awfully cold.

We do not think that it is necessary to allow that condition to occur. We think that we can move forward with coal gasification. But it has to be on the basis of an energy policy where the Government agrees, in effect, with the crisis position that I just pointed out.

Thus, if we can agree on the fact of an emerging crisis, then I think legislative steps are needed to provide protection to pioneering industries. There must be assurances against the disastrous damage that could come to the private sector if they put major amounts of their money into coal gasification, and then have the rug pulled out from under them by the means that I have mentioned. I think that it is a question of do you people—does the Government—do the various committees—does the Congress—believe what I believe?

Namely, that we are going to be in a real mess in the early 1980's, and if we are, then it is possible, by a forthright energy policy, to start right now.

We are ready to start moving tomorrow.

Senator GRAVEL. Thank you very much.

Senator Bentsen?

Senator BENTSEN. Do you have any figures to indicate the cost of gasified coal, at a Btu equivalent to oil?

Mr. BYROM. On today's costs, assuming $15 coal, it would take about $15 a barrel price of oil. This is not cheap.

Senator BENTSEN. I know it is not. That is why I was trying to get some numbers.

Mr. BYROM. This is very rough, and it would depend on the quality of coal, of course. But, just for a rough reference, $15 a barrel oil is equivalent, if you assume $15 a ton cost of coal.

Senator BENTSEN. How can you then justify building one of these plants, even if you were sure that the present price of oil from the Middle East remained constant?

Can you actually justify building one?

Mr. BYROM. This is assuming a reasonable return on investment. If you were to build it today, that $15 price makes it a viable investment.

If you were guaranteed that that was where the price was——

Senator BENTSEN. I understand. There is a serious problem there. In fact, I mentioned that earlier.

Mr. BYROM. I know your position, and I think from what I know of it, we are in agreement. One of the frightening things to me, this is a perfectly good process to make ammonia for fertilizer for agriculture. And at today's price of ammonia it is a viable kind of operation.

There are about 16 of these plants operating around the world. This is the commercial process. This is not some dream or something we think we can do. It is something we are prepared to do tomorrow, but have these obvious economic limitations. Of course ammonia is made from natural gas today.

And what we are all bothered about is what is going to happen when there is not enough natural gas to go around to do all the things we expect of it?

Senator BENTSEN. So am I. Reading through your statement, I was not sure who was lifting from whose speeches. I agreed with a great deal of it.

Senator GRAVEL. Thank you very much.

[The prepared statement of Mr. Byrom with attachment follows. Hearing continues on p. 113.]

TESTIMONY OF FLETCHER L. BYROM, CHAIRMAN OF THE BOARD OF KOPPERS COMPANY, INC., PITTSBURGH, PA.

My name is Fletcher L. Byrom. I am Chairman of the Board of Koppers Company, Inc., in Pittsburgh, Pennsylvania. Mr. Best has asked that I comment on the capital needs of the energy sector during the next decade. I appreciate the invitation to appear here today and in the brief time alloted will endeavor to respond to your request from the vantage point of a major corporation ready to make a substantial contribution to relieve our national energy shortage.

My company, among other things, is enaged in the engineering and construction field and we are presently capable of engineering, erecting and putting into operation plants which will gasify coal, forming a gas having a heating value of approximately 300 Btu per cubic foot. This medium Btu gas can be used as a synthesis gas to produce certain chemicals for which natural gas is now used, such as ammonia and methanol, and is suitable for consumption by industries requiring heat for their basic processes, or generation of electricity.

During the last three years we have been in touch with scores of companies in the heavy industrial class to acquaint them with our process and capabilities. While many have shown sincere and active interest in coal gasification, none has been willing to commit the large sums of capital required to substitute coal gasification for natural gas or other fossil fuels. Some, nevertheless, have commissioned us at considerable cost to them to prepare detailed feasibility studies based on our Koppers-Totzek process.

We, of course, have been most interested in their reasons for holding back. And I think these reasons are the nub of your interest. This is what they tell us: "Without exception, they have reservations because the nation lacks an over-all energy policy—in regard to both foreign and domestic sources. Without such a clearly stated and firm policy directed toward reducing our reliance on imported energy, and administered by a one-stop agency, no company can risk the large capital investments necessary to meet its needs and the energy needs of the nation."

The policy should afford industry the types of guarantees and incentives which will protect it against eventualities which are beyond industry's control and which cannot be defended against in normal business practices.

Government policy consideration must be given to the capital needs of industry which result from expenditures caused primarily by the national goal of reducing reliance on imported fuel. Special consideration, in view of their status as public utilities, should be given to electric power. The fact that a moderate winter in 1974 alleviated the problem should not be relied upon in the future. The likelihood is that there will be extensive peak load shortages and brownouts. And industrial users of natural gas, on interruptible contracts, have been seriously curtailed in the past. But this is only a sample of what can come in the future with its serious disruption of the economy and extensive loss of jobs.

Consideration should be given to the danger of a serious and capricious drop in the world price of oil directed at deterring our efforts at national self-sufficiency and at economic disruption in the consuming nations. Such action could bankrupt companies which make extensive investments in substitute domestic fuels and would surely dry up capital markets for committed companies, including newly opened and expanded coal mining operations.

Safeguards are necessary to defend against dumping in this country of low-priced fertilizer or other products derived from petroleum. While we at Koppers are in favor of unimpeded, reciprocal fair trade, we are mindful, as are companies with which we are in touch, of the disruption which could result if Middle Eastern producing countries should decide to build plants to use the natural gas whch they now flare, and sell the resulting products on the world market. While we naturally would welcome low-priced fertilizer for our agriculture as a boon to food production to meet our needs and those of an overpopulated world, we cannot as a nation leave unprotected those companies which invest extensively in the plants needed to contribute to our goal of energy self-sufficiency. Nor can we afford to expose American agriculture to the caprice of countries which could cut off its fertilizer supply once our own production has dwindled under foreign price pressure.

We, of course, are not unmindful of the many other aspects which must be covered in any comprehensive national energy policy. However, I am limiting my testimony for the present to those elements which impinge on the ability of industry to address itself to the serious and urgent need to build a substitute energy industry in the United States.

Obviously, each corporation and certainly utilities have different capital problems. It is impossible, therefore, to suggest one solution for all. But it is possible to suggest several approaches, each of which may apply to some companies but not necessarily to all. To do the entire job, therefore, a package of incentives is required. The following are some we have discussed with companies who have come to use for feasibility studies and which we agree are essential elements in support of a national energy policy:

1. There must be legislation along the lines of the World War II Certificate of Necessity for war-related projects to provide special tax incentives by granting to certified energy-related projects.

(a) Additional investment tax credits of as much as 5% over the existing credit,

(b) A fast write-off for tax depreciation purposes of as little as two to three years,

(c) The right to issue tax-free bonds.

At the same time, as I have repeatedly said, elsewhere, Congress must consider a complete revision of our general tax depreciation policy in order to give recognition to the replacement cost of capital assets in our inflationary economy.

2. Price equalization to permit new energy plants to continue to operate uneconomically if the imported price of oil should put new domestic plants at a competitive disadvantage. This would require a guaranteed government subsidy based on the Btu price equivalent of the output of new plants, including allowance for amortization and a fair and reasonable return on investment in the specific facility.

3. In addition, in lieu of price equalization, a form of government insurance against damages resulting from foreign energy pricing policies ranging from cash payments to a program of government buy-back of new plants. These plants could be held in standby for future need as the particular impact on an industrial plant or a utility as well as economic and national defense considerations may dictate.

Points #2 and #3 are suggested jointly as an alternative to proposals to establish a floor under imported prices of oil and liquefied natural gas (LNG) either by tax or tariff. We oppose floors on these products because this would deprive segments of the economy from benefitting from imports when available, and would deprive the consumer of the benefits of the lower prices.

4. It is well known that many oil producing exporting countries now flare the natural gas obtained in conjunction with crude oil production. To prevent dislocation from foreign producer decisions to convert this gas to ammonia, methanol or a wide variety of petrochemical products and sell them on the U.S. market at prices below the U.S. cost of production of these products, we recommend legislation to permit the imposition of countervailing duties to equalize prices.

All of these, we feel, are necessary elements of a national energy policy. But I would repeat that until all elements of such a policy are executed and administered by a single, one-stop agency, industry will not be able to respond expeditiously to any policy. Until this is done, our national economy and the employment of our work force will remain in serious jeopardy.

Our most basic national needs require that this be done now. For the welfare of our nation and of the world community depend on the earliest possible restoration of our energy integrity.

This day can be advanced when government policy recognizes that much natural gas now used by industry can be conserved for higher priority uses by substituting medium-Btu gas.

For example, the steel industry presently consumes about two billion cu. ft. per day of natural gas—equivalent to two trillion Btu per day. To replace this natural gas with medium-Btu industrial fuel gas would require about 167 gasifiers, requiring a capital investment of about $2.5 to $3.0 billion, exclusive of costs for opening new mines.

Some 134 thousand tons of coal per day, or about 45 million tons per year, would be required.

This approach to supplying industrial fuel gas would release sufficient natural gas to heat over 3.5 million average-size houses in a climate such as Pennsylvania's.

We are constantly amazed at the amount of time, effort and money being expended by the Federal Government to develop new technology for coal gasification. Three known processes are in successful operation throughout the world; the technology is here today, and we should move to construct these commercial-scale plants immediately.

The Koppers-Totzek process has been evaluated by an independent private laboratory under commission from the Environmental Protection Agency, and it has been approved as meeting environmental standards. There are some 16 plants using this process, either operating or under construction, throughout the world, indicating that it is a commercially feasible process. It is important to note that the process uses any type of coal or lignite. In view of this, we feel that we can contribute to easing the energy crunch by building gasification plants for those energy-consuming industries which have been using natural gas in significant quantities.

As you know, historically heavy industry such as electric power generation, steel, chemicals, non-ferrous metals, glass and ceramics have been using between one-half and two-thirds of the natural gas consumed in this country. The farms of this country rely heavily on the ammonia fertilizer produced from natural gas. The remainder of the natural gas is consumed by domestic heating, commercial and light industrial uses.

When heavy industry users had their natural gas supply interrupted, in most cases, they turned to fuel oil or liquefied petroleum gas (LPG) which has in turn required vastly expanded importation of foreign crude.

Industry needs this new source of domestic fuel immediately. It can be delivered by existing technology.

Therefore, with your permission, I am offering for the record as an appendix to this testimony a paper refuting the often-heard claim that economic, ecologically sound processes for coal gasification are not presently available.

I hope I have been able to outline the problems facing the nation in reaching a measure of energy self-sufficiency as industry sees them, and to suggest some remedies and needed actions. It is clear that solutions are beyond the control of industry. Therefore, it is a problem requiring government intervention now.

SUMMARY OF "COAL GASIFICATION: NEGLECTED RESPONSE TO AMERICA'S ENERGY NEEDS"

(Submitted by Koppers Co., Inc.)

If indeed a measure of energy self-sufficiency is part of the national goal, then immediate legislation permitting alternate fuel development would serve the dual purpose of getting coal gasification on stream, and enhancing the U.S. Governmnet's position in negotiating the lowest-price energy imports.

Industry is ready now to deliver commercial-sized, environmentally innocuous coal gasification plants which can use only coal feedstock regardless of sulfur content.

Currently in the United States there are utilities, manufacturing companies, chemical producers and metals manufacturers using critically short natural gas who are ready to build coal gasification plants. But industry will not commit capital funds to these plants—and to materially contribute to a solution of the nation's energy problem—for fear that political factors could drop the cost of oil to a point which would render gas from coal uncompetitive.

This is a factor beyond the control of industry. It is, therefore, a problem requiring government intervention.

Legislation should be provided in two broad areas:

1. *Stimulation of plant construction* through any one or a combination of the following incentives: low-interest loans; such tax incentives as investment credits and accelerated write-offs; or industrial development bonds.

2. *Energy cost equalization* to ensure that those who adopt coal gasification will not be placed at a future disadvantage with competitors if potentially cheaper energy sources should materialize. To prevent pioneers in adoption of a new domestic energy source from being unjustly penalized by such developments, the availability of subsidies to provide cost parity should be ensured.

The time for government action is now.

Coal Gasification: Neglected Response to America's Energy Needs Summary

President Ford has said that the nation needs a program of Federal incentives to ensure that we can produce the equivalent of one million barrels of synthetic fuels per day by 1985. To help accomplish this he called for 20 new synthetic fuel plants in the next decade.

Robert C. Seamans, Administrator of the Energy Research and Development Administration, says that the President's objective is attainable if the government will promulgate a plan including front-end price support and a purchase guarantee.

Industry must be convinced, moreover, Dr. Seamans asserts, that government not only is believable but that it can deliver.

With the United States sitting on one-half of the world's coal reserves, coal gasification clearly is the quickest route to fulfillment of the President's goal.

Industry is ready now to deliver commercial-sized environmentally innocuous coal gasification plants which can use only coal as feed stock regardless of sulfur content.

The generally-held assumption that commercial scale coal gasification for industry requires further technological development is without basis. Fourteen plants using just one of the commercially available processes (Koppers-Totzek) are now in operation in Europe, the Mid-East, Africa and India.

Currently in the United States there are utilities, manufacturing companies, chemical producers and metals manufacturers using critically short natural gas who are ready to build coal gasification plants.

At current and projected market prices of other energy forms these plants are economically viable.

But industry will not commit capital funds to these plants—and to materially contribute to a solution of the nation's energy problem—for fear that political factors could drop the cost of oil to a point which would render gas from coal uncompetitive.

This is a factor beyond the control of industry. It is, therefore, a problem requiring government intervention.

This intervention by government must assure that gas yielded from coal will not be significantly more costly to consumers than the energy generated by imported fuel or other sources.

If the President's goal is to be met this problem must be confronted by government now.

New plants can be brought on stream in three years. That's three years from the time government provides the assurance to permit industry to proceed.

These assurances must be an integral element in any rational energy policy. When, in Dr. Seaman's words, the government "delivers," industry will deliver the plants.

Particularly for the East and Northeast where shortages are greatest and, coincidentally, coal is readily available, the coal gasification solution will bring early relief without environmental sacrifice.

Introduction

Coal gasification is not a new technology. Prior to World War II it provided much of this nation's gas requirements for heating, cooking and industrial applications. After the war, however, gas producers who had served a major portion of the United States phased out as plentiful supplies of low-cost natural gas were distributed through a nationwide pipeline system.

However, while interest in coal gasification in the United States dwindled with the advent of plentiful cheap natural gas, Europe's interest in gasification grew because it was not similarly blessed. With its increased interest, Europe refined and improved the processes. Still later, even Europe shifted its principal interest from gasification of indigenous coal to cheaper, imported hydrocarbons.

Today, the situation has changed. The spiraling cost of petroleum energy in all its forms is fast erasing the price differentials between coal gas and other sources. Interfuel competition is becoming a thing of the past as all sources must be exploited if the United States is to have any hope of attaining a high level of energy independence by 1985.

U.S. production of natural gas has not kept pace with demand, even though 23 trillion cubic feet was produced in 1974. The federal Power Commission estimated that during the winter months of 1974–75, the 42 major U.S. interstate pipe-

lines would fall short of their contracted deliveries to industry by an average of 11 percent. This would be a 60 percent jump over the 1973–74 short fall figures.

When natural gas allocations must be reduced, most suppliers use a priority list favored by the FPC. Lowest-priority users are industrial customers with interruptible contracts and with boilers equipped to use alternative fuels (usually oil or liquefied petroleum gas). Next to be cut off are industrial users with non-interruptible contracts with boilers equipped to use alternative fuels. Next are the ammonia plants producing fertilizer. Then come commercial users. The highest priority goes to houses and other residential structures.

Grim as it is, this is only the beginning. Even under the most optimistic assumptions of National Petroleum Council studies, U.S. production will reach only 32 trillion cubic feet by 1985. Demand will have soared to 39 trillion cubic feet.

Thus, our "minicrisis" of this comparatively mild winter may be only the first of an annual more critical series as the gap between supply and demand continues to widen.

These increasing threats of natural gas shortages and the abundance of U.S. coal reserves [1] has led to a mounting interest in coal gasification. This is reflected in the U.S. government's current financing of some 20 pilot plant projects. It is estimated that any commercial processes stemming from these pilot projects may be as much as 15 years away and it is conceded that the experimental processes under test may not prove practical.

These developmental efforts seek processes for pipeline quality (1,000 Btu) gas. However, low and medium Btu technology, adequate to meet the gas needs of industry and utilities and thus free natural gas for pipeline uses, is not in the developmental stage. It is perfected and operating successfully and extensively in commercial plants abroad.

COAL GASIFICATION'S POTENTIAL APPLICATIONS

Industries and utilities consume 67 percent of the total natural gas used today, with the remaining 33 percent going to residences and commercial operations.

Coal gasification can make a significant immediate contribution in the combined industrial and utility markets which account for two-thirds of the Nation's gas demand.

The specific applications in which coal gas can be used instead of natural gas are:

As an industrial fuel for combustion in heating furnaces and for varied heat-treating processes.

As an energy source for electrical power generation.

As synthesis gas to be used as feedstock:

For ammonia, a major chemical that now consumes vast quantities of natural gas for the manufacture of fertilizers;

For methanol, another high-volume chemical product;

And for other hydrocarbon-based chemicals.

The steel, automotive, nonferrous metals, glass, rubber, cement, foundry, utility and chemical industries can use coal gas on a large scale. All of these industries can readily convert to a substitute gas. This will release large amounts of gas for light industrial, commercial and residential applications.

In terms of the overall U.S. energy interests, the mathematics of such conversions is extremely significant. One moderately small K–T gasifier, for example, could produce an energy equivalent sufficient to service about 20,000 average six-room homes in a climate such as Pittsburgh's. Thus, spread over a broad spectrum of industrial/utility applications, coal gasification technology could have an enormous impact upon the Nation's energy picture.

The advantages of coal gasification have not gone unnoticed by potential users of the technology. During the oil embargo, interest in the process ran particularly high. The Koppers Company in fact was called upon to do engineering studies, make plans, survey sites and do all preliminary groundwork for a number of prospective customers for K–T plants. With the lifting of the embargo, however, their interest plummeted because potential users of coal gasification:

Fear they will be put in a competitive disadvantage in going to such expense while others may continue to draw from regulated natural gas sources.

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[1] 488.9 trillion tons against normal present consumption of 613.6 million tons.

Must plan for the possibility that oil prices will be lowered in the future, again making gas from coal noncompetitive,

Are uncertain about U.S. policy on imports,

Must take into account the unclear future of environmental legislation and possible relaxation of air quality standards.

Energy users therefore continue to look to liquefied petroleum gas and petroleum for energy—ultimately meaning more imports and a worsening of our balance-of-payments problems. And the disparity between natural gas requirements and supply continues to widen.

DESCRIPTION OF K-T PROCESS

In the Koppers-Totzek process, pulverized coal, oxygen and steam are fed into a gasifier where they react in suspension at high temperatures.

The gasifier is a refractory-lined steel shell equipped with a stream jacket.

A two-headed gasifier can gasify more than 400 tons of coal per day. The coal, oxygen and steam are brought together in opposing burner heads spaced 180° apart. Four-headed gasifiers, capable of gasifying 850 tons of coal a day, employ burner heads 90° apart. With the use of multiple units, capacities and efficiencies can be greatly increased.

Within the gasifier, the operating pressure is slightly above atmospheric and the reaction temperature is 3,300–3,500° F. The coal is gasified almost completely and instantaneously, and organic contaminants are destroyed to trace quantities.

K–T can gasify all ranks of coal. High sulfur and ash present no problems. Actually, any carbonaceous material that can be dried and pulverized is a suitable feedstock.

The process is virtually pollution-free. At the prevailing operating temperatures, no tars, phenols or other condensable hydrocarbons are formed—only gaseous products. Sulfur in the coal is converted to hydrogen sulfide in the gasifier. The hydrogen sulfide is removed and converted to elemental sulfur through commercially proved processes. This contrasts sharply with the direct firing of coal in a boiler, where the sulfur in the coal is converted to sulfur dioxide, which is difficult to remove from stack gases.

Because the sulfur in coal presents absolutely no environmental problems in the use of the K–T process, the technology could be applied to tap the vast reserves of high-sulfur coal, such as Illinois No. 6, currently unsuitable for many applications under Environmental Protection Agency standards.

There are no solid waste problems associated with the K–T process. About 50 percent of the coal ash particles fuse and drop out as slag into a slag quench system below the gasifier. The remaining inert ash particles are carried out of the gasifier as a fly ash mingled with the unburned carbon and are removed downstream. Used as landfill, the slag is more inert than the ash associated with the original coil *in situ*.

The product obtained from K–T is a clean, desulfurized, medium-Btu gas having a heating value of about 300 Btu's per cubic foot (compared with 1,000 Btu's for natural gas).

This gas is becoming a more and more acceptable alternative to natural gas as energy costs continue to escalate. Some industrial consumers are now paying up to $2 per million Btu's for natural gas delivered to their plants. A moderately sized six-gasifier K–T facility to supply industrial fuel gas would produce the equivalent Btu value of 66 million cubic feet of natural gas per day at comparable costs (as calculated by the FPC Utility Financing Method). The construction cost of the facility itself would approximate $100 million.

CONCLUSIONS

Collectively, the roadblocks to the implementation of coal gasification projects are having a considerable negative effect on the nation's energy picture.

Clearly, coal gasification as a source of energy will remain dormant until a definitive, comprehensive, national energy policy emerges that recognizes the positive contribution coal gasification can provide to our nation's energy producing capabilities. This recognition must be solidly reinforced with a program to provide the direction and incentives that will stimulate coal gasification's adoption.

The U.S. government has proposed policies calling for tariffs on imported petroleum and taxes on domestic production. It seems appropriate that part of the large sums these policies would produce should be plowed back into

development of energy supplies from such commercially proved non-polluting sources as gasification of coal, an abundant national resource.

Government support could be provided in two areas:

Stimulation of plant construction through any one of a combination of the following incentives: low-interest loans, such tax incentives as investment credits, and accelerated write-offs.

Energy cost equalization to ensure that those who adopt coal gasification will not be placed at a future disadvantage with competitors if cheaper energy sources should materialize. For example, costs of imported hydrocarbons may go down as the result of unforeseeable changes in political or international economic forces. To prevent pioneers in adoption of a new domestic energy source from being unjustly penalized by such developments, the availability of subsidies to provide cost parity should be ensured.

Since at least three years of construction time is required to put a coal gasification plant on stream, time is a critical factor if the nation is to derive early benefits from this technology. Priorities should be established so that coal gasification projects can get under way quickly, with related planning to ensure availability of:

(a) Adequate engineering and construction capabilities;
(b) Components and systems such as compressors and oxygen plants; and
(c) Adequate supplies of coal feedstocks.

If indeed a measure of energy self-sufficiency is part of the national goal, then immediate legislation permitting alternate fuel development would serve the dual purpose of getting coal gasification on stream, and enhancing the U.S. Government's position in negotiating for lowest price energy imports.

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The time for government action is now.

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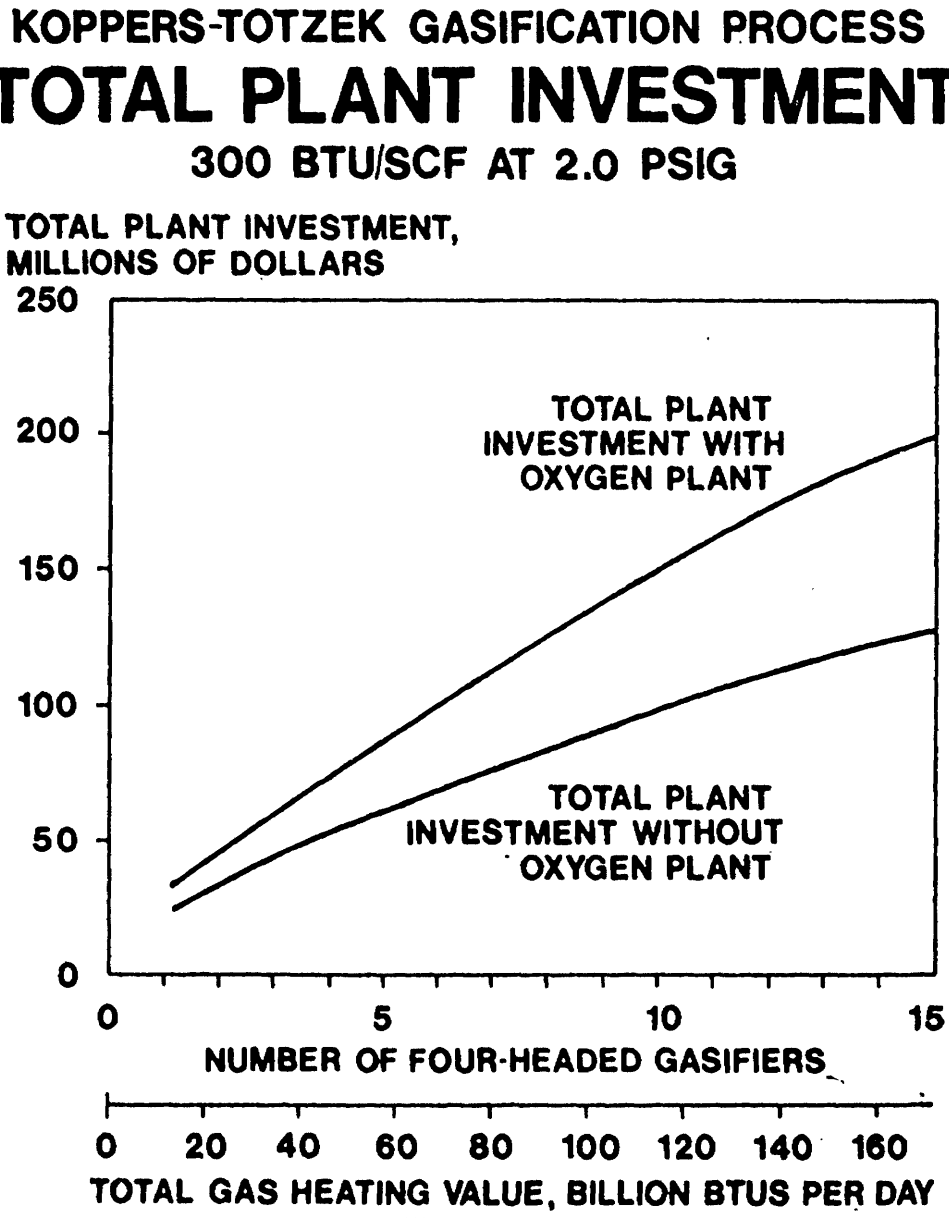
Economics of the K-T Process

Plant Investments and Gas Cost

The attached charts present plant investment and gas cost data for 300 Btu per standard cubic foot (SCF) gas produced from coal in the Koppers-Totzek

Process. Plant investment costs shown are based on mid-1974 price levels. Gas costs were calculated using the Utility Financing accounting method [1] proposed to the Federal Power Commission (FPC) by a ten member FPC appointed committee identified as "Synthetic Gas-Coal Task Force."

TOTAL PLANT INVESTMENT



(Figure 1)

[1] Reference: "Description of Gas Cost Calculation Methods Used by the Synthetic Gas-Coal Task Force at the FPC National Gas Survey", for presentation to: Federal Power Commission, Washington, D.C., June 12, 1972, by: H. M. Siegel, T. Kalina, and H. A. Marshall, Esso Research and Engineering Company.

This graph shows approximate capital costs for plants of various capacities to produce 300 Btu, clean, desulfurized utility gas or synthesis gas delivered at 2 psig. Capital costs are order of magnitude installed costs for grass roots battery limits plant to produce a desired quantity of 300 Btu gas, and do not include costs for land or off-site facilities.

The basis for this graph is outlined in Figure 2.

(Figure 2)

BASIS FOR CALCULATING TOTAL CAPITAL REQUIREMENT[1]

Total Plant Investment:	
All onsites plant sections	XXX
All utilities and offsites	XXX
(Including fresh water treating, cooling towers, power generation and distribution, steam generation, pollution control facilities, site preparation, offices, shops, control houses, etc.)	XXX
Contractor's overhead and profit	XXX
Engineering and design costs	XXX
Subtotal plant investment	XXX
Project contingency (15 percent subtotal plant investment)	XXX
Development contingency[2] (7 percent of subtotal plant investment)	XXX
Total plant investment	XXX
Interest during construction (interest rate times total plant investment times 1.875 years average period)	XXX
Startup costs (20 percent of total gross operating cost)[3]	XXX
Working capital (sum of: (a) raw materials inventory of 60 days at full rate, (b) materials and supplies at 0.9 percent of total plant investment, and (c) net receivables at 1/24 of annual gas revenue at $1.00/MMBtu)	XXX
Total capital requirement	XXX

[1] All items in parentheses refer to particular bases used by the Synthetic Gas-Coal Task Force.

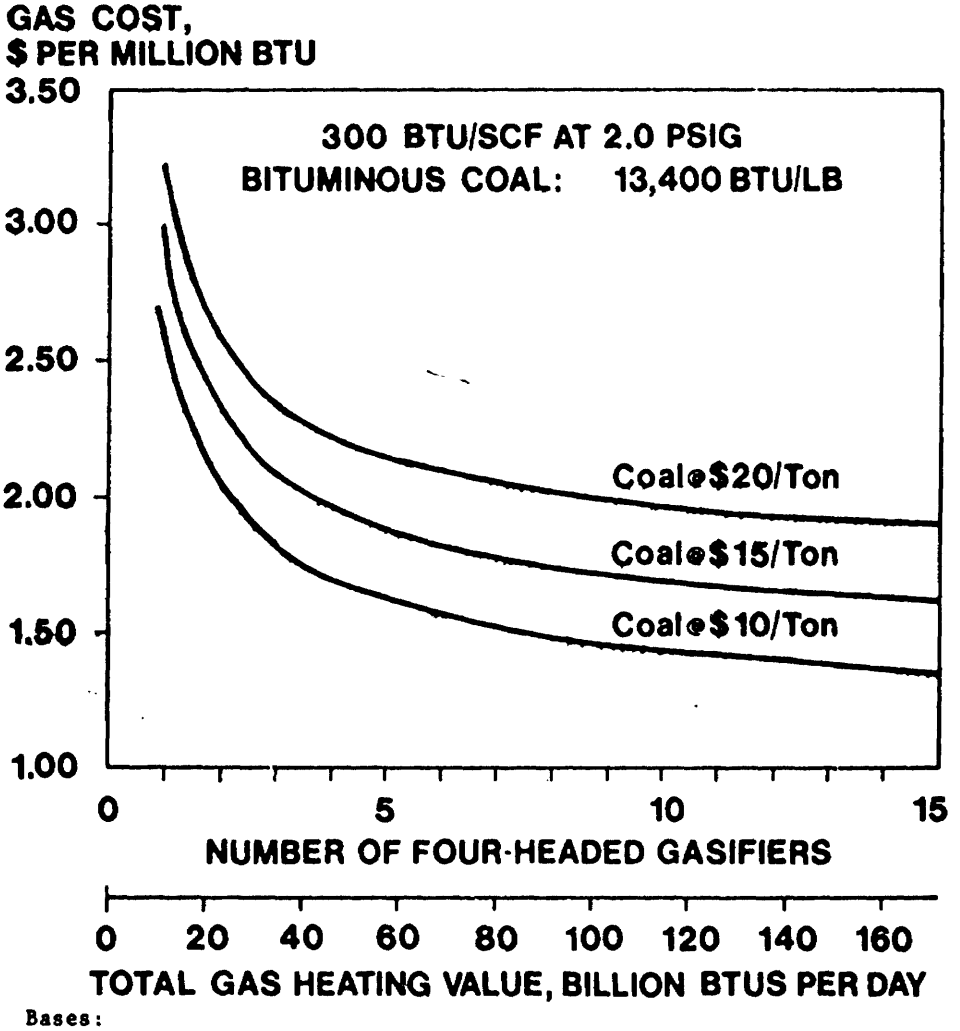
[2] Not required for processes already developed.

[3] Based on capitalization of 40 percent of the full-rate gross operating costs during a six-month startup period. (Assumes that 60 percent of the costs during the startup period are covered by revenue from gas deliveries.)

KOPPERS-TOTZEK GASIFICATION PROCESS

AVERAGE GAS COST

FPC UTILITY FINANCING



Bases:

1. Feedstock: Bituminous Coal
2. Plant Life: 20 Years
3. Depreciation: Straight Line
4. Capital Structure: 75% Debt, 25% Equity
5. Interest Rate on Debt: 9%
6. Rate of Return on Equity: 15%
7. Federal Income Tax Rate: 48%

AVERAGE GAS COST (FIGURE 8)

Order of magnitude costs for the 300 Btu gas are shown for various plant sizes and coal costs. To develop accurate capital and operating costs, each project requires a detailed study of individual conditions.

The graph reflects the effect of scale on gas costs. With small plants, gas costs will be comparatively high. With plants requiring more than about eight gasifiers, gas costs do not drop significantly with increase in capacity. Some savings are effected in areas such as coal handling and preparation and general

facilities with increase in plant size, but size limitations of available equipment necessitate multiple strings of equipment.

Yearly gas costs are shown in Figure 4. Figure 5 expresses the average gas cost equation.

(Figure 4)

Koppers-Totzek gasification process, yearly gas costs, FPC utility financing

[300 Btu/SCF at 2 psig Bituminous Coal: 13,400 Btu/lb]

Project year:	Gas cost, $/million Btus
1	2.18
2	2.14
3	2.10
4	2.07
5	2.03
6	2.00
7	1.96
8	1.92
9	1.89
10	1.85
11	1.81
12	1.78
13	1.74
14	1.71
15	1.67
16	1.63
17	1.60
18	1.56
19	1.53
20	1.49

Average 20-year gas cost=$1.83/MM Btus.
Plant size: 6 gasifiers.
Coal cost: $15/ton.

(Figure 5)

Average gas cost equation, utility financing method

Basis:

20-year project life.

5%/year straight line depreciation on Total Capital Requirement, excluding Working Capital.

48% Federal Income Tax Rate.

Definition of Terms:

*C=Total capital requirement, Million $
W=Working Capital, Million $
N=Total Net Operating Cost in First Year, Million $/year
G=Annual Gas Production, Trillion Btu/year
d=Fraction Debt
i=Interest on Debt, percent per year
r=Return on Equity, percent per year
p=Return on Rate Base, percent per year

Equation for Return on Rate Base:

$$p=(d)i+(1-d)r$$

General Gas Cost Equation:

Average gas cost,

$$\$/MM\ BTU=\frac{aN+0.05(C-W)+0.005\left[p+\frac{48}{52}(1-d)r\right](C+W)}{G}$$

Values of the Parameter a:

*See fig. 2.

Operating cost approach	Plant startup completion date	Value of a
Without escalation during project life	All years	1.0000
With escalation during project life	1975	1.3726
	1980 and beyond	1.3435

Reference: "Description of Gas Cost Calculation Methods Being Used By the Synthetic Gas-Coal Task Force of the FPC National Gas Survey", for presentation to: Federal Power Commission, Washington, D.C. June 12, 1972, By: H. M. Siegel, T. Kalina, H. A. Marshall, Esso Research & Engineering Co.

COSTS OF CHEMICAL PRODUCTS

Figures 6, 7 and 8 show estimated costs for producing ammonia, methanol and hydrogen via the K-T system. As indicated earlier, estimated costs are on a battery limits basis and all utilities are purchased. The biggest utility cost is power for synthesis gas compression, and in this report it is charged in at one cent per kilowatt. Power requirements could be reduced with the use of steam turbine drives, however, this would require low cost, low sulfur coal for in-plant coal fired steam generation. With high sulfur coal, one could use gasification to supply environmentally acceptable fuel gas to a steam generator. Each of these alternatives involves many variables and requires special considerations, therefore they are not included in this discussion.

Cost data are based on the following conditions:

Operating period	330 days per year.
Plant capacity:	
Ammonia	2100 tons per day; 693,000 tons per year.
Methanol	
Methanol	634.9 M gal per day; 209,525 M gal per year.
Hydrogen	100 x 10^6 SCFD.
Project life[1] (n)	20 years.
Taxes and insurance	3.5 percent of plant investment.
Interest[1] (i)	9 percent; 20 year average equals 6.0 percent.
Corporate charges	10 percent of plant level cost.
Gross return	20 percent of plant investment.
Federal income tax	48 percent of gross return.
Debt	100 percent.
Working capital	60 days inventory of raw material; net receivables 1/24 annual revenue; materials and supplies at 0.9 percent of plant investment.
Start-Up Costs	20 percent of total net operating cost.
Interest During Construction	1.875 years at 9 percent of plant investment.
Coal Cost for All Cases	$8.00 per ton.

[1] Based on capital recovery factor $= \frac{i\,(1+i)^n}{(1+i)^n-1}$.

FIGURE 6.—KOPPERS-TOTZEK COAL GASIFICATION, ESTIMATED ANHYDROUS AMMONIA COSTS—BASIS: 330 DAYS PER YEAR—PLANT CAPACITY: 2100 TONS PER DAY, 693,000 TONS PER YEAR

	Amount (millions)	Cost per ton NH_3	Percent cost per ton
Plant investment	$123,000		
Working capital	5,329		
Total investment	128,329	$185.00	
Direct operating costs:			
Raw materials, chemicals, catalysts, and utilities. Includes sulfur credit	19,578	28.25	27.7
Labor and supplies, operating and maintenance. Includes supervision and general overhead	4,518	6.52	6.4
Total direct costs	24,096	34.77	34.1
Indirect costs:			
Depreciation, taxes, insurance, and interest—Plant investment basis. Total indirect costs	17,835	25.73	25.2
Total cost plant level	41,931	60.50	59.3
Corporate charges, 10 percent plant level cost	4,193	6.05	5.9
Gross return, 20 percent of investment	24,600	35.50	34.8
Total yearly costs	70,724	102.05	100.0

Tons NH_3 per 330 days year	693,000
Selling price dollars per ton NH_3	102.05
Federal income tax (millions)	11,808
Net return (millions)	12,792
Net return:	
Percent of plant investment	10.4
Percent of sales	18.1
Basis:	
Years of project life	20
Federal income tax rate (percent)	48
Debt (percent)	100
Interest (20 yr average =6 percent)	9

Note: Not included in cost calculations are the following:

	Amount (in millions)
Startup costs	4,800
Interest during construction (1.875 yr at 9 percent)	20,756
Total	25,556

These costs, if included in plant investment, would add $5.35 per ton to the ammonia selling price.

FIGURE 7.—KOPPERS-TOTZEK COAL GASIFICATION, ESTIMATED COMMERCIAL METHANOL COSTS- BASIS 330 DAYS PER YEAR—PLANT CAPACITY: 2,100 TONS PER DAY-693,000 TONS PER YEAR, 209,525 MILLION GALLONS PER YEAR

	Amount (millions)	Cents per gallon	Percent cost per ton
Plant investment	$118,820		
Working capital	3,276		
Total investment	122,096	58.0	
Direct operating costs:			
Raw materials, chemicals, catalysts and utilities (includes sulfur credit)	15,166	7.2	23 5
Labor and supplies, operating and maintenance (includes supervision and general overhead	4,481	2.1	6.9
Total direct costs	19,647	9.3	30 4
Indirect costs:			
Depreciation, taxes, insurance and interest—Plant investment basis Total indirect costs	17,229	8 2	26.8
Total cost plant level	36,876	17 5	57 2
Corporate charges, 10 percent plant level cost	3,688	1 8	5 9
Gross return, 20 percent of investment	23,764	11 3	36.9
Total yearly costs	64,328	30 6	100 0

Million gallons per 330 days year	209,525
Selling price cents per gallon	30 6
Federal income tax (millions)	$11,407
Net return millions	$12,357
Net return:	
Percent of plant investment	10 4
Percent of sales	19 2
Basis:	
Years of project life	20
Federal income tax rate (percent)	48
Percent debt	100
Interest (20 yr. average equals 6 percent)	9

Note. Not included in cost calculations are the following.

	Amount (millions)
Startup costs	$3,900
Interest during construction (1.875 yrs at 9 percent)	20,000
Total	23,900

These costs, if included in plant investment, would add 1.6 cents per gallon to selling price of methanol

FIGURE 8.—KOPPERS-TOTZEK COAL GASIFICATION, ESTIMATED 96 PERCENT PURITY HYDROGEN COST, BASIS: 330 DAYS PER YEAR—PLANT CAPACITY: 100×10⁶ SCFD

	Amount (millions)	Dollar per MSCF	Cost per MSCF
Plant investment	$84,725		
Working capital	3,795		
Total investment	88,520	$2.570	
Direct operating costs:			
Raw materials, chemicals, catalysts and utilities. Includes sulfur credit	12,660	.384	$26.03
Labor and supplies, operating and maintenance. Includes supervision and general overhead	3,914	.119	8.07
Total direct costs	16,574	.503	34.10
Indirect costs.			
Depreciation, taxes, insurance and interest—Plant investment basis.			
Total indirect costs	12,285	.372	25.22
Total cost plant level	28,859	.875	59.32
Corporate charges, 10 percent plant level costs	2,886	.087	5.90
Gross return, 20 percent of investment	16,945	.513	34.78
Total yearly costs	48,690	1.475	100.00

MMSCF per 330 days year	33,000
Selling price dollars per MSCF	1.475
Federal income tax (millions)	$8,134
Net return (millions)	$8,815
Net return:	
Percent of plant investment	10.4
Percent of sales	18.0
Basis:	
Years of project life	20
Federal income tax rate (percent)	48
Percent debt	100
Interest (20 yr average equals 6 percent)	9

Note: Not included in cost calculations are the following:

	Amount (millions)
Startup costs	3,350
Interest during construction (1.875 yr at 9 percent)	14,297
Total	17,647

These costs, if included in plant investment, would add 8 cents per 1,000 cubic feet of the selling price of hydrogen.

On the basis of the included cost data, synthesis chemical products from coal will be costly in comparison to costs prevailing some months ago. It is highly unlikely that anhydrous ammonia will ever again be available at the July 1973 selling price of $60–65 per ton; nor will 14 cents per gallon methanol be available. In the past year prices of these chemicals doubled. In the July 1974 issue of Chemical Marketing Reporter ammonia was listed at $130–160 per ton and methanol at 27–30 cents per gallon. At these prices the coal gasification route is still competitive with capitalization of startup costs and interest during construction. Ammonia price becomes $107.40 per ton and methanol 32.2 cents per gallon. Hydrogen price becomes $1.56 per MSCF. With respect to hydrogen costs, recent information from hydrogen supplier indicates a projected price of $1.10/MSCF when natural gas cost is $1.50/MSCF. Costs are based on hydrogen quantity of 100 x 10^6 SCFD. The economics of supplying hydrogen at the estimated $1.48/MSCF via the coal gasification route is questionable at this time if natural gas is available at reasonable costs.

Significant reductions in the selling prices of the above chemicals are indicated, if the Federal Power Commission (FPC) formula is used. Methanol drops to 18 cents per gallon, hydrogen to 90 cents per MSC and ammonia to $62 per ton. Methanol and hydrogen could be considered as fuel and perhaps FPC would approve this approach on a utility enterprise basis. Ammonia would require special consideration since it does not fall into the fuel category.

In the final analysis the future selling price of these chemicals will be dependent upon the guidelines which could be established by the concerned regulatory bodies. These guidelines could include allocation of domestic natural gas for chemical feedstock and incentives to encourage importation of these chemicals from other countries where abundant supplies of natural gas are available at low cost. On the other hand, encouragement to build coal gasification plants for chemical feedstock could be in the form of an accelerated writeoff, tariff regulations restricting imports, and a guaranteed selling price during plant project life.

If one is realistic and bases a decision on reported information, then one must consider that in the immediate future domestic natural gas will not be available for chemical feedstock. In addition, imports will not be a practical solution at any time to the shortage problem because of political instability and imbalance of foreign exchanges.

We are all aware of the acute shortage in the United States of natural gas and in the past five years the demand has exceeded production. Further, this natural gas deficiency has been met from proven reserves. These reserves are now undesirably low and efforts will have to be made to bring production and demand in balance.

We believe that a major means now available to begin a reversal in the supply and demand problem is coal gasification. The K–T gasification process is a commercially proven one with 25 years operating experience in the production of synthesis gas from all ranks of coal or liquid feeds.

Environmental posture

Gasification of solid or liquid fuels by the commercially proven Koppers-Totzek Process offers an environmentally acceptable means of producing a 300 Btu per cubic foot synthesis gas which can be readily substituted for natural gas in industrial fuel applications. The gas is also an excellent base for the production of chemicals such as ammonia and methanol. It can be catalytically upgraded to a heating value of 960 Btu per cubic foot to provide a gas comparable to and interchangeable with natural gas. The Koppers-Totzek synthesis gas can also be converted to liquid hydrocarbons by use of the Fisher-Tropsch technology. In 1948, the U.S. Bureau of Mines selected the K–T Process to supply the synthesis gas for the Fisher-Tropsch unit at a coal-to-oil demonstration plant at Louisiana, Missouri. Results at Louisiana were successful and since 1952 Heinrich Koppers

GmbH (Essen, Germany) has engineered and installed 47 gasifiers in 16 different locations throughout Europe, Africa and Asia.

Environmentally objectionable gaseous matter from any plant includes particulate matter, sulfur compounds, carbon monoxide, hydrocarbons and oxides of nitrogen. Water contaminating substances include oil and such serious taste offending compounds as phenols and pyridines. Source regulations have been promulgated by Federal and State agencies which will permit the national ambient air standards to be met, in accordance with the Clean Air Act. The ultimate goal for water is zero discharge by 1985.

Koppers-Totzek Process is the first commercially proven gasification process to undergo a pollution evaluation study for the United States Environmental Protection Agency. Esso Research and Engineering Company, Linden, New Jersey, under contract to EPA, began the evaluation of the K–T Process in early 1973. The completed report, EPA–650/2–74–009a, titled "Evaluation of Pollution Control in Fossil Fuel Conversion Process, Gasification; Section 1: Koppers-Kotzek Process, January 1974", has been issued and is available upon request through the Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

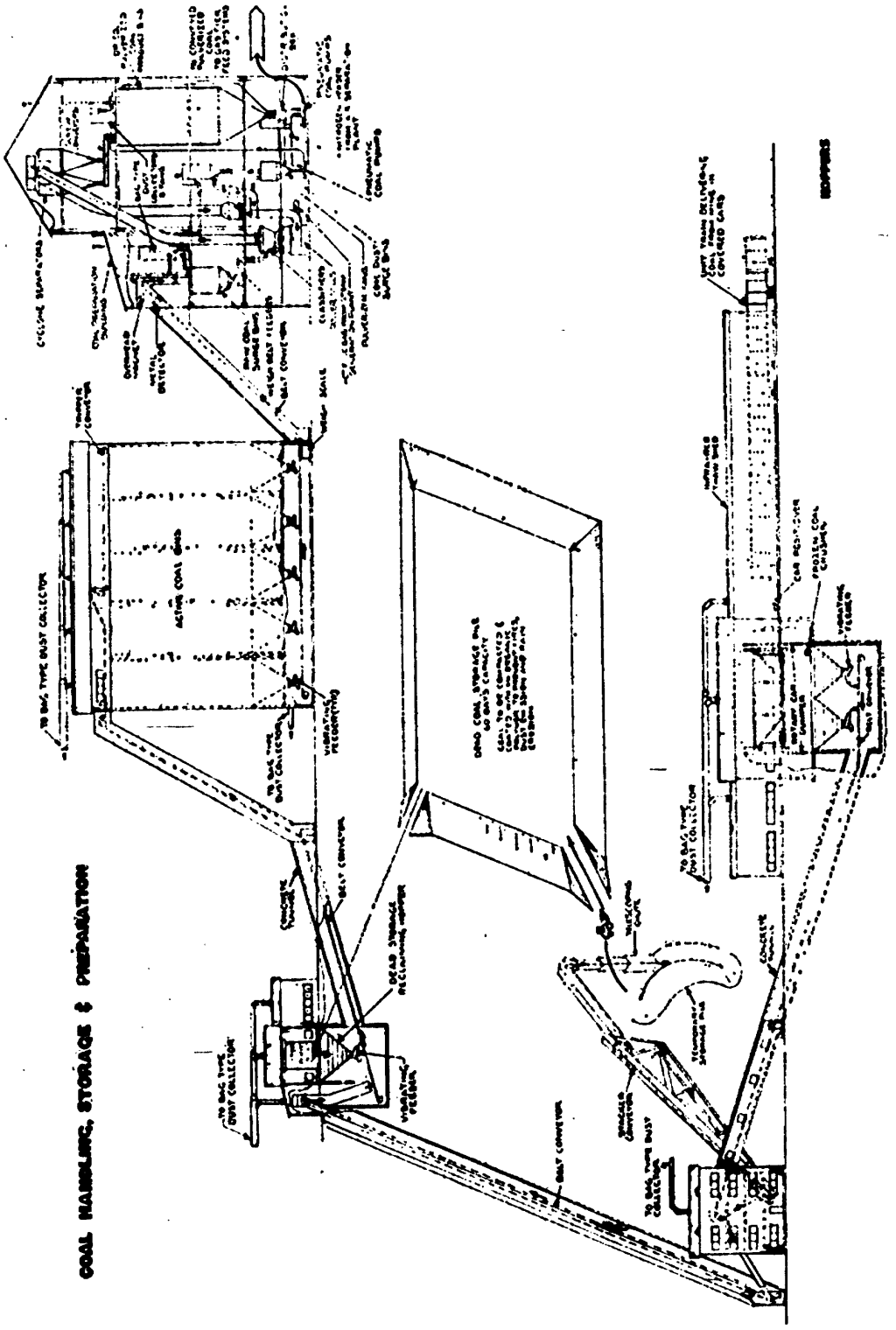
Of particular interest are the following excerpts taken from the report:

"This process can be used to make synthesis gas, reducing gas, or fuel gas, and was studied first for several reasons: (1) more complete information is available than on some other processes; this specific design does not include proprietary cleanup processes; and there are a number of commercial plants in operation; (2) it is a simple and relatively clean process in that it does not produce tar or phenols, (minor amounts of cyanide, ammonia, etc., are produced); (3) the process developer was cooperative in supplying requested information."

"Low Btu gas, such as that from the Koppers-Totzek gasifier, would be expected to give lower NO_x due to lower flame temperature." (Refers to comparison with natural gas and coal firing.)

Control of the environment in a fuel conversion facility depends to a great degree upon the controllability and simplicity of process operations. The 25-year K–T record of commercial operation shows a consistency in continuous production at 95 percent of the on-stream design figure. This reliance requires controllability. The "simple and clean process" yields slag and a synthesis gas composed primarily of carbon dioxide, carbon monoxide and hydrogen. The sulfur contained in the feed material is converted during gasification to hydrogen sulfide and carbonyl sulfide. The sulfur compounds can be removed to regulatory environmental limits from the gas with commercially proven processes and converted to elemental sulfur suitable for sale to the chemical industry. The slag as produced is granulated and, since it has passed through the molten state in the gasifier, contains little or no dust or leachable material. The slag will be suitable for road aggregate, landfill or for use in cinder blocks. The trace amounts of ammonia, cyanide, etc., in the raw gas are removed during gas cleaning and disposed by combination in the Claus sulfur unit. The clean gas can be burned in conventional power generating equipment and the combustion gases are acceptably low in NO_x.

Gasification plants require emergency supply of coal. To minimize air pollution due to coal dust, this coal supply, as shown in Figure 1, is placed in "dead storage", where the coal is held in a compacted and sealed pile. The outer surface of the pile is sprayed with an organic polymer crusting agent to prevent dusting or rain erosion. Crusting also prevents rainwater penetration of coal particles and thus water runoff contains little or no contaminants such as those found in mine waters. In addition, the coal pile is located on a waterproof base to prevent water seepage into the ground. Thus, all runoff water is contained and used in the process. Under this arrangement, the daily in-and-out requirements of coal due to coal dust, this coal supply, as showng in Figure 1, is placed in "dead storage" is taken only in an emergency when the normal supply of coal is interrupted.



Use of dust collecting and vacuum cleaning systems in the covered conveyor galleries and coal preparation areas result in a facility where dust emissions do not exceed EPA standards.

Simplicity, controllability and reliability of the K–T Process are important factors in the operation of a clean and environmentally acceptable gasification plant. As reported in the pollution evaluation report, K–T plants can be designed to meet current environmental codes. We in Koppers believe that these codes can be attained with current technology and equipment at economical costs.

Senator GRAVEL. Our next witness is the State senator from the State of California, William Greene, whom I had the pleasure to meet some time ago in my visits to California.

Senator Greene, it is a pleasure to have you here.

Senator BENTSEN. Mr. Chairman, I would like to join you in that welcome to Senator Greene, a friend of mine from California, who I know has a great interest and concern in the energy problem, and has, I think, some very interesting proposals that we want to have before this committee.

STATEMENT OF HON. WILLIAM GREENE, A SENATOR FROM THE STATE OF CALIFORNIA

Mr. GREENE. Thank you for the opportunity of being here to share with you the work that we are doing in the California Legislature relating to jobs, the economy, and the energy crisis that our Nation is facing.

For the purposes of the record, I am Senator Bill Greene. I represent the 29th district in Los Angeles.

The President of the United States stated that all possible approaches must be used to make us independent of imported oil by 1985. He asks us to drive less and drive slower. He has announced that he will impose a tax on all oil to reduce consumption. These are all measures of restraint.

Last year California felt the impact of the temporary shortage of gasoline on employment. Due to the geography of California and in light of our lack of public transportation, we are uniquely susceptible to the slightest disruption in our gasoline supply.

Despite these facts, California generates sufficient energy to efficiently power 10 percent of its automobiles every year, and throws it away. In fact, we pay millions of taxpayers' dollars to dispose of it.

This source of energy is waste. Waste, as you gentlemen obviously know, is one of only two regenerative sources of energy. The other is the sun. Obviously we must convert the various forms of waste into a readily usable liquid energy if we expect to be successful.

Liquid energy, based upon alcohol, is most promising. Alcohol can be readily made from any organic waste materials and it is a positive additive for automotive fuel. During the past several months the California Legislature has authorized my committee to supervise $1.1 million "Energy From Waste" research project. The work was done for the legislature by the EDICT Foundation, which is the Ecology Development, and Implementation Commitment Team, whose president is Scott Carpenter and is made up of some of the best minds in the space industry, including scientists, engineers, and technicians, organized into a nonprofit, tax-exempt corporation.

It is made up of such minds as Werner Genglebach who was an assistant to Dr. von Braun, Ellis Katz, and other persons who are employed by firms such as Lockheed, Rockwell, and the Aerospace Corp.

Our committee has supervised these intensive studies of alcohol-based synthetic fuels. These studies show that it is technologically, environmentally, and economically feasible to convert wastes to synthetic fuel on a production level equal to approximately 10 percent of the gasoline consumption level.

While the study was done for California, we are confident the same 10 percent figure would apply nationally. Local governments across the Nation are becoming increasingly aware of the value of wastes which, up until now, have posed an increasingly insurmountable disposal problem.

Every year, California alone produces approximately 25 million tons of waste which could be economically converted to fuel for our State, or for a national project for the Nation. This waste would provide more than 2 billion gallons of synthetic fuel for use as a gasoline supplement, or as a fuel for stationary powerplants.

Also, let me add, from waste you can also get methane gas which our scientific studies conclusively show to be an excellent and ideal partial substitute for natural gas. Of course, you can get ammonia or you can get a synthetic coal also.

The technology required to convert these waste products to a fuel supplement on a production level currently exists in various research centers around the Nation. We believe these pilot operations can be brought into production now with no real technical risk.

It has long been recognized that the conversion of wastes to alcohol, methanol, ethanol, et cetera, was feasible. It has been shown that modern automobiles can operate on alcohol-gasoline fuel formulas without engine modifications.

In the racing industry, for example, and in field tests of regular production autos depending upon the percentage of additives you use. If the plants are required to convert California waste products to gasoline supplements, it will provide up to 240,000 jobs throughout the economy at a time when the national unemployment rate is 9 percent and California's unemployment rate is 10 percent. These jobs, of course, are very important.

This would involve about 80,000 direct jobs and 160,000 indirect jobs. Additionally, after the plants are built, the new industries that are created will employ approximately 6,000 people directly, and up to 30,000 persons indirectly.

If the Federal Government were to adopt a plan similar to that contained in our California Legislature—and I have brought copies of that legislation and I have given them to your staff—it would create more than 2 million jobs over a 5-year period, and a new industry employing about 300,000 people.

It would reduce national gasoline consumption by 10 percent and relieve our dependency to some degree on imported oil. It would use a regenerative source of energy and slow the depletion of our natural energy resources.

It would reduce air pollution and solve the solid waste disposal problem. It would provide revenue to local government and create a taxable end product.

How much would this cost? About $20 billion—$5 billion less than it costs to put a man on the Moon. Where do we get $20 billion? We suggest the creation of a Federal Resource Recovery Financial Authority which would make low-cost loans to the States or local governments for use in the construction of these conversion plants.

Those loans would then be paid off by revenue derived from the sale of fuel produced from the waste. The only opposition to this effort that we have encountered in California has been from the oil industry.

They claim that methanol is bad for automobile engines and just will not work as an additive to gasoline. However, if you go down to a gasoline station, you can buy a can of gasoline antifreeze and you will find that it contains methanol.

I brought a can along with me, gentlemen. Shell Oil Co. sells this for $2.35 a can—a 12-ounce can. You can buy this in any gasoline station. So the oil industry is already doing it.

And, when you read the sales pitch on the can, you will note the following is credited to its product: "It cleanses the entire fuel system. It prevents frozen gas lines. It inhibits rust and corrosion. It insures quicker starts. It gives faster pickup. It prevents stalling. It removes moisture from the system." And it is effective, they state, in all gasoline systems.

Now the prices charged for these additives, which are recommended for every fill-up, is from $10 to $24 per gallon. Now this is a great oil company profit when you consider that it sells for 52 cents per gallon commercially.

Furthermore, this is methanol which in this case is made from natural gas, which is closest to the oil companies' interests, and of course, would be waste materials.

The research that is available from around the world indicates that America can now move on this vital issue with very little effort. The German Government has just announced funding to help Volkswagen prepare for a 15 percent methanol blend with gasoline by 1980.

ARCO has been adding 5 percent alcohol to arconol—arconol is nothing but gasoline and alcohol—here on the east coast for many years. The countries of South America use alcohol with their gasoline today. Japan, England, New Zealand, and Russia have all shown interest in this opportunity to extend their oil base fuel supply.

It is heartening that Americans should be moving ahead in this area as a leader and we urge your consideration and stand ready to assist in any way we can and share with you the knowledge that we have gathered on the subject to make our experts, our scientists and our engineers available to you.

Here in the Federal Government you have the power and the challenge in your hands, and you alone at the Federal level can move to give this option for waste disposal, jobs and a new energy source.

If you chose to make that move, it is our opinion that you will have met the challenge of positive answers, where others have offered only restraint.

Thank you very much, gentlemen.

Senator GRAVEL. Have you coupled your efforts in California with some economic studies?

Mr. GREENE. Yes; we have. Our economic work has been done, in the main, by the Security Pacific National Bank with whom we have

contracted. We have a running contract with them for other work that we are doing.

Our studies show that we recommend California moving into this area by floating general obligation and revenue bonds. After the paying off of those bonds, the economics of today are such that those local jurisdictions which build plants would gain something like up to $120 million in return revenue.

Senator GRAVEL. Revenues after they had financed them through a revenue bond process. There is a plant in operation in St. Louis. Is this the one which you are talking about?

Mr. GREENE. It is similar. It is quite similar except that it produces solid or gaseous fuel instead of liquid. There are several local jurisdictions, as I mentioned in my testimony, that are moving here. The St. Louis work is similar; the Memphis, Tenn. work is similar; the same type of work is going on in Maine; Nashville, Tenn.; Seattle; from which we drew most of our experience.

I had the pleasure of visiting a few. Our staff people and our scientists visited many of the localities in the Nation where they are moving in this direction. We drew most of our experience from the Seattle effort, because they have intentions of using the type process that we feel is most advantageous for California. That is, the pyrolysis process.

Senator GRAVEL. In operation?

Mr. GREENE. It is not in operation. They are at the building stage. Seattle, what their figure shows is where they have been running a $6 million deficit in terms of solid waste disposal that they are going to realize a revenue gain of something like $3 million annually.

Senator GRAVEL. $3 million, and they are going to sell alcohol? Is that it?

Mr. GREENE. Methanol.

Senator GRAVEL. They will sell it to the oil companies?

Mr. GREENE. In Seattle, they are going to convert their own wastes and then market the methanol. Some will be used in their city vehicles. The rest will be put on the market. They feel they could sell it at a profit at something like 35 cents a gallon.

Senator GRAVEL. Methanol? You just pump it right in the automobile the way you do normal gasoline?

Mr. GREENE. Yes, sir.

Senator GRAVEL. Do you get as good mileage from methanol?

Mr. GREENE. In our studies we have recommended to the legislature, and we recommend in our research work, a very conservative movement in this area. We did not recommend any more than 15 percent additive. You get these kind of figures with a 15 percent additive.

Senator GRAVEL. I am confused now. You say "additive"?

Mr. GREENE. An additive to the current formula for gasoline.

Senator GRAVEL. Diluting it?

Mr. GREENE. Yes. You get a 50 percent decrease in carbon dioxide, 30–35 percent in the oxides of nitrogen, for a well-tuned engine up to a 10 percent increase in mileage.

Senator GRAVEL. Very good. I think this is excellent testimony, Senator Greene.

Senator Bentsen?

Senator BENTSEN. Thank you very much, Senator Greene.

I think it is very helpful to us. Obviously there is a great future in solid waste conversion for energy purposes. I cannot help but remember that old line that everybody wants you to pick up the garbage but nobody wants you to put it down.

You have found a place to put it down and put it to work and make it effective. We have an EPA report of March 1975 that estimates that by 1980 a minimum of 200 million dry tons per year of waste will be readily available for energy recovery.

The total size of the waste stream would be over 1 billion dry tons a year. Now, to try to equate that to what they tell us would be the energy recovered from these wastes the equivalent British thermal unit value would be about 700,000 barrels of oil a day and that would be a very substantial reduction in our dependence on foreign oil, which we all want to try to move toward.

Let me ask you, from a technical standpoint, when you make these kinds of gains as you did in methanol, I am really intrigued and interested in this process. You say you recommended up to 15 percent? What happens if you start adding more than that? Apparently you begin to run into problems?

Mr. GREENE. Yes, sir, you do. It is not that you cannot use a larger percentage of blends, but you do run into other problems. You have problems with miscibility. You have problems of moisture. You have problems due to the materials with which engines, gasolines and what have you, are now made.

However, these are all fixable problems. It is just that the scientific research and the technology has not been organized to responded satisfactorily to these problems.

Senator BENTSEN. Is that what they are trying to do with Volkswagen?

Mr. GREENE. Yes, sir. There is no longer any debate anywhere in the scientific community, on the 15 percent additive. We sat down with the oil company researchers of Standard Oil and what have you, in California. They do not debate with us on this. They do not want to do it. They do not want to see it done. But they do not question our technological and scientific data on 15 percent.

Once we are off and rolling on this, we of course are going to contract to see that the research is done to see what happens when we go to 20 percent, 25 percent, and what have you.

Senator BENTSEN. You are really solving a couple of very serious problems with this, doing away with the problem of land fills and incinerators and still helping to meet the energy needs of this country.

I think this calls for very serious consideration. I was interested in the report about Seattle. Is that a municipal effort there? Or is it private enterprise?

Mr. GREENE. Theirs is going to be a municipal effort built by private enterprise. In California we think that it is great—I, personally, and my committee favor the private sector coming into this area. In fact, we hope to move the legislation through mandating a 5 percent additive initially to create the market to encourage the private sector to come into that.

We prefer that in California. We would be recommending that to our local jurisdictions and we think this is a brand new area for the

private sector; a new industry opening additional employment opportunities and solving several very serious problems at the same time.

Senator BENTSEN. Why is the price 35 cents compared to gasoline? I would think that this would be a more valuable product.

Mr. GREENE. I cannot give you that answer off the top of my head, because I have not committed the facts surrounding that to memory, as yet. However, my staff, is sending you all of the work that we have done. In fact, hopefully it arrived today and we have quite a bit, an extensive dissertation on that, so you and your staff will be able to have the information here and to look at it and examine it.

I am sorry I cannot answer that right off the top of my head.

Senator BENTSEN. Do you have any of these plants in operation in California?

Mr. GREENE. There are several small plants. In Santa Anna there are several small pyrolysis plants. Georgia Tech has several.

Senator BENTSEN. In operation?

Mr. GREENE. In operation actually producing. I have been there. I spent several days there.

Senator BENTSEN. These numbers are holding up?

Mr. GREENE. These numbers are holding up.

Senator BENTSEN. Thank you. I have no further questions.

Senator GRAVEL. I have no further questions.

We really appreciate your testimony, Senator Greene.

These hearings are now adjourned.

[Whereupon, at 12:10 p.m., the subcommittee adjourned, subject to the call of the Chair.]

APPENDIX

Communications Received by the Committee Expressing an Interest in These Hearings

STATEMENT OF DR. V. STEPHEN KRAJCOVIC-ILOK, CHAIRMAN AND PRESIDENT, ILOK POWDER COMPANY, INC.

SUMMARY

1. Ilok Powder Company has perfected *economically feasible technology* which reduces coal to ultrafine and submicron powders. This technology was pioneered by Dr. Hans Rohrbach in the 1940's and has been proven effective.

2. *Battelle Laboratories*, in an independent report to the Defense Department on August 15, 1974, said that "the Ilok method of coal preparation may revolutionize the energy structure of all industrial nations."

3. Ilok's coal reduction methods remove all *sulfur* from coal *before* burning, eliminating the need for utilities to invest billions of dollars in scrubbers.

4. Ilok's 4 micron coal is colloidal and capillary. By blending it with oil or natural gas it will *extend* the lifespan of our oil and gas reserves from the present 30 years to several hundred years. For as little as a $10 billion investment America can now become energy self-sufficient within the next five years.

5. America's coal—reduced to a 4 micron size—is a *fossil cell* and as such it is a *substitute for oil* on a one-to-three basis. This means that America's 2 trillion tons of coal can be economically converted to 6 trillion barrels of synthetic crude oil, enough to satisfy our energy requirements for hundreds of years.

6. All that remains to ensure our energy future free from OPEC pressures is for the Government and for the private industries and for the banks to commit sufficient resources to this revolutionary Ilok technology, which will give back to America—and this time for good—her rank as the world's leading oil producer.

STATEMENT

My name is Dr. V. Stephen Krajcovic-Ilok, Chairman and President of the Ilok Powder Company, Inc. It is with a sense of deep appreciation that I have accepted this second invitation of the Chairman of the Subcommittee on Energy to testify on matters relating particularly to the conservation of energy.

I first wish to reaffirm all the claims regarding the Ilok coal and powder technology that I made before this subcommittee on January 28, 1974. However, I also wish to say that Ilok technology is now able to remove from coal before burning not only the inorganic, but also the organic, sulfur during the reduction of raw coal to the 4 micron size. This makes a vast difference in the economy of energy, because it means that the basic problem of the estimated 17 million tons of sulfur dioxide emitted annually from coal-fired power plants has been solved and the battle over the scrubbers can end. The estimated cost of scrubbers is about $9 billion dollars. This money can now be invested by the hard-pressed utilities in the expansion of their electricity generating plants.

As to the updating of the capital and operating cost estimates cited in my testimony of last year, I would only state that as to the capital costs of construction of various types of Ilok plants, a general twenty percent (20%) increase be called for. Operating costs for running such plants would generally increase about forty percent (40%) due largely to the increases in the cost of coal and other raw materials. But these increases are insignificant when compared to the energy crunch that has intensified in the year and a half since I last testified before this subcommittee.

Since then America's economic troubles have been greatly aggravated. The hardships encountered by our industries, labor, and consumers are countless. They will continue to multiply until America finds a reliable home-grown source of energy.

ILOK TECHNOLOGY IS THE SOLUTION TO OUR ENERGY PROBLEMS

Ilok technology has the solution for providing America with a permanent, reliable source of energy, a solution, which will bring about a dynamic economy, high employment for all Americans, and a continued growth of our GNP without

a parallel growth in the use of energy resources. Ilok has the solution for the conservation of energy too.

The cornerstone for this dual capacity is Ilok coal powder technology.

How can I make, Mr. Chairman, this extraordinary claim? Simply, because, if applied, Ilok technology, in using the same amount of energy resources now used in America, will yield greater energy performance than was hitherto possible. This achievement will provide us with an additional amount of useable energy from the same resource.

Such additional amounts of energy performance from the same amounts of energy resources can then be used to increase our GNP. In short: The same limited amount of our energy resources will give us both:

1. The continued growth of our GNP; and, concurrently,
2. The conservation of energy.

Again, Mr. Chairman, allow me to offer a few concrete examples:

1. At the present time, U.S. Utilities, by burning coal, obtain from one ton of bituminous coal about 2,700 kWh. Yet, one ton of the Ilok 4 micron coal, burned in Diesels, yields 4,100 kWh. The same result would be obtained if the Ilok 4 micron coal would be burned in MHD systems.

2. The coal liquefaction processes currently financed by the Federal Government yield about 1.5 barrels of liquid coal and about 8,000 SCF of gas from each one ton of bituminous coal. Yet one ton of Ilok 4 micron coal, when liquefied, yields 4.5 barrels of liquid coal.

3. The coal gasification processes currently financed by the Federal Government yield generally only about 16,000 SCF of high BTU gas for each ton of coal. Yet one ton of 4 micron coal, reacted with hydrogen also produced from the same one ton of 4 micron coal, yields about 24,000 SCF of high BTU gas.

These are dramatic figures, Mr. Chairman. They must convince you that, although America has many potential energy options, only Ilok's solution is scientifically and economically satisfactory to America both as to (a) a reliable and permanent source of energy and to (b) a reliable method for the conservation of energy.

COAL IS AMERICA'S GREATEST ENERGY RESOURCE

Since America has very great reserves of coal and since Ilok technology is based on coal, this Nation must emphasize coal. There is no other safe option for, as Dr. Hans Bethe, the Nobel Laureate, said recently, I also wish to repeat that "wind power is for birds; tidal power is for the fish; and solar power makes sense chiefly in tropical places where the sun shines most regularly and where there is plenty of human labor to dust off the mirrors that focus the sun's rays in solar furnaces." This is not to say that these other energy sources should be dismissed lightly, but we must realize that their use is limited in pulling America out of its energy crunch.

It is not our dwindling supply of oil, Mr. Chairman, but our two trillion tons of coal which will be America's predominant and reliable source of energy for the next 400 to 700 years. Dr. Thomas V. Falkie, Director of the Interior Department's Bureau of Mines, declared in his recent speech in Houston, Texas, on April 9, 1975, that achieving a greater degree of national energy self-sufficiency will depend on a greater use of coal.

COAL AS THE SUBSTITUTE FOR OIL

Analysis of the Organization of Petroleum Exporting Countries in their attempt to provide a basis for determining the cost of crude oil advised early this year that the OPEC price for crude oil should be at the level of the cost of energy substitutes for Middle East oil. And the Shah of Iran stated that "right now we have almost arrived at an authentic oil price. And I say 'almost' because what really counts is *how much money it will cost to find an energy substitute for oil.*" The Shah of Iran also said that "if a substitute is found for oil, then the present deposits could last up to 300 years instead of being depleted in 30 to 50 years."

Mr. Chairman, *Ilok Powder Company has already found an authentic substitute for oil.* It is Ilok's 4 micron coal. Let me explain.

Most of us are familiar with the pyrolysis of coal, because it is used throughout America every day when coke is made from coal.

Now, when we pyrolyze 1 ton of coal, what do we get? We always obtain a variety of solid, liquid, and gaseous by-products. The chief end-product, however, of 1,500 pounds of coal is coke, coke breeze, and semi-coke. These results of the destructive distillation of coal are invariably obtained from all sizes of coal. But, once we pyrolyze 20 micron coal, we suddenly see a physical change in

that coal; its swelling is not as pronounced as we saw in the sizes of coal above the 20 micron sizes. Progressively smaller sizes show that:

1. At the 19-, 18-, and 17-u sizes, the swelling is not only less pronounced, but the coke, still obtained, is no longer as solid as earlier in that it shows a myriad of fine pores on its surface.

2. At the 12-, 10-, and 8-u size, the swelling of coal almost disappears and the yield of already torn up coke becomes insignificant.

However, 3. At the micron 4 size, there is *no swelling* nor *coke* nor *char* whatsoever. Only the *liquid* and *gaseous* end-products of the pyrolysis remain.

This is a startling phenomenon. What are we to make out of it? Nothing less than discovering that form of coal which is an authentic substitute for oil and gas. By having reduced conventional coal to 4 micron size, we have uncovered *primordial plant cells* as they existed before their coalification—which took place over centuries—and we have removed from these cells their very membranes. What we then have, are minute, cell-like particles, which we refer to as "fossil cells" that is, the very essence of coal, and even of oil itself.

CHARACTERISTICS OF THE SUBSTITUTE FOR OIL

This substitute for oil, which we have discovered, has the following properties:

1. It is dry and porous.
2. It is capillary and colloidal.
3. When blended with oil and gas, true colloids are obtained.
4. It burns in diesels, turbines, boilers or MHD systems without any residue.
5. When pyrolyzed, it yields only gaseous and liquid products—exactly what we get from Texas or Alaska oil well.
6. When shaped in pellets or briquettes, we have a new clean "coke" substitute for steel-making without the old coke's health hazards.
7. When used as powder or as granules, we have a filter for the removal of carcinogens from our drinking water.
8. When reacted with an additional quantity of hydrogen—also produced from the 4 u coal—the hydrocarbon content of the *fossil cell becomes equal to the crude oil*—and is therefore a perfect substitute for oil and gas.

This last property, Mr. Chairman, is not only Ilok's but also America's total response to the challenge created by the Organization of Petroleum Exporting Countries. The discovery of the "fossil cell" that the Ilok 4 micron coal technology represents only requires our imagination as to the implementation of this technological breakthrough that some experts call a second industrial revolution.

BATTELLE LABORATORIES PROPOSAL FOR AN IMMEDIATE USE OF 4 MICRON COAL

Under a contract with the Defense Department, Battelle Laboratories, in their Final Report of August 15, 1974, stated that if the Ilok technology would be meaningfully implemented, then "The energy supply situation of the United States could be significantly improved in a relatively short time with respect to fuel availability, economy and environment."

* * * * * * *

"The Ilok method of coal preparation may revolutionize the energy structure of all industrial nations."

Realizing the merit of the Ilok technology, Battelle Laboratories recognized that this country should go "colloidal", because on that basis in a relatively short time America would not have any energy crunch. What does Battelle mean? They mean that we ought to blend our limited quantities of oil and gas with the almost unlimited amounts of coal converted to Ilok 4 micron size. Battelle recommended this solution to our energy crunch irrespective of whether the Ilok technology would require 25, 100, or 250 kWh per each ton of coal to be reduced to 4 micron size, because in each case America would realize enormous savings in the cost of its fuels.

Since the removal of the energy shortages is so important to us, let me illustrate what the use of the 4 micron Ilok technology would mean, if our own Department of Defense would switch to Ilok colloidal fuels. Would the Department of Defense realize any savings in its fuel procurement bill? Would these savings be substantial ones? If so, how would this benefit all America if the entire country switched to Ilok colloidal fuels? Those questions must be asked when we try to conserve energy. Allow me, therefore, to reproduce the computerized results of the final report that Battelle Laboratories made for the Defense Department.

TABLE 2.—COLLOIDAL FUEL SAVINGS FOR 25 KHW/TON GRINDING ENERGY [1]

Cost of oil		Cost of coal (dollars per ton)	Coal/oil mixture (w/o)	Electrical energy cost (cents per kilowatt hour)	Colloidal fuel cost (dollars per million Btu)	Net colloidal fuel savings (dollars per million Btu)	Savings (million dollars per year)	
Dollars per barrel	Dollars per million Btu						Air Force jet fuel	Total DOD fuel
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5.00	0.806	10.00	30	2	0.849	None	None	None
				6	.856	None	None	None
			50	2	.817	None	None	None
				6	.827	None	None	None
		25.00	30	2	.948	None	None	None
				6	.954	None	None	None
			50	2	.965	None	None	None
				6	.974	None	None	None
		40.00	30	2	1.046	None	None	None
				6	1.052	None	None	None
			50	2	1.112	None	None	None
				6	1.122	None	None	None
10.00	1.613	10.00	30	2	1.521	0.092	55.2	121.9
				6	1.528	.085	51.0	112.6
			50	2	1.422	.191	114.6	253.0
				6	1.431	.182	109.2	241.1
		25.00	30	2	1.619	None	None	None
				6	1.626	None	None	None
			50	2	1.569	.044	26.4	58.3
				6	1.579	.034	20.4	45.0
		40.00	30	2	1.718	None	None	None
				6	1.724	None	None	None
			50	2	1.716	None	None	None
				6	1.726	None	None	None
15.00	2.419	10.00	30	2	2.193	.226	135.6	299.5
				6	2.199	.220	132.0	291.5
			50	2	2.026	.393	235.8	520.7
				6	2.036	.383	229.8	507.4
		25.00	30	2	2.291	.128	76.8	169.6
				6	2.298	.121	72.6	160.3
			50	2	2.173	.246	147.6	325.9
				6	2.183	.236	141.6	312.7
		40.00	30	2	2.389	.030	18.0	39.7
				6	2.396	.023	13.8	30.4
			50	2	2.321	.098	53.8	129.8
				6	2.331	.088	52.8	116.6

[1] Remark by ILOK: These are the only correct results because they are based on the Ilok/Rohrbach comminution law and actual performance data obtained for over 20 years.

TABLE 3.—COLLOIDAL FUEL SAVINGS FOR 100 KWH/TON GRINDING ENERGY[1]

Cost of oil		Cost of coal (dollars per ton)	Coal/oil mixture (w/o)	Electrical energy cost (cents per kilowatt hour)	Colloidal fuel cost (dollars per million Btu)	Net colloidal fuel savings (dollars per million Btu)	Savings (million dollars per year)	
Dollars per barrel	Dollars per million Btu						Air Force jet fuel	Total DOD fuel
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5.00	0.806	10.00	30	2	0.859	None	None	None
				6	.885	None	None	None
			50	2	.832	None	None	None
				6	.871	None	None	None
		25.00	30	2	.957	None	None	None
				6	.984	None	None	None
			50	2	.979	None	None	None
				6	1.019	None	None	None
		40.00	30	2	1.056	None	None	None
				6	1.082	None	None	None
			50	2	1.127	None	None	None
				6	1.166	None	None	None
10.00	1.613	10.00	30	2	1.531	0.082	49.2	108.6
				6	1.557	.056	33.6	74.2
			50	2	1.436	.177	106.2	234.5
				6	1.476	.137	82.2	181.5
		25.00	30	2	1.629	None	None	None
				6	1.655	None	None	None
			50	2	1.584	.029	17.4	38.4
				6	1.623	None	None	None
		40.00	30	2	1.727	None	None	None
				6	1.754	None	None	None
			50	2	1.731	None	None	None
				6	1.770	None	None	None
15.00	2.419	10.00	30	2	2.203	.216	123.6	286.2
				6	2.229	.190	114.0	251.7
			50	2	2.041	.378	226.8	500.8
				6	2.080	.339	203.4	449.1
		25.00	30	2	2.301	.118	70.8	156.3
				6	2.327	.092	55.2	121.9
			50	2	2.188	.231	138.6	306.0
				6	2.227	.192	115.2	254.4
		40.00	30	2	2.399	.020	12.0	26.5
				6	2.425	None	None	None
			50	2	2.336	.083	49.8	109.9
				6	2.375	.044	26.4	58.3

[1] Remark by ILOK: The above cost figures do not apply since they are contrary to the Ilok/Rohrbach comminution law.

TABLE 4.—COLLOIDAL FUEL SAVINGS FOR 250 KWH/TON GRINDING ENERGY[1]

Cost of oil		Cost of coal (dollars per ton)	Coal/oil mixture (w/o)	Electrical energy cost (cents per kilowatt hour)	Colloidal fuel cost (dollars per million Btu)	Net colloidal fuel savings (dollars per million Btu)	Savings (million dollars per year)	
Dollars per barrel	Dollars per million Btu						Air Force jet fuel	Total DOD fuel
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5.00	0.806	10.00	30	2	0.879	None	None	None
				6	.944	None	None	None
			50	2	.861	None	None	None
				6	.960	None	None	None
		25.00	30	2	.977	None	None	None
				6	1.042	None	None	None
			50	2	1.009	None	None	None
				6	1.107	None	None	None
		40.00	30	2	1.075	None	None	None
				6	1.141	None	None	None
			50	2	1.156	None	None	None
				6	1.254	None	None	None
10.00	1.613	10.00	30	2	1.550	0.063	37.8	83.5
				6	1.616	None	None	None
			50	2	1.465	.147	88.2	194.7
				6	1.564	.049	29.4	64.9
		25.00	30	2	1.649	None	None	None
				6	1.714	None	None	None
			50	2	1.613	None	None	None
				6	1.711	None	None	None
		40.00	30	2	1.747	None	None	None
				6	1.812	None	None	None
			50	2	1.761	None	None	None
				6	1.859	None	None	None
15.00	2.419	10.00	30	2	2.222	.197	118.2	261.0
				6	2.288	.131	78.6	173.5
			50	2	2.070	.349	209.4	462.4
				6	2.169	.250	150.0	331.2
		25.00	30	2	2.320	.099	59.4	131.1
				6	2.386	.033	19.8	43.7
			50	2	2.218	.201	120.6	266.3
				6	2.316	.103	61.8	136.4
		40.00	30	2	2.419	None	None	None
				6	2.484	None	None	None
			50	2	2.365	.054	32.4	71.5
				6	2.463	None	None	None

[1] Remark by ILOK: Energy input of 250 kWh per ton of coal is contrary to the Ilok/Rohrbach comminution law. In addition, a grinding input of 250 kWh would cause an evolution of heat well above 275° C rendering coal plastic, which would prevent its reduction to 4 micron size.

"The important results obtained from these tables are summarized as follows:

1. With fuel oil costs of only $5/barrel, there is no economic advantage in producing colloidal fuel. This is true for even the lowest grinding (25 kW), electricity cost, per kWh (2¢), and coal cost per ton ($10), with the higher coal to oil mix (50%). This may indicate the reason for the lack of interest in colloidal fuels until recently, when the cost of oil has skyrocketed from the $5/barrel range.

2. With fuel oil costs of $10/barrel, the savings with colloidal fuel is significant only at low coal costs ($10/ton) and the high percentage mix (50%). For instance, at 20 kWh/ton grinding energy, the fuel savings is about 19¢/MBTU with the coal cost at $10/ton and a 50% mix (either 2¢ or 6¢ electricity cost). At 250 kWh/ton grinding energy, the savings drops to about 15¢/MBTU for 6¢ electricity cost. These results indicate that at low grinding energy requirements the effect of electricity cost is quite significant. The best results indicate that for oil at $10/barrel, coal at $10/ton, with a 50% mix and electricity at about 2¢/kWh, the Air Force could save about $114.6 million per year while the Department of Defense could save about $253 million per year by using colloidal fuels. This represents a savings in fuel costs of about 12% for both the Air Force and Department of Defense. At the higher grinding energy requirement of 250 kWh/ton the Air Force savings would be about $88.2 million while the Department of Defense savings would be about $194.7 million. This represents a savings in fuel costs of about 9%

3. With fuel oil costs of $15/barrel, the savings with colloidal fuel is significant at almost all coal costs, electricity costs, and mix ratios. For instance, at 25 kWh/ton grinding energy, the fuel savings is about 40¢/MBTU with coal cost at $10/ton and a 50% mix (for either 2¢ or 6¢ electricity cost). At 250 kWh/ton

grinding energy, this savings becomes about 35¢ /MBTU for 2¢ electricity cost and about 25¢ /MBTU for electricity cost. Once again it is apparent that at low grinding energy levels the electricity cost is insignificant while at high grinding energy levels the electricity cost is quite significant. These optimum results at 20 kWh/ton grinding energy indicate *a savings for the Air Force of about $235 million per year and for the Department of Defense of about $520 million* (about 16%). At the higher grinding energy requirement of 250 kWh/ton, the Air Force savings would be about $210 million while the Department of Defense savings would be about $462 million (about 14%). The savings for both the Air Force and the Department of Defense for other commodity costs or mix ratios can be taken from the tables.

4. It has been noted that at the low grinding energy levels, the cost of electricity has little effect on colloidal fuel costs, while at the higher grinding energy levels the effect is significant. This also accounts for the fact that colloidal fuel costs are significantly lower at the low grinding energy levels than at the high grinding energy levels levels when electricity costs are high. In other words, with high electricity costs, the grinding energy levels must be maintained low, or using the same reasoning, with high grinding energy levels the electricity cost must be kept low.

5. Although not shown on Tables 2, 3, and 4, a coal-to-oil mixture of 70% was also evaluated. This is believed to be an improbably high value, but was evaluated because Dr. Krajcovic-Ilok used this value in the economic analysis of his colloidal fuel plant. The complete list of results at this mixture can be obtained by utilizing the computer program output. However, the results at the optimum economic and production condition will be presented here to show the phenomenal savings possible if this mixture ratio could be obtained. At the 25 kWh/ton grinding energy level, with the cost of oil at $15/barrel and the cost of coal at $10/ton, the *Air Force savings would amount to about $317 million* per year while the *Department of Defense savings would be about $700 million* per year (over 20% savings).

In summary, it appears from this preliminary economic analysis, that:

1. Colloidal fuels are economically attractive only with high oil costs (above $10/barrel) and reasonably low coal costs ($25/ton range or below).

2. With high electricity costs (=0¢/kWh), the coal grinding energy must be maintained at low levels for minimum colloidal fuel costs.

3. With high coal grinding energy requirements, the electricity costs must be kept at low levels for minimum colloidal fuel costs.

4. Based on median selected values for commodity costs, grinding energy requirements, and coal-to-oil mixture ratios, it appears the Air Force could save about $100 million to $200 million per year by using colloidal fuels in place of jet fuel. Likewise, using the same median values, the Department of Defense could save about $200 million to $400 million per year. These values represent fuel cost savings of about 10–20% exclusive of additional capital costs and supplementary costs which may be incurred in a changeover to this alternative fuel."

COMMENTS ON THE BATTELLE REPORT

Battelle's computerized tabulations for the valid 25 kWh/ton, the non-applicable 100 kWh/ton, and even for the completely impossible 250 kWh/ton grinding energy, are of great interest because they all prove that, *irrespective of the cost for the grinding of coal to 4 micron size*, not only energy shortages can be alleviated promptly, but also sizeable cost savings in our national fuel bill can be obtained.

Such savings will increase even more if diesel oil, fuel oil, and gasoline, and not crude oil, are blended with the Ilok coal powders; such fuels sell at wholesale for much higher prices than the crude oil used by Battelle in its computerized tabulations.

But why did Battelle use three different grinding energies for the reduction of one ton of coal to 4 micron size, if, as its own Battelle report clearly stated, "*all the available comminution theories, based on simplified assumptions, cannot necessarily be invoked as an absolute counterproof for the Ilok values*" (that is, the 25 kWh/ton of grinding energy)?

Battelle was wisely comparing the actual Ilok grinding performance data with the technologically impossible data advanced by some so called experts, whose 250 kWh/ton energy input would only cause the coal to be ground to enter its plastic stage so that no one could ever grind it to the 4 micron size because of the evolution of heat within the reductor mill well above 275 degrees centigrade.

Yet, Battelle used this technologically impossible energy input of 250 kWh/ton, based on the inapplicable von Rittinger Law, to just prove that even in that hypothetical case, Ilok technology would still result in impressive fuel savings in addition to helping alleviate our energy shortages.

ILOK—ROHRBACH COMMINUTION LAW

To end all doubts about the Ilok comminution data, an independent review by government and private scientists has recently been made of the various established energy grinding laws, including the Ilok data. This was necessary, Mr. Chairman, because the independent review states:

"The questionable law of von Rittinger is often used as basis for prediction of the required expenditure of energy 'below the 74 micron level'—leading to the forming of high cost estimates that seemingly make coal energy conversion unattractive. Such estimates have not been validated and in the absence of experimental evidence to corroborate the use of Model von Rittinger, there is a very real danger of making wild unsubstantiated projections. At the least, one ought to compare available reported data with the theoretical prediction so as to examine this model in a realistic application. Thus far, only one company has come forth with a process that not only experimentally, but practically, gives evidence that the laws of comminution need re-examination."

Upon the conclusion of their re-examination of various comminution laws and their comparison with the actual Ilok data, the report states:

"Again it is to be realized that these *Ilok data points are based on repeated tests and are reproducible*," and "from a manufacturing standpoint, furthermore, it would take the Ilok process only one hour to reduce the quantity of one ton of nut coal to the end-product of 4 micron size—a most promising feature."

COMPARISON OF RITTINGER'S LAW WITH ILOK DATA

Grinding step	Unit size relative	Achieved actual (microns)	Model 1 step n	Requirements cumulative	Fitted (kilowatt-hours)	Ilok data (kilowatt-hours)
0	1	1,024				
1	½	512	E_1	E_1	1.067	
2	¼	256	$2E_1$	$3E_1$	3.201	
3	⅛	128	$4E_1$	$7E_1$	7.469	
		74	$5.84E_1$	$12.84E_1$	13.70	13.70
4	1/16	64	$8E_1$	$15E_1$	16.005	
5	1/32	32	$16E_1$	$31E_1$	33.077	
		[1] 20	$20.2E_1$	$51.20E_1$	54.630	17.68
6	1/64	16	$32E_1$	$63E_1$	67.221	
7	1/128	8	$64E_1$	$127E_1$	135.509	
8	1/256	4	$128E_1$	$257E_1$	274.219	19.58

[1] Actually, this size is somewhere between 15 and 20 microns, although the model 1 energy was computed at the higher size.

The review of the communition laws goes to state:

"Battelle infers that the von Rittinger Law predicts that the 4 micron size would be achieved by an expenditure of about 250 kWh, according to present technology, if possible, rather than the figure 24.58 kWh shown in the above table. It will now be shown that such ballpark assessment (250 kWh) can be reached only by assuming an original feed particle size of 1024 (or 1000) microns rather than the *nut feed* size actually used. In view of this, it would appear that the *Ilok figures are that much more impressive*." (Emphasis added)

Therefore, as a result of the actual test data and experimentation covering a period of more than twenty years, the independent mathematical review confirmed the Ilok-Rohrbach comminution law, which I have discovered. It reads as follows:

"Consumption of energy decreases in geometric proportion to the decreasing

particle size (or, alternatively to the increasing surface area of the material ground). This decreasing proportion is determined by the square root of the ratio of the resulting and previous particle size."

The new law which appears to describe the energy consumed in the Ilok process is:

$$E_n = 2E_i(1-(x_n/x_o)^{1/2})$$

where

E_n=amount of energy required to reduce particle size to size x_n,

and

x_o=initial feed size.

I cite the above formula primarily for the benefit of our scientific community, but also because this new law will help America to end its dependency on the Middle Eastern oil.

BLUEPRINT FOR ENERGY SELF-SUFFICIENCY OF THE UNITED STATES

The tabulated results of the Battelle computer printout for the range of the 25 kWh/ton grinding energy, additionally confirmed by the independent scientific review of comminution laws, are critically important for making America energy self-sufficient in a relatively short time. It can now be shown that:

	Barrels of oil
1. One Ilok plant blending daily 11,500 tons of 4 micron coal with 100,000 barrels oil produces Ilok colloidal oil of	150,706
Savings from foreign imports daily	50,706
2. 20 Ilok plants would therefore reduce imports daily of	1,015,920
3. 100 Ilok plants would reduce imports daily of	5,079,000

To reach the objective of America's energy self-sufficiency, Ilok Powder Company would require:

1. 365 million long tons of coal yearly for reduction to 4 micron size;
2. A long term and low interest government loan of at least $10 billion; and
3. A dedicated cooperation of Government energy experts.

Since the formulation of colloidal fuels preserves all the energy inherent in coal and oil, it also provides a workable and feasible model for the conservation of energy, as opposed to the coal gasification and liquefaction processes currently under development—processes that do not conserve, but waste, energy. This is why the Battelle report states that:

"The ILOK method of coal preparation may revolutionize the energy structure of all industrial nations."

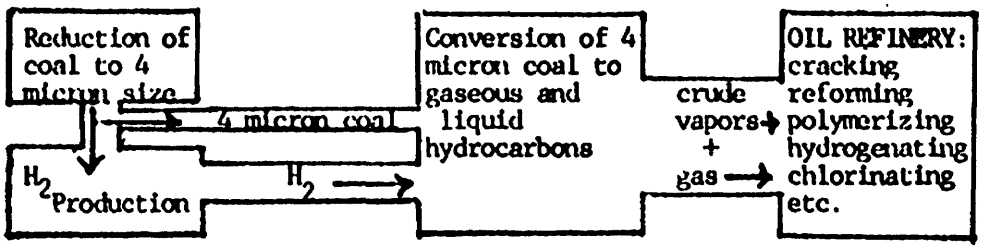
AMERICA AS THE FIRST AMONG THE OIL PRODUCING NATIONS

Ilok colloidal fuels recommended by the Battelle Laboratories to improve the energy supply situation of the United States in the shortest possible time, are, luckily, only one side of the coin called "the 4 micron coal technology".

The other side is even more intriguing: using 4 micron coal as a substitute for oil, instead of remaining an energy-dependent, oil-consuming nation, *America can now reclaim its rank as the world's leading exporter of energy* and can again become the leader of the oil producing nations.

By using the 4 micron coal technology as a substitute for oil, America will surpass any of the present oil producing nations, not only with respect to the quantity of oil that she can produce each year, but also with respect to the element of time. At the present rate, the last drop of oil shall be consumed within the next 30 to 50 years, as the Shah of Iran estimates. America's oil production, however, based on the Ilok's fossil cell technological breakthrough, will still be here

for many hundreds of years to come. This is simple to accomplish as is the graphic representation, which shows it:



Since the above was already carried out in practice, it must be done again. Even if this same thing would appear to some as impossible, then, Mr. Chairman, America must do it. There simply is not a second choice.

CONCLUSION

If Ilok Powder Company, as was demonstrated, can open for America as many "new oil wells" and as many new oil refineries—as the Nation may need, then, Mr. Chairman, it must be true that the Ilok coal powder technology that can achieve these objectives, must become the cornerstone on which to build America's energy future.

At the present time the world proven reserves of crude oil amount to only 546 billions of barrels. Because Ilok technology can convert an average ton of coal to at least 3 barrels of crude oil, then the 2 trillion tons of America's coal reserves can be economically converted to 6 trillion barrels of crude oil.*

In the long run, Ilok technology will terminate America's dependency on the Middle Eastern oil. And the energy shortages that, from the global standpoint, have been so divisive, will henceforth become a force for unity among all nations under the renewed and unassailable leadership of America.

Mr. Chairman, I thank you again for the opportunity you have given me to present my views to your Subcommittee on Energy.

THE UNIVERSITY OF GEORGIA,
COLLEGE OF BUSINESS ADMINISTRATION,
April 30, 1975.

MICHAEL STERN,
Staff Director, Senate Committee on Finance, Dirksen Senate Office Building, Washington, D.C.

DEAR MR. STERN: Please include the enclosed statement in The Subcommittee on Financial Markets and Subcommittee on Energy Joint Hearings on the Capability of U.S. Financial Markets to Capitalize Energy Projects Required for the United States to Move Toward Energy Independence.

The proposal is merely an outline of what would be required to achieve energy self sufficiency but it is based on an analysis of the American and World Petroleum industry which is at variance with the views of many economists who have testified before the Committee on Finance in recent years.

My point of view is expressed in four separate papers which have been recently published, are forthcoming, or are under review. These were not written for congressmen or the lay audience but reprints are available upon request for the interested reader. They include:

*If it is a fact that America has only 237 billion tons of recoverable coal, the 6 trillion barrels of synthetic crude oil reserves should be revised to read *711 barrels* of synthetic crude oil, which is still more than the present proven world reserves of crude oil of 546 billion barrels. In the same way, Germany's 316 billion tons of coal can be converted to *948 billion barrels* of synthetic crude oil, while England's 188 billion tons of coal represents *564 billion barrels* of crude oil—enough to insure the durability of economical and political institutions of Europe for centuries to come.

"A Theory of Exchange, Philanthropy, and Appropriation," *Public Choice* (forthcoming, Fall, 1975).

"A Positive Theory of Trade and Compensation" *Southern Economic Journal* (April, 1974).

"Toward An Economic Model Of The World Petroleum Market" (in the review process).

"Cartel Rivalry and the World Price of Oil" (in the review process, revised, and resubmitted).

In commenting on the last article a highly competent (but anonymous) viewer for the *Southern Economic Journal* has stated:

"I believe that the author is dealing with an important topic. As you know, it is a topic of some personal professional concern to me. It is also an important topic with regard to public policy planning. I also think that the attempt to use international trade theory, together with a division of factors such as he employs could be a useful avenue of attack upon the problem. Moreover, the author has a point of view on cartel stability which is at variance with the conventional wisdom. All these factors make a revised version of the article worth further consideration."

Indeed my point of view is at variance with the conventional wisdom and perhaps the Congress will find this point of view useful.

Thus, even though the enclosed proposal is abbreviated it is based upon a rather extensive study of the oil industry and an even more extensive background in economic theory and analysis. I hope that the Congress can develop a program which will achieve energy self sufficiency without also developing an administrative nightmare.

Thank you.

Sincerely,

ALBERT L. DANIELSON, *Associate Professor.*

Enclosure.

A PROPOSAL TO ACHIEVE ENERGY SELF-SUFFICIENCY THROUGH A SLIDING SCALE TARIFF, BY ALBERT L. DANIELSON, UNIVERSITY OF GEORGIA

The energy crisis emphasizes the emerging paradigm crisis in economics by accenting its deficiencies: one branch of economics emphasizes the monetary and fiscal policies a nation should adopt to achieve specified ends; another stresses optimal policies for individuals and firms to maximize satisfaction in consumption or profits in production; but in both the economic system is one in which force and collusion are ruled out by a legal authority which establishes rules to prevent coercion and preserve competition.

The energy crisis is essentially a struggle for power; and power within the modern context means control of monetary wealth. The member countries of OPEC seek a greater monetary return for their oil. This fact has been publicized and is well known. What has not been publicized and is not well known is that prior to the takeover by OPEC domestic American and multi-national corporations had received large monetary returns using essentially the same tactics as OPEC. The means of achieving these returns has been the same, namely, restricting output to maintain price above a competitive level.

This is not a moral evaluation of the current situation. When individuals combine to limit production it is neither good nor evil from a scientific point of view; it is merely an empirical fact. When OPEC wrests control of production from the multi-national corporations it is neither good nor evil from a scientific point of view; again it is simply an empirical fact. But if one's life is materially affected by the outcome it becomes more than an empirical fact. It becomes a problem or a political issue.

One problem being considered by this committee concerns programs which will hasten the development of domestic energy resources. A tariff, import quota, and a minimum import price have been proposed to encourage capital formation and protect domestic investment. This issue and proposals related to it undoubtedly involves some of the most important issues of this decade.

Our experience with the oil import control program during 1959–73 should discourage the use of an import quota. The agricultural price support programs and recent experience with price controls should forewarn of impending problems if a guaranteed minimum crude-oil price is established. The major defi-

ciencies of quota and price support programs are their inflexibility and their tendency to spawn bureaucracy.

What is needed at present is a program that can be passed by the Congress and that will make the United States nearly self sufficient in energy production within about ten years. Furthermore the program should be flexible enough to allow domestic prices to rise enough to provide capital for resource development, but to fall when adequate energy supplies are forthcoming. It should be stable enough to ensure investors a fair return on prudent investments and to minimize the risk premiums on investments.

Such a program would require: (1) a minimum change in the functions of agencies regulating the production of crude oil and natural gas; (2) the prospect of reasonably stable or moderately increasing energy prices; (3) a *gradual* increase in the use of domestic energy resources; (4) a *gradual* decline in the use of foreign energy resources; and (5) the use of the price mechanism to allocate resources.

A tariff program can be devised which will satisfy these basic requirements and thus lead to energy self sufficiency. The crucial element is to make the tariff on crude oil dependent on the price of crude oil and its rate of increase. A general formula for the tariff proposal could be:

(1) $T_{t+1}=B_0+B_1\rho_t+B_2\rho_t$

Or in the discrete form equation (1) can be written

(2) $T_{t+1}=B_0+B_1\rho_t+B_2(\rho_t-\rho_{t-1})$,

where T is the tariff per barrel of crude oil and ρ is the domestic price. The B_i values (B_0, B_1, and B_2) could be established by Congress or by an administrative agency subject to Congressional review. These would become critical parameters whereas the prices and levels of output associated with them would fluctuate. The B_i values could be subject to periodic changes to ensure progress toward self sufficiency.

The only general requirements would be the signs of B_i, namely:

$B_0<0$

$B_1<0$ (higher domestic prices result in a lower tariff)

$B_2<0$ (a rapid rate of increase in domestic prices results in a lower tariff)

such a program would encourage domestic production and simultaneously discourage withholding proved reserves to unduly raised prices.

As an example suppose the initial price is \$5.25/bbl. and the import tariff \$3.00/bbl. Foreign crude could be laid down on the U.S. east coast for as little as \$1/bbl. and oil shale could be developed for about \$7/bbl. This means that the tariff need not exceed \$6/bbl. (in constant dollars) and that \$7/bbl. is a fairly reasonable target self-sufficiency price. A program could be initiated to enact (at most) a \$6/bbl. tariff over, let us say, seven time periods, as shown in Table 1. Then using the values $B_0=\$12$, $B_1=-1$, and $B_2=-2$, any further increase in domestic prices would reduce the tariff by \$.03 for every \$.01 increase in price. On the other hand, if domestic prices were to decline from \$7.00/bbl. the tariff would rise by \$0.03 for every \$.01 decline in price until it became prohibitive.

The target self sufficiency, price, tariff, and B_i values are only suggestive. However, the proposal could be adopted to achieve almost any price or level of domestic output while providing stability and equity for producers and consumers and avoiding the morass of direct regulation.

In addition the formula could be extended to include the world oil price and thus encourage OPEC and the multi-national corporations to price their oil lower than they might otherwise be inclined.

TABLE 1.—SCHEDULE OF DOMESTIC CRUDE OIL PRICES AND TARIFF RATES ASSUMING RISING (DECLINING) DOMESTIC PRICES

Period (t)	Domestic price of crude oil (p)	Monthly change in domestic price (p_t)	Import tariff per barrel (T_{t+1})
0	$5.25	.....	$3.00
1	5.50	$0.25	3.50
2	5.75	.25	4.00
3	6.00	.25	4.50
4	6.25	.25	5.00
5	6.50	.25	5.50
6	6.75	.25	6.00
7	7.00	.25	6.00
Example of rising domestic prices:			
8	7.00	.25	5.50
9	7.50	.25	4.75
10	7.75	.25	4.00
11	8.00	.25	3.25
12	8.25	.25	2.50
13	8.50	.25	1.75
14	8.75	.25	1.00
15	9.00	.25	.25
16	9.083	.083	0
Example of declining domestic prices:			
8	7.00	−.25	6.50
9	6.75	−.25	7.25
10	6.50	−.25	8.00
11	6.25	−.25	8.75
12	6.00	−.25	9.50
13	5.75	−.25	10.25
14	5.50	−.25	11.00
15	5.25	−.25	11.75

TESTIMONY OF BARRY COMMONER, DIRECTOR, CENTER FOR THE BIOLOGY OF NATURAL SYSTEMS, WASHINGTON UNIVERSITY, ST. LOUIS,[1] AND CHAIRMAN, BOARD OF DIRECTORS, SCIENTISTS' INSTITUTE FOR PUBLIC INFORMATION

Project Independence was created because of the threat, dramatized a year ago by the Arab oil embargo, that the United States would not have enough energy to meet its future needs. The importance of avoiding an energy shortage is self-evident. Even the short-lived embargo had serious economic consequences: the auto industry has gone into a sharp decline, with thousands out of work: the price of gasoline and other essential fuels has risen sharply, placing a heavy burden on wage earners and householders, especially the poor; the increased price of fuel and energy-dependent products such as fertilizer has made life equally difficult for farmers, and will lead to increased food prices.

There is good reason, then, to be concerned about the continued availability of the vast amounts of energy required to run our society. A national energy policy is urgently needed. It will succeed only if it is a *rational* policy, that takes into account the basic facts about how the different ways of producing and using energy affect its continued availability.

[1] The data reported here were prepared by a Center project under the direction of Ali Shams, with the assistance of Sharon Carter, Vivian Goldman, and Susan Tubbesing.

First, we need to recognize that energy is itself of no real value; value is created only when energy is converted into an economic or social good: a warm home, the movement of freight or passengers, the conversion of ore into metal; the fashioning of metal into useful objects. Second, we should be clear that energy is never created out of nothing; rather, what we do is to transform energy that is available in nature into more useful forms.

There are, therefore, two basic requirements for the production of energy in useful forms: (a) a natural source of energy such as fuel and (b) the machinery needed to transform the original energy into a useful form—for example, a furnace that converts energy latent in the molecules of coal or oil into heat, or a power plant that converts some of the nuclear matter of uranium atoms into energy. The problem, then, is to make sure that we have both the fuel and the machinery required to yield the needed energy.

There are a variety of natural energy sources: oil and gas, coal, uranium and other nuclear fuels, geothermal energy and solar energy (which includes hydroelectric power, since the water that falls from a dam is lifted, to begin with, by the sun). Two main factors determine the usefulness of these energy sources: (a) their availability over a period of time; (b) the environmental impact of obtaining and using them, which in turn can significantly reduce the economic and social value, that is, after all, the purpose of using energy.

Viewed against these criteria, there is a sharp distinction between solar energy and all other energy sources. First, only solar energy is renewable; all other fuels, whether fossil or nuclear, are limited in amount and are simply exhausted as energy is released from them and used. Second, only solar energy is essentially free of environmental impact; all other fuels despoil the land as they are extracted and pollute the environment with either chemical or radioactive contaminants as they are used. In contrast, the acquisition of solar energy involves only the transfer of energy, absorbed from sunlight, from one place on the earth's surface to another. This is a process that occurs naturally, with considerably daily and seasonal variation, in the form of weather. The capture of enough solar energy to supply all U.S. needs would cause perturbations that would be small enough, relative to the natural fluctuations of the weather, to have no noticeable environmental effect.

Apart from their intrinsic properties, the different sources of energy also have a strong influence on the kind of machinery, and the requisite capital investment, needed to release the energy. In particular, the *availability* of the energy source affects the amount of needed capital investment. Usually we think of availability in terms of how long our fuel supplies are likely to last at the present (or hopefully, some reduced) rate of use: 25–50 years for oil and gas; 400–500 years for coal; 25–50 years for present uranium ores (which might be extended to 500 years or so if the nuclear breeder becomes practical). However, this is not the whole story. What is also extremely important, and almost always neglected, is the impact of diminishing sources of fuel on the second requisite factor in energy production—capital goods.

In order to illustrate the effect of a diminishing fuel supply on capital costs, let us take the example of domestic oil production in the U.S. As already indicated, oil is a limited resource and, obviously, as it is taken out of the ground and there is less and less left for later use. As a result, as more oil is sought, wells become deeper, they go into offshore locations, and more complex methods of extracting oil from the well must be used. In sum, as more and more oil is produced, the process becomes increasingly difficult and more expensive machinery must be used per barrel of oil produced.

Very recently, through the initiative of the Oil and Gas Journal (September 2, 1974), the results of a study made for Project Independence have been made available. The study predicts the capital investment required to obtain U.S. crude oil at different rates of production over the next ten years. Present domestic crude oil production in the U.S. is about 10.5 million barrels per day, and to achieve this level of output about 408 million dollars are spent in necessary capital investments per year. According to the report, even if the capital investment were to be tripled between 1974 and 1985, production will *fall* to 6.9 million barrels per day by 1985. In order to provide for an *increase* in oil production, a huge rise in capital investment is needed. For example, if production is to be doubled to 20.2 million barrels per day by 1985, annual capital expenditures would have to rise from $408 million at present to $13,535 million in 1985.

Clearly, the law of diminishing returns is at work. Thus, while it now takes about $40 in annual capital investment to produce a barrel of oil in the U.S., in

order to merely double the present rate of production the annual capital investment would need to be increased to about $600 per barrel of oil produced. In other words, the efficiency with which capital is used to produce oil would fall from .025 barrel per dollar of capital investment to .0017 barrel per dollar—a 93 percent drop in efficiency. This example is a sober reminder that we must pay close attention to the effect of depletion of a non-renewable fuel, such as oil, on the required capital investment, for—as we shall see in a moment—we are likely to run out of capital needed to produce oil sooner than we run out of the oil itself.

In the case of coal, increasing the rate of production requires a vast extension of coal operations, especially in the Western states. Although there is not likely to be a very sharp increase in the amount of capital investment needed per unit of coal produced, *environmental* costs will increase, leading once more—at least in social terms—to a bad case of diminishing returns.

This is made quite clear by a hitherto unpublished government report on the water requirements for the huge Western coal operations. As pointed out in a recent issue of *Environment* (Sept. 1974), the water required to develop the proposed extension of energy sources in the Western states will exceed the amount that can be made available for this purpose, based on existing water withdrawal regulations. For this reason, the exploitation of Western coal cannot be carried out without impinging seriously on the water supplies—not to speak of the land—needed to support agriculture. As Governor Thomas L. Judge of Montana points out, "We cannot have an expanded agricultural economy and full-scale energy development. There are insufficient land and water resources to permit both to occur." (N.Y. *Times*, Sept. 5, 1974). Thus, for the sake of more rapid exploitation of a non-renewable resource, coal, we would destroy land and water—both vital, *renewable* resources that are perpetually available to us, if properly conserved. Inevitably, then, the drive to expand coal production by extending it into the Western states will be accompanied by an increased cost—at least in food production—per ton of coal mined. Once more, we are confronted by the law of diminishing returns.

In the case of nuclear power production, we see another reason for diminishing returns in the production of energy—the increasing complexity of energy technology. Because of the intense radiation involved in nuclear power production, nuclear reactors require numerous controls and safety devices, adding to the capital cost. As a result nuclear power production is about twice as capital intensive as power production from fossil fuel. And the amount of capital required to produce a unit of nuclear power will rise rapidly, as the highly complex and unproven breeder reactor is introduced, and as the industry confronts, at last, the unsolved problem of safely disposing of radiation wastes. Estimates of the probable cost of the first breeder reactor have already doubled, well in advance of construction, in recent months. Equally significant is the dismal experience with the new fuel recovery plant at Morris, Illinois. Built at a cost of $64 million, the plant, which was supposed to open in 1971, has now been found to be useless, apparently because "the technology used in the plant does not work", (St. Louis *Globe-Democrat*, Aug. 20, 1974). The plant may have to be scrapped and a new one built at a cost estimated between $90 and $130 million. Thus, if the new plant works, the ultimate total capital cost of the facility would be about three times the original cost. Clearly, if, as proposed by the Atomic Energy Commission—and from all indications by Project Independence itself—nuclear power takes on an increasing share of the nation's energy budget, the capital investment required per unit of energy produced is bound to rise.

From these fairly elementary considerations of the properties of the non-renewable fuels—that, with an increased rate of energy production, they will become progressively less available, generate worsening environmental impacts and (in the case of nuclear power) require increasingly complex and unproven technology—we should anticipate that the amount of capital investment needed to produce energy by these means will rise faster than energy production itself. And given the growing constraints on the availability of capital this factor—the energy productivity of capital or the efficiency with which capital is used to produce energy by these means will rise faster than energy production itself. alternative means of producing energy can be made. In other words, just as the constraints on the rate of energy production have taught us the importance of improving the efficiency with which energy is converted into economic and social value through energy conservation, so we are confronted with a corresponding need for *capital conservation*. In both cases, the failure to conserve can lead to a disastrous break in the continuity of adequate energy production, the seriousness

of which has already been brought home by the consequences of the recent oil embargo. Yet, curiously, despite the recent efforts to develop the future course of U.S. energy policy and the accumulation of separate data regarding projected rates of energy production and of capital consumption, the crucial relationship *between* these two factors has, to my knowledge, not yet been worked out.

Accordingly, the staff of the Energy Resource Task Force at the Center for the Biology of Natural Systems has made a preliminary effort to develop this information. As it happens, a very detailed report published by the National Petroleum Council in 1971 ("US Energy Outlook") includes a great deal of data on the possible rates of energy production from different fuels, and estimates of the requisite capital investment for the period 1971–1985. These data are summarized in Table I, which shows quite clearly that the needed capital increases much faster than the energy produced. As a result, the efficiency of capital investment in producing energy from these non-renewable fuels drops sharply, from 2,170 BTU per dollar of capital investment in 1971 to 1,280 BTU per dollar in 1975; to 830 BTU per dollar in 1980 and 580 BTU per dollar in 1985. In other words, between 1971 and 1985 the efficiency ratio declines by 73 percent. This result, depending as it does on projected values and extrapolations, should not be regarded as quantitatively precise. Nevertheless, it does strongly indicate that the decrease in the efficiency with which capital is used in energy production that was predicted on the more theoretical grounds described above, can be expected to actually occur in the next ten years.

TABLE I.—RELATIONSHIP BETWEEN ENERGY PRODUCTION AND REQUIRED CAPITAL INVESTMENT

	1971		1975		1980		1985	
	Btu (trillions)	Capital (millions)	Btu (trillions)	Capital (millions)	Btu (trillions)	Capital (millions)	Btu (trillions)	Capital (millions)
Petroleum products	21,048	$11,120	22,789	14,342	24,373	22,289	23,405	31,727
Gas	22,388	2,676	20,430	3,133	18,030	19,395	14,960	34,002
Coal	13,062	595	16,310	776	19,928	1,036	23,150	1,370
Nuclear fuel	983	100	4,000	9,900	11,349	1,300	29,810	950
Other (nonsolar)[3]	7	[1] 0	120	200	343	3,277	514	14,830
Electric generation		12,000		21,270		42,000		75,000
Total	57,488	26,500	63,649	40,621	73,973	89,278	91,839	157,879
Energy productivity of capital (million Btu per dollar capital)	2.17		1.28		0.83		0.58	

[1] Value less than $1,000,000.
[2] These data are for 1970, since data comparable to succeeding years was not available for 1971. The recorded values therefore underestimate the above Btu values by about 3 percent.
[3] Hydroelectric power, which is not expected to change significantly, is excluded.

Note: All data are from the National Petroleum Council report "U.S. Energy Outlook," using their data for Case I (maximum production), except for data on electric generation which were obtained, by extrapolation from values for 1973 (actual) and 1974-77 (planned), from McGraw-Hill, Department of Economics. The NPC capital values are reported in 1970 dollars. The capital values for electric generation reflect expected future costs, as estimated by each reporting utility and therefore include a variable inflation factor, and therefore, to this extent, somewhat overestimate expenditures.

Environmentalists are, of course, sensitive to the limitation of resources, and in the face of this rapidly growing demand for capital we need to ask whether or not there are limits to its supply. The answer is, of course, self-evident today, as we head into a capital crisis that has already led to the cancellation of a number of power plant projects. Accoring to a recent report of the New York Stock Exchange, the U.S. will be short some $700 billion in investment capital needed between now and 1985. According to the report, $820 billion of capital will be required to produce energy. If this demand is met it will necessarily reduce the capital available for other investments, particularly in industry. This trend is unmistakable in Table II which compares the projected capital demands for energy and for industry as a whole. In 1971 capital required for energy production was 33 percent of the capital required for total U.S. industrial investments; although the ratio will probably be unchanged in 1975, it will probably reach 58 percent in 1980 and 81 percent in 1985. Again, although these data should not be regarded as precise, they do reflect an apparently real trend for energy production to encroach heavily on the capital available for industry as a whole.

TABLE II.—PERCENT OF ALL INDUSTRIAL CAPITAL INVESTMENT REQUIRED FOR ENERGY PRODUCTION

	Required capital (millions)			
	1971	1975	1980	1985
Energy production [1]	$26,500	$40,621	$89,287	$157,879
All industry [2]	$81,210	$124,420	$155,000	$195,000
Percent energy	33	33	58	81

[1] From table I.
[2] Data from McGraw-Hill, Department of Economics; 1971 value actual; other values obtained by extrapolation from 1973 actual value and planned values for 1974, 1975, 1976, and 1977.

The present difficulties of certain sectors of the energy industry in finding sufficient capital for new construction is, of course, affected by the high interest rate. However, from the above considerations it would appear that the difficulty is more fundamental. So long as the energy industries depend on non-renewable sources—oil and gas, coal and uranium—expansion of energy production to meet the growing demand will so rapidly reduce the efficiency with which capital can be used to produce energy, as to impose serious limitations on all other investment.

Thus the growing amount of capital needed to expand the production of energy, based on non-renewable sources, will interfere with the capital investments needed for industry, housing and other essential activities. If we continue on this course we will be precipitated into an untenable situation: the effort to increase energy production will itself cripple the very activities that the added energy is supposed to serve!

Clearly, we must find a rational alternative to this patently absurd prospect. If we keep in mind the basic reason for the declining energy productivity of capital—that the prospective sources are non-renewable—the alternative becomes self-evident: solar energy. Unlike conventional energy sources, sunlight is continuously available in unlimited amounts, so that its use can be expanded at will without incurring capital costs that rise more rapidly than the production of energy itself. For example, if the cost of building and installing a solar unit to heat a residence by providing 30,000 kwh of energy is, let us say, $4,000, then the capital required for supplying 30 billion kwh to a million buildings will cost $4,000 million. The capital cost required per building, or per kwh, *will remain constant* despite the million-fold expansion in the production of solar energy. (In fact, given the advantages of mass production of the heat collectors, the cost is likely to decrease.)

This relationship reflects the simple fact that unlike non-renewable energy sources, the capture of sunlight does not reduce the further availability of sunlight. To increase the amount of energy produced, all that is required is an extension of the collector area. Apart from the differential effects of latitude, each newly added solar collector is as efficient as all the others.

There are, I am aware, a number of widely publicized—but poorly documented—views that solar energy is "impractical" or, at best, only feasible in some distant future. In answer, let me outline briefly a simple way to carry out the purpose of Project Independence (to become independent of imported energy by 1980), by means of presently available solar energy systems, at a capital cost that can be almost completely amortized by the target date.

About 25 percent of the nation's total energy requirements are used to provide space heat and hot water, chiefly in residences. According to a recent report to the National Science Foundation from the Westinghouse Electric Corporation, the cost of a solar system to provide a single family residence unit with 50 percent of its heating requirements in one of the most demanding areas, the Northeast, would be $4,220 in 1975, and $3,290 in 1985. Accepting about $4,000 as the average cost over the period to 1985, then, the approximately 60 million residences in the U.S. could be equipped with solar heating systems at a total cost of $240 billion. This would save about 12.5 percent of the total national energy budget. Add to this, a saving of 7.5 percent of the national energy budget that could readily be achieved by simple conservation practices, and we arrive at a 20 percent reduction in energy use—which is also the fraction of the energy budget represented by oil imports. At a price of $10 per barrel, these imports are likely to cost about $30 billion per year. Thus, in eight years, the capital cost of installing the solar

heating systems would be recovered and the aim of Project Independence would be achieved.

Of course, the total required investment must include the cost of capital required to construct *new* manufacturing facilities needed to produce the solar systems. However, since the actual fabrication of the solar collector represents the only new manufacturing operation needed for the system (the rest is simple plumbing and air circulation units) and since this is not much more complicated than the manufacture of a multiple-paned window (and indeed could probably be readily fabricated in a facility already manufacturing such items), the additional capital cost for new manufacturing facilities is likely to be rather small. The low level of technology involved in such installations can be judged from the fact that a solar heating system was recently installed and operating in a school within three months after the contract had been let.

Another frequently voiced complaint about the feasibility of solar energy is that it would take up too much land area. To begin with, all U.S. energy needs could be supplied by solar collectors (operating at ten percent efficiency) covering less than .04 percent of the land surface. A considerable fraction of this area might be obtained simply by using the large, and growing areas of pavement. Then consider the 25 percent of the total energy budget required for heating. This could be taken care of almost entirely by solar collectors mounted on the roofs of buildings, since as a rule of thumb the roof area of a building can collect sufficient energy for two stories. The effectiveness will of course vary with latitude; in the mid-latitudes of the U.S. 75–80 percent of the heat requirements could be accumulated. Finally, apart from land areas, there are the opportunities for extracting the solar energy stored in warm ocean waters; those surrounding the U.S. could provide for the *total* energy budget.

Then there is the complaint that solar energy systems are not economically competitive with conventional fuel-supplied systems. Of course this advantage is only temporary and will fast disappear as the cost of fuel and the unattainable capital requirements of conventional systems begin to take effect. How rapidly this can occur is made plain by a recent estimate, based only on the rising cost of fuel and ignoring the problem of capital availability. This shows that two solar methods, wind-driven generation of electricity and heat derived from burning organic photosynthetic products, will be as cheap or cheaper than conventional systems by 1985. By that time heating and cooling and the production of electricity from ocean thermal gradients may be cost competitive, or at most 50 percent more expensive than conventional systems. The competitive position of nearly all solar systems is expected to improve steadily and even this conservative estimate indicates approximate equality by 2000. Let us recall, however, that the capital requirements for solar systems will rise only in proportion to the amount of energy produced, while the capital requirements of the conventional competitors will, as we have seen, rise much faster than the rate of energy production. Taking this important factor into account it is likely that several major solar processes could become cost competitive within a few years.

Finally, there is the argument which concedes that we ought to recognize the near-term exhaustibility of oil and gas supplies, and the longer term exhaustibility of coal supplies—and their inherent environmental damage—and base our energy system largely on nuclear power. The feasibility of the breeder reactor is, of course, essential to this argument, since the present types of reactors will deplete the economically feasible supply of uranium ore in 25–50 years. This approach depends crucially on the acceptability of the environmental, economic, and social consequences of an energy system largely based on the breeder reactor.

Let us recall that unlike present reactors the breeders (and indeed, when breeders are operating, the older liquid water reactors themselves) will use as a fuel not uranium, but plutonium. Plutonium is the most dangerous, radioactive substance that is known. Yet, its effects are so poorly understood that equally competent experts differ by as much as 10,000-fold in their estimates of the acceptable level of exposure to plutonium. That the danger of an accident is not easily dismissed—despite recent protestations from the AEC—is evident from the simple fact that no private insurer, or collection of them, has been willing to insure a conventional reactor, let alone a breeder, against an accident. And we can judge the seriousness of the potential environmental effects of the breeder from the fact that the recent draft of the AEC's Environmental Impact Statement was greeted by an unprecedented demand that it be withdrawn and wholly rewritten, not only from independent groups such as the Scientists' Institute for Public

Information, and the National Resources Defense Council, but also from the Environmental Protection Agency itself.

However, all these difficulties pale before the most serious drawback of the breeder—that the enormous amounts of plutonium it would produce would create a grave threat from clandestine construction of nuclear bombs. There is no need here to reiterate the unrefuted claims advanced by Dr. Theodore Taylor that unlike conventional (uranium) nuclear fuel, a handful or so of stolen plutonium could be made into a devastating bomb by one or a few people using material available from a hardware store and a laboratory supply house. If the AEC's plans to go forward with the nuclear power program along these lines are allowed to proceed, by 2000 the U.S. would have on hand enough plutonium to produce some 10,000 bombs, each sufficient to destroy a medium-sized city. To prevent a possible threat to one city, the loss of even .01 percent of the plutonium would have to, somehow, be prevented.

If the breeder program goes forward, the only rational response would be to mount an absolutely theft proof guard over the fuel plants, the power plants, reprocessing plants and transport vehicles. Willrich & Taylor's recent book on this problem states the inevitable conclusion: ". . . the establishment of a Federal Nuclear Materials Security Service with the sole responsibility of protecting nuclear materials . . . such a force would be a clear and present deterrent to any external threat, including acts of sabotage by outsiders against nuclear facilities, as well as acts of theft."

Given the overriding responsibility of the regular U.S. armed forces for safeguarding the country against "acts of sabotage by outsiders" it takes little imagination, it seems to me, to envision the real outcome of the creation of a plutonium economy: the nation's power-generating system would become literally an armed camp, controlled by the military. And control of the power system is, after all, tantamount to control of the productive system as a whole.

It seems to me that no prudent citizen can contemplate the proposal to base the nation's power supply on the breeder reactor, and therefore on plutonium that must be minutely and ceaselessly guarded from theft, without giving the most serious thought to the fateful consequences of committing the control of the nation's power system to the military. I, personally, would regard it as a seductive step toward fascism.

INTERSTATE NATURAL GAS ASSOCIATION OF AMERICA,
Washington, D.C., May 9, 1975.

Hon. LLOYD BENTSEN,
Chairman, Subcommittee on Financial Markets
Hon. MIKE GRAVEL,
Chairman, Subcommittee on Energy,
U.S. Senate Committee on Finance, Washington, D.C.

DEAR SENATORS BENTSEN AND GRAVEL: Pursuant to your announcement of April 22, 1975, of joint hearings by the Subcommittees on Financial Markets and Energy on the capability of U.S. financial markets to provide capital for the development of domestic energy resources, the Interstate Natural Gas Association of America (INGAA) respectfully submits the following comments on this most important question for your Subcommittees' consideration.

INGAA is a non-profit natural gas industry organization whose membership includes all the major interstate natural gas pipeline companies in the United States. Our pipeline members today serve all of the lower 48 states, with the exception of Vermont, through an underground pipeline network now totaling more than 265,000 miles of transmission lines alone. They account for 90 percent of the total interstate sales of natural gas and provide the vital transportation link between the gas producer at the wellhead and the distributor who makes final delivery of gas to the consumer.

As you have properly noted in your announcement ". . . vast sums of capital [will be] required to finance the expansion of present energy resources and the development of alternative energy systems." The magnitude of the capital requirements of the energy industries looking to the future is such that traditional sources of capital and methods of financing are probably incapable of providing the necessary funds for industry. New and innovative approaches must be devised to meet the challenge of the future if the energy needs of this Nation are to be met. Of particular concern to us are the enormous amounts of money needed for important supplemental gas projects. Our comments will address this aspect of your inquiry.

DESCRIPTION OF THE NATURAL GAS INDUSTRY

America has reached industrial pre-eminence in the world primarily because of its vast energy resources. Of all the different forms of energy sources, natural gas is perhaps the most perfect form of energy. In a remarkably short time it has become a vital part of our economy. In less than three decades, natural gas production has been transformed from an ignored byproduct of oil production into an invaluable commercial commodity—the cleanest and the most adaptable of the fossil fuels.

The role of natural gas developed dramatically during the 1945–70 period. During this 25-year span a complex high-pressure transmission pipeline network was extended into all of the lower 48 states. During this period natural gas consumption increased at an annual rate of 6½%. As a result of this rapid growth, natural gas moved from supplying 13% of America's total energy requirements in 1945 to 33% in 1970, where it stands now. However, when we eliminate oil imports and focus on U.S. energy production, natural gas unequivocally emerges as the dominant source of energy. Natural gas and natural gas liquids which are produced from gas wells account for 41.1% of total U.S. energy production, compared with 30.6% for crude oil, 22.1% for coal, and 6.2% for hydropower and nuclear energy.

The national network of field and gathering, transmission and distribution lines has increased from about 387,000 miles in 1950 to a total of 967,667 miles at the end of 1973. The number of underground storage reservoirs has increased from 125 pools with a total capacity of 770 billion cubic feet in 1950 to 360 pools with a total record capacity of 6.8 trillion cubic feet in 1973. During the 1950–73 period, the total gas utility plant increased from $7.8 billion in 1950 to $47.1 billion in 1973, more than six times in 23 years, and revenues from sales of gas to consumers increased from about $2 billion in 1950 to approximately $13.0 billion in 1973.

In 1973, the gas utility industry customers totaled about 43.7 million. Of this total, approximately 40.1 million were residential customers, 3.3 million were commercial customers, 200,000 were industrial customers and 55,000 other customers. Of utmost importance is the fact that natural gas has become the predominant fuel for househeating purposes—thus, fulfilling a critical human need. In 1973, the gas utility househeating customers totaled more than 33 million.

In addition to being a predominant fuel for househeating purposes, natural gas is a key to our highly sophisticated industrial economy. Natural gas provides over 50% of the total energy used by the U.S. industry—more than three times that supplied by any other fuel.——

Also, it should be borne in mind that the natural gas industry is one of the Nation's largest employers. In 1973, the industry had 215,200 employees, receiving a total payroll of $2.4 billion for an average wage per employee of $11,380.

The reasons for the dramatic growth of the natural gas industry are obvious. First, natural gas is our cleanest fuel. It is virtually free of sulphur and particulates. It does not pollute land or water and offers the best hope for alleviating air pollution, especially in urban areas. In contrast, every other fuel, including uranium, requires expensive emission control devices to protect land, water or air environment. Second, natural gas is the most efficient fuel—93% of the wellhead gas production is utilized directly by the consumers. This high efficiency is achieved because there is no need for downstream energy conversion as in the refining of crude oil and in transforming the primary energy of coal or oil into electricity.

The industry which currently supplies one-third of the Nation's total energy requirements is obviously essential to its people and the economy. For the continued growth and viability of America, natural gas must continue to provide the vital energy supplies it has so abundantly supplied in the past. Unfortunately, domestic natural gas reserves have been declining at an alarming rate and as a consequence there is a critical shortage today of this vital natural resource.

THE ENERGY SHORTFALL AND THE FINANCIAL CRUNCH

The natural gas industry has thus entered into a new era. With the growing decline in natural gas production from historical sources, the industry has embarked upon innovative and aggressive gas acquisition programs designed to supplement its gas supplies from non-historical sources, namely, deepwater offshore drilling, the production of synthetic gas from coal and petroleum feed-

stocks, the production and transmission of Alaskan/Canadian Arctic gas and the transportation of liquefied natural gas. These sources of gas supply involve unprecedented capital investments—a coal gasification plant, e.g., capable of producing 250,000 Mcf (1000 cubic feet) of high BTU gas per day is estimated to cost about $1 billion in 1975 dollars just for the gasification plant alone, that is excluding necessary pipeline facilities to bring the gas to market. Bringing Alaskan gas and gas from Northern Canada to the lower 48 states, whether by tanker in liquid form or by conventional pipeline, will cost billions of dollars. The overall cost of additional pipeline facilities during the 1970–1990 period, based on suppy projects for the same period, has been estimated to be as much as $237 billion. In addition, substantial expenditures must also be incurred to (a) stimulate and encourage gas exploration and development, (b) expand and accelerate research and development efforts, and (c) construct new and replacement facilities to comply with more rigid safety and environmental regulations.

The cost of new facilities has increased dramatically due to inflation and other factors; the cost of long and short-term debt and preferred stocks has risen to all-time highs; the market value of common stocks has dropped to modern lows in relation to earnings—in most cases well below book value; and the competition for capital funds has accelerated. While most of these factors are applicable to some extent to all industry, the natural gas industry is aso faced with two basic disadvantages in competing with other industries for capital: (1) investor concern with regulatory policies and regulatory lag; and (2) investor concern with the availability of natural synthetic gas to maintain or increase authorized delivery volumes. To say the least, the natural gas industry is confronted with a monumental task to raise the capital required for the industry to perform its public service obligations.

The magnitude of the task of raising the necessary capital to meet these projected expenditures can be better appreciated when compared with the industry's past history. During the twenty years preceding 1970, the gas pipeline industry invested a total of about $20 billion, or about $1 billion a year on the average. This means that the gas pipeline industry faces capital requirements almost twelve times as large in the period 1970–1990 as in the preceding twenty years merely to meet a growth in supply of 2 percent to 5 percent annually. To meet this challenge new methods of finding and attracting capital must be devised.

In connection with certain high cost, long lead-time energy projects, such as coal gasification, it is clear that they cannot be financed on the credit of the sponsoring company alone since the costs represent too large a percentage of the company's assets and the risk of loss is too large for it to assume (the costs noted above a billion dollars for a single coal gasification plant would virtually double the net plant investment of most interstate natural gas pipeline systems). In such cases a "project financing" approach must be adopted, which means that the investor looks to the project itself for return of and on his investment. In practice, this means that the project must have fully protected agreements under which the cost of the project, including return of and on investment, must be paid by consumers in their rates under all circumstances. The question whether such "all events" agreements will be approved is very much in doubt, however, due to a recent ruling of the Federal Power Commission rejecting this concept (See FPC Op. No. 728, issued April 21, 1975, in *re* Transwestern Coal Gasification Co., *et al.*, Docket No. CP73-211). It is understood the applicants will seek rehearing.

It is also vital to the ability of the gas pipeline industry to finance the massive projects required to provide this essential form of energy that significant amounts of cash be generated internally so as (1) to reduce the industry's dependence on the outside capital markets, and (2) to increase the ability of the pipeline industry to sell their securities to the public. This can be done by increasing cash flow from depreciation, increasing cash flow from earnings, increasing cash flow from customer payment of carrying charges on capital during construction and increasing cash flow from tax credits and deferrals. In doing so, the investment quality of the securities issued is also greatly enhanced by improving earnings, coverages and capitalization ratios which will result in lower cost debt and rebound to the benefit of the consumer.

CONCLUSION

INGAA and its member companies are pleased that the Financial Markets and Energy Subcommittees have undertaken a review and study of this most impor-

tant matter. If our Nation's economy is to be stimulated and unemployment reduced, natural gas supplies must be increased and supplemental supply sources must be developed. The natural gas industry has an impressive resource base of natural gas which can be developed and delivered to consumers if appropriate support and incentives are promulgated. We earnestly submit that a recognition of, and response to, the needs of the gas industry are necessary in order to meet our national goals of energy self-sufficiency, industrial growth, environmental protection and protection of the millions of consumers who rely upon the gas industry to supply them with fuel.

We appreciate this opportunity to comment and we urge your Committees to pursue this matter vigorously to the end that early solutions to this most serious problem can be achieved.

Yours truly,

WALTER E. ROGERS,
President.

STATEMENT BY CHARLES H. BROWN, SENIOR VICE PRESIDENT, THE OIL SHALE CORPORATION

Mr. Chairman and Members of the Committee: As an independent publicly-owned energy company organized twenty years ago for the specific purpose of developing America's oil shale, The Oil Shale Corporation ("TOSCO") has a vital interest in the capability of U.S. financial markets to provide capital for the development of domestic energy resources. In the recent decades, TOSCO has been an industry leader in organizing resources for oil shale research and development with substantial accomplishments.

Solely with private funds, TOSCO and various venture partners have been able—through an expenditure of more than $50 million—to design, develop and demonstrate the TOSCO II oil shale retorting process, currently recognized as this country's most advanced first generation oil shale recovery technology. While most of the $50 million was raised and spent before the recent unprecedented era of double-digit inflation and financial market disarray, we found adequate private capital available for promising technology during the relatively inexpensive research phase of development. We believe this availability still exists for research and pilot testing of energy technologies with genuine possibilities for the future.

However, we have been forced to the reluctant conclusion that commercial-size demonstration plants of alternatives domestic energy systems cannot be financed by traditional methods in private financial markets today. Over a period of several years, TOSCO has made an intensive effort to organize the resources to construct the first commercial-size oil shale complex in the U.S. on private lands near Grand Valley, Colorado. Because the technology was acceptable to them, we were able to enlist the participation of some of America's largest energy companies—presently Atlantic Richfield Company, Shell Oil Company, Ashland Oil Company. As the Colony Development group, we mined over 1 million tons of oil shale, built and operated a semi-works plant which processed some 1,000 tons of shale per day.

After months of intensive study of the technological performance and operating costs of the semi-works plant, the Colony Group believed it was ready for scale-up to a commercial-size facility. We hired a general contractor, designed the complex, solicited bids for major components and filed the environmental impact analysis data for an Environmental Impact Statement, hoping to begin field construction in the Spring of 1975.

In October 1974, however, the Colony Group announced that the scheduled start would have to be delayed. The reasons underlying the suspension of this important pioneer oil shale plant demonstrate the importance of this Committee's joint hearings on the availability of private capital for the development of domestic energy systems.

1. THE CAPITAL REQUIREMENTS FOR COMMERCIAL-SIZE OIL SHALE FACILITIES ARE VAST AND LARGE ENERGY COMPANIES ARE VIRTUALLY THE ONLY COMPANIES WHICH WILL CONSIDER A PIONEERING VENTURE IN SYNTHETIC FUELS DEVELOPMENT

Our estimates, which were compiled at a cost of several million dollars, indicate that a 50,000 barrel per day oil shale complex with first stage upgrading facilities now requires an investment of at least $900 million. A few large oil com-

panies are accustomed to assembling capital resources of this magnitude for massive petroleum projects in Alaska, the North Sea and the Canadian tar sands; however, non-energy companies are reluctant to invest in such huge projects, even though they have serious need for the products, because the risks are unfamiliar and the project size is frightening.

2. THE FEW LARGE ENERGY COMPANIES WHICH WOULD HAVE NORMALLY BEEN INTERESTED IN PIONEERING SYNFUEL DEVELOPMENT ARE NOW FACED WITH HUGE CAPITAL OUTLAYS TO EXPAND PRODUCTION FROM THEIR TRADITIONAL ENERGY SOURCES AND HAVE ONLY LIMITED FUNDS FOR DEVELOPMENT OF ALTERNATIVE ENERGY SYSTEMS

The only domestic oil reserves of consequential volume left to be produced are in new fields in Alaska and off-shore, and in existing fields requiring costs secondary or tertiary recovery. All require huge capital investments, and are top priority projects with the major oil companies. The limited funds remaining for novel alternative energy sources are being used largely for relatively inexpensive research. In the competition for corporate funds, a major new synfuel project of equal economic merit is at a serious disadvantage to a petroleum project, because petroleum companies are geared to produce petroleum.

3. OVER A PERIOD OF MANY YEARS, SOPHISTICATED MECHANISMS HAVE BEEN ESTABLISHED FOR THE ORGANIZATION OF CAPITAL FOR EXPANSION OF TRADITIONAL ENERGY SUPPLIES, SUCH AS PETROLEUM, COAL, AND NUCLEAR POWER PLANTS; SYNTHETIC FUELS CAN CALL ON NO SUCH MECHANISMS

Drilling syndicates provide hundreds of millions of dollars for petroleum exploration through funds raised from high income earners in business and the professions who are interested in reducing their tax liability through deductions for intangible drilling expenses; coal producers collateralize long-term sales contracts to industrial plants and public utilities for expansion capital; and utilities have an established mechanism for adjusting their rate base to assure repayment of capital borrowed to construct nuclear generating facilities. While a commercial oil shale plant could offer certain tax incentives to a prospective investor—15% depletion, investment tax credits, and accelerated depreciation—synfuel plants are as yet unproved commercially and have yet to establish widespread sophisticated mechanisms for organizing capital resources.

4. FIRST GENERATION SYNTHETIC FUELS PROJECTS MUST RELY SOLELY ON EQUITY CAPITAL DURING THE THREE TO FOUR YEARS OF CONSTRUCTION

Where multi-million dollar housing or office building projects have ready access to institutional loans for construction money, synthetic fuels plants must be built to venture capital from the owners. If the owners must borrow to supply the funds (and even the largest must), the balance sheet liability has an immediate impact on the borrower's credit rating and his ability to acquire funds for other purposes. During periods of restraint in federal monetary policy, the cost of the borrowed funds could make a synfuel project economically unviable, as in 1974 when the prime rate reached 12%.

5. RAISING RISK CAPITAL FROM EQUITY ISSUES IS VIRTUALLY IMPOSSIBLE IN TODAY'S EQUITY MARKET

The common stock of many established companies is selling in the secondary market today at four times earnings. To finance a large and novel alternative energy project among investors expecting investment ratios of this type would be virtually impossible, and to structure an after-tax return of this magnitude into the selling price of synthetic fuels would be prohibitive.

6. UNTIL THE TECHNOLOGICAL AND ECONOMIC FEASIBILITY OF SYNTHETIC FUELS ARE COMMERCIALLY DEMONSTRATED, LONG-TERM LOANS TO SYNFUEL PROJECTS WILL BE LIMITED TO THE COLLATERALIZED SCRAP VALUE OF THE PLANT, LEAVING TWO-THIRDS TO THREE-FOURTHS OF THE TOTAL CAPITAL REQUIREMENT TO BE SUPPLIED BY EQUITY

Based on an analysis of the $900 million capital requirements for a commercial-size oil shale plant utilizing first generation technology, lending institutions following conventional procedures could probably loan no more than $150 million

to the project—the scrap value of conventional pipe, fittings, and other multi-use components of the plant—until the project established itself as an acceptable lending risk. Even if the $150 million could be borrowed at a rate competitive with loans provided other energy projects, the massive equity requirement and the higher return expected by investors on risk capital would necessitate a price for the synfuel which would make it non-competitive.

7. WHILE SHALE OIL COULD BE PRODUCED AND SOLD AT A PRICE COMPETITIVE WITH PRICES FOR FOREIGN OIL LANDED IN U.S. PORTS TODAY, EQUITY INVESTORS ARE RELUCTANT TO COMMIT HUGE FRONT-END CAPITAL OUTLAYS TO OIL SHALE PROJECTS UNTIL THERE IS MORE CONFIDENCE IN THE LONG-TERM PRICE OUTLOOK FOR PETROLEUM, BECAUSE A SHALE OIL PLANT MUST COMPETE WITH PETROLEUM IMPORTS IN THE U.S. MARKETPLACE FOR THE 17 TO 20-YEAR LIFE OF THE PLANT.

If inflation in construction and operating costs settle down to 3 to 5 per cent annual levels and capital could be raised at reasonable rates, such as 8 or 8½ per cent loans and 12 per cent discounted cash flow to equity, TOSCO firmly believes that U.S. sulfur-free shale oil can be produced and sold in commercial volume at less than the current price for low-sulfur Indonesian or Persian Gulf crude oil landed in U.S. ports. This benchmark price is currently $11.50 to $12.00 per barrel plus import license fees and duties. However, import price levels of this magnitude are a relatively recent phenomenon and there is no consensus of opinion in the U.S. industrial and financial community, or even among Government officials, concerning long-term petroleum prices.

No prudent investor can invest in a synfuel project amid such uncertainty, because synfuel projects must project cash flow over a 17 to 20 year period. A fledgling industry could be destroyed overnight by a substantial downward price adjustment by the oil producing countries if they continue to have free access to the U.S. market. Price uncertainty will continue to be a major deterrent to private investment in novel alternative U.S. energy sources so long as there is uncertainty over long-term oil import policy.

TOSCO does not believe it is necessary for Government to establish a high tariff or severe import quotas or to provide a broad price support program in order to assure development of domestic synthetic fuels. In our view, measures of this nature which were strong enough to provide adequate price protection for a developing domestic synfuels industry would place serious inflationary pressures on overall domestic energy prices.

We suggest that Government should instead contract for a specific limited volume of synfuels, such as 500,000 to 1,000,000 barrels per day, between now and the early 1980's to assure synfuel development at a manageable level. Even if synthetic fuel prices are $3 to $4 per barrel more costly than imported conventional petroleum (which TOSCO does not believe will actually be the case), 500,000 barrels of the costlier synerude blended into the national petroleum "mix" of 14 million barrels per day would add only about 10¢ per barrel to the average price of U.S. crude petroleum.

Also, TOSCO suggests that Government can assure development of alternative domestic energy *at reasonable prices* by helping venture companies gain access to capital at competitive costs. Our studies indicate that the cost of producing synfuel from a TOSCO II shale oil facility is largely a function of project financing. If the project is properly "leveraged" (i.e. three-quarters debt financing at 8½ per cent and one-quarter equity at industry average after-tax discounted cash flow), the shale oil price would be $11.15 per barrel. If the project must be financed totally by equity, the price would go up to between $17 and $20 per barrel.

CONCLUSION

Synfuel plants are new and unproved and, until they are known risks, they cannot compete for capital on even terms with established conventional projects. And until they can obtain capital at competitive rates, synthetic fuels cannot compete in the marketplace.

The U.S. has an abundance of coal and oil shale. The technology exists to produce high amounts of synthetic fuels from these resources; but the Nation cannot know the economic feasibility or the environmental compatibility of its synthetic fuels until some commercial-size plants are built. Such plants require massive amounts of front-end capital at competitive interest rates if the synfuel products are to be competitive in cost. Private capital on such terms is simply not available for novel energy projects; and private investors are un-

certain about petroleum prices long term. Government must lead the way out of this energy dilemma.

We commend the Subcommittees on Financial Markets and Energy for initiating dialogue on this very important matter. We also note that the Committee currently has before it a bill introduced by Senator Bentsen (S. 973) which would create an Energy Development Board with authority to make purchase commitments and to guarantee loans for synthetic fuel projects. TOSCO believes that this combination of incentives goes to the heart of the economic obstacles confronting investments in synthetics fuels and would provide effective stimulus to such investment. We urge this Committee and the Congress to act favorably on legislation establishing a procurement/loan guarantee program as contemplated by S. 973.

STATEMENT OF NATIONAL ASSOCIATION OF PETROLEUM INVESTMENT ANALYSTS

The undersigned officers of the National Association of Petroleum Investment Analysts are pleased to submit the following testimony to the Sub-Committees on Financial Markets and Energy, Committee on Finance—U.S. Senate. The opinions expressed herein are those of the executive officers of the Association.

The National Association of Petroleum Investment Analysts is composed of more than 300 senior security analysts from all over the country specializing in the study of the oil and gas industry. It is believed that our members' efforts influence a very substantial part of the capital funds that are invested in the oil and gas industry so we have a vital interest in the matters under discussion at these hearings.

We have noted the joint statement of Senators Bentsen and Gravel indicating that the purpose of the hearings is to investigate the amount of capital required to hasten the development of domestic energy resources and the capability of private financial markets to supply that capital. The officers of the Association feel strongly that the availability of capital to the U.S. oil industry is being severely jeopardized by government interference with the activities of oil and gas companies. Not only is the ability to generate capital being reduced, but, more importantly, the ability to attract new capital from investors is being diminished.

Over the past decade, 1974 was the first year that cash earnings were about equal to capital expenditures for most oil companies. The attached table from the publication "Petroleum Outlook"—April 1975 (John S. Hereold, Inc., Greenwich, Conn.) adds up the cash earnings of 18 major companies to a total of $21.3 billion. Capital expenditures amounted to $19.4 billion or 91% of the available funds. Dividends more than absorbed the balance, leaving a shortfall of $1.7 billion in a record year that was swelled by non-recurring inventory and currency profits. While we do not wish to belabor this point, we have plenty of evidence available that shows a much greater shortfall in prior years.

At this juncture, we would like to state our belief that the oil industry should be commended rather than vilified for its 1974 profits *because* almost all of it is expended in the search for more oil within the United States. For example, Cities Service plans to drill 315 net wells in 1975 versus about 210 in 1974, all in this country. This is a prime example of how the public good can be served by the profit incentive because it has contributed to a significant increase in drilling activity as have higher prices themselves. Domestic reserves and production are still trending downward, but we believe the decline would be greater if the profits of 1974 had not occurred. Unfortunately, vilification and government regulation are hampering the oil companies continually and we expect the search effort will be curtailed by the Tax Reduction Act of 1975, a course directly contrary to our stated national policy. First quarter 1975 oil company earnings reports are already showing sharp declines from a year ago and reductions in planned capital expenditures are following in concert.

For example, Gulf had planned to spend over $500 million searching for oil and gas in the U.S. this year and now plans to cut back due to the loss of the depletion allowance. Continental plans to reduce 1975 spending by $100 million due to depletion allowance elimination and continuing political and economic uncertainties. Review of the first quarter reports of many major oil companies reveals plan after plan to re-examine slated expenditures due to the unfavorable developments that have come about in our country. Not only does this lessen our chances of achieving a higher degree of energy independence, it will

bring about the loss of thousands of man-hours of intelligent planning that have gone into these proposals and eliminate many job opportunities.

These hearings are also studying the capability of private financial markets to supply capital and we believe that this capability is being severely hampered by the government's attempts to regulate the industry. We subscribe to the free enterprise system, and specifically support a free market for the domestic oil industry. Moreover, we strongly believe that the government should encourage the oil industry to develop our natural resources through tax and other incentives.

While it is possible to justify some insurance legislation to protect the industry from the inroads of imports, at the present prices for foreign crude, such protection certainly need not be implemented. While we grant that a minimum price on oil imports might be a suitable mechanism to achieve such a goal, we reiterate that a better way would encompass tax incentives to encourage domestic activity. Obviously, we feel that the repeal of the depletion allowance will turn out to be a serious error because it lessens the amount of capital available to the companies.

The question has been raised as to future capital requirements. We submit a simple calculation that can provide a framework for minimum capital needs in the exploring and producing end of the industry. It is estimated that recent oil finding costs in the U.S. have been in the area of $3–$4 per barrel. Some observers might use a higher number. In 1974 our domestic production was as follows:

	Millions
Natural gas (cubic feet)	21,300,000
Equivalent oil (6,000 cubic ft.=1 barrel) (barrels)	3,550
Crude oil and natural gas liquids (barrels)	3,854
Total production (oil and equivalent) (barrels)	7,404

Capital requirements: Finding costs at $3=$22.2 billion, at $4=$29.6 billion.

The above level of required expenditures that might be needed to replace production relates only to 1974 production levels and gives no weight to the need to expand domestic output to curtail foreign imports, nor to provide for future growth in domestic consumption. Needless to say, any realistic estimate of capital requirements to replace our current production or to provide for a higher level of output will require substantially more funds than that spent in recent years. Our calculation above is addressed to the exploration and producing function alone and gives no recognition to capital requirements for pipe lines, refining and marketing facilities.

The Sub-Committees are also interested in the ability of the capital markets to provide the outside capital needed to supplement internally generated funds. It should be noted that in recent years the oil industry has used much more debt capital to provide the majority of supplemental capital needs. A decade ago, few of the major oil companies had more than 10%–12% of debt in their capital structures whereas currently many have more than 20%–25%. While there is some room for additional debt in many companies we think that considerable equity capital may be necessary if future oil needs are to be met.

If much of the future capital requirements are to be met by the public, perhaps we should look at the needs and fears of the private investor. In our opinion, there are three general requirements that apply to all investors.

1. Safety of principal.
2. Adequate cash return.
3. Prospect of some growth.

The overriding fear of investors is uncertainty about the future and particularly of additional government interference, regulation and/or taxation. The greatest deterrent to the generation of investment capital is an inability to assess the future, particularly a fear of government interference, regulation and/or taxation. If one surveys the current investment environment, particularly in the oil industry, there is grave uncertainty with respect to future demand, future

prices, future taxation, and additional regulation. In this uncertain environment, investors are absolutely bewildered. Because of this environment the major oil stocks have been selling at unrealistically low P/E ratios. Using the Standard & Poor's stock price indexes as a guide, the international oil stocks are selling at 4.1 times latest twelve months earnings (ending December 31, 1974) and the integrated domestics at 6.8 times. By all historical standards, these are very depressed multiples. While there are many factors that affect investor enthusiasm and hence stock market multiples, it is easy to note a number of government actions that are very important investment negatives.

1. Price Controls: The oil industry is the only industry still under federal price controls. They have been imposed on natural gas for over 20 years and crude oil and refined products since 1971.

2. Additional Income Tax Load: Most oil depletion benefits were eliminated in 1975 and the use of foreign tax credits was curtailed. There is a considerable fear of additional tax burdens.

3. Government Interference: Restrictions on the use of proprietary raw materials, crude oil allocations and crude oil entitlements (this fringes on the confiscation of private property).

4. Fear of Government Competition: Congressional proposals to create: (a) The Federal Oil and Gas Corp. and (b) A Government agency to purchase all oil imports.

Government intervention in the affairs of the oil and gas industry has led to an uncertainty crisis that is impeding capital formation. The constantly changing rules of the Federal Energy Administration have brought about a lack of clarity as to the outlook for the industry that is seriously affecting oil investment. We cannot emphasize too strongly the fact that capital seeks the best return. Advice to investors by analysts like ourselves is suffering from a severe credibility gap that is not afflicting anlysts specializing in other industries. Government intervention is causing violent and unpredictable changes in reported earnings, and analysts' forecasts of future earnings.

As one illustration of what we are saying, the *Wall Street Journal* on May 8, 1975 quoted the forecasts made by two oil investment analysts of Marathon Oil Company's 1975 per share earnings. Both analysts, in our opinion, are well qualified and highly respected. One apparently believes the company may be "hard-pressed" to achieve his $3.00 per share estimate, while the other analyst continues to maintain his $4.25 per share estimate for 1975. That's a 40% disparity. For the record, Marathon earned $5.70 per share last year.

Inability to project oil profitability in the future has led and is leading to the lessening of available capital for the search. As a consequence, other industries are attracting investable funds that otherwise might go into oil and gas. We go so far as to suggest that the so-called "prudent man" has a severe problem to face in investing in the oil industry today due to the difficulty of estimating its prospects. If the U.S. Government would allow the oil industry an opportunity to solve the energy crisis through the free market mechanism, we believe that the problem would be solved at the lowest cost to the American consumer. Concurrently, the United States could become far less dependent on foreign oil supplies for its welfare and future prosperity.

Sincerely,

STERLING MCKITTRICK, Jr.,
President,
Ingalls & Snyder.

D. BARRY MCKENNITT,
Vice President,
The Boston Co.

ROSARIO S. ILACQUA,
Secretary-Treasurer,
L. F. Rothschild & Co.

May 8, 1975.

SELECTED MAJOR INTEGRATED OIL COMPANIES SURPLUS OR DEFICIT OF 1974 CASH EARNINGS

[In millions of dollars]

	Cash earnings	Capital expenditures	Common dividend	Capital expenditures plus dividend	Surplus or deficit of cash earnings
Amerada Hess	380.6	417.2	7.2	424.4	−43.8
Ashland	214.4	183.7	31.4	215.1	−.7
Atlantic Richfield	953.4	1,178.5	105.4	1,283.9	−330.5
Cities Service	482.0	444.9	61.0	505.9	−23.9
Continental Oil	686.8	674.3	85.8	760.1	−73.3
Exxon	4,854.0	3,650.0	1,118.9	4,768.9	+85.1
Getty	538.0	449.7	24.3	474.0	+64.0
Gulf	1,848.0	1,661.0	307.0	1,968.0	−120.0
Kerr-McGee	194.5	228.0	21.3	249.3	−54.8
Marathon	320.6	235.0	53.9	288.9	+31.7
Mobil	1,978.1	1,640.0	325.9	1,965.9	+12.2
Shell	1,275.8	929.2	165.1	1,094.3	+181.5
Standard of California	1,677.0	1,726.2	326.6	2,052.8	−375.8
Standard of Indiana	1,874.4	1,790.0	233.9	2,023.9	−149.5
Standard of Ohio	202.7	700.0	37.5	737.5	−534.8
Sun	706.2	834.1	37.1	871.2	−165.0
Texaco	2,376.7	1,965.0	570.6	2,535.6	−158.9
Union	723.9	688.1	60.3	748.4	−24.5
Total [1] (18 companies)	21,287.1	19,394.9	3,573.2	22,968.1	−1,681.0

NATIONAL COAL ASSOCIATION,
Washington, D.C., May 9, 1975.

Senator LLOYD BENTSEN,
Chairman, Subcommittee on Financial Markets,
Senator MIKE GRAVEL,
Chairman, Subcommittee on Energy,
Committee on Finance, U.S. Senate, Washington, D.C.

GENTLEMEN: Your Subcommittees have just completed joint hearings on the capability of the financial markets to provide capital for the development of domestic energy sources. With respect to the coal industry, I would like to briefly summarize what we believe the capital requirements will be over the near-term—to 1985.

How much of the need can be met by internally generated capital will depend on many factors, including additional incentives under the tax system. However, since tax incentives are not the subject of this hearing, I will direct my comments generally to coal's capital demand.

Economists estimate, on the assumption that OPEC oil will continue to be available, that coal's capital needs will be at least $21 billion between now and 1985 to meet demand requirements. For an industry with a current capitalization of about $5 billion, the magnitude of this capital need is almost staggering.

However, this can be a realistic national goal if coal is permitted to undertake the necessary investment now in productive capacity. It can be accomplished if Congress is willing to create a legislative climate sufficiently favorable to the rapid and orderly development of coal.

Legislative policy must reduce the risk of investment in coal to the levels common to other businesses. The public must realize that profit is a normal part of the cost structure of industry. Without the attraction of potential profit no investor would take a dollar out of an insured savings account to risk it on investment in an industry which is in apparent disfavor with governmental policy.

In 1974, coal production totaled 590 million tons and coal consumption was 620 million tons. In 1975, barring labor disputes and restrictive legislation, coal production is estimated to increase seven percent over that of last year. Seven percent is a healthy increase, especially coming on a production base that has been virtually stagnant for the past 20 years. While western tonnage is beginning to have a major impact, expansion should come from the southern Appalachian region and even more could be coming out of northern Appalachia if overly harsh pollution regulations did not bar the way.

But these figures, good as they may appear to be, are insignificant in the light of coal's potential growth. The National Academy of Engineering has targeted a production level of 1.2 billion tons annually by 1985. The Secretary of the

Interior has projected an even higher production level, some 2.0 billion tons annually. This latter number is contained in the Administration's Project Independence, and thus represents a level of output attainable only with the strongest national commitment.

Let us assume that the more conservative projection made by the National Academy of Engineering is obtainable. According to NAE, this is what the coal industry will have to do if, in fact, it is to meet the projected level of production:

Develop 140 new two-million-tons-per-year underground mines in the East.

Open 30 new two-million-tons-per-year surface mines in the East and mines generating 105 million tons per year of new production in the West.

Manufacture 140 new one hundred cubic yard shovels and draglines.

Build 2,400 continuous mining machines.

To give you a better appreciation of equipment costs, those 2,400 continuous miners mentioned in the NAE study cost about $225,000 apiece. A strip mine bulldozer, necessary to reclaim surface mined lands costs about $100,000, and a large shovel or dragline runs from $5 million to $12 million.

Economically, failure to achieve a 1.2 billion ton level means a continuation of an oil balance of payment deficit which now approaches $2 billion per month. Neither the United States nor any other nation can sustain this type of national deficit for very long.

It is generally accepted in the coal industry that the capital cost of installing a new deep mine is now $30 to $35 per ton of annual production. Thus, a medium-large mine, with a capacity of one million tons a year, represents $30 million to $35 million investment by the time it begins commercial production. To bring a one million ton per year surface mine to commercial production would cost about $25 million.

Since the industry needs to replace about 5 percent of its capacity every year simply to replace mines that are worked out, it must open new mines with about 30 million tons of capacity annually just to stay even.

The fundamental premise that coal must be the keystone to our energy picture is obvious when we consider that our nation cannot forever rely on ever-increasing amounts of Mid-East oil. Take, for instance, some realistic but basically conservative figures, the known recoverable reserves of oil and gas in the United States, and the recoverable portion of the demonstrated reserves of coal—in other words, the reserves of each fuel that have been located, measured, and that we know can be economically recovered with present technology:

Fuel	Standard units	Equivalent, in billion tons of coal
Coal	217.0 billion tons	217.0
Natural gas	250.0 trillion cubic feet	12.3
Petroleum	35.3 billion barrels	9.4
Natural gas liquids	6.5 billion barrels	1.2

In that list, coal is 90 percent of the total. If we add all the uranium that can be produced at up to twice the current price and oil shale at competitive prices, coal is still 80 percent of the total. The amount of coal included in the table above would last, at the present rate of production, for about 300 years.

If we choose to rely primarily on indigenous energy—and no other choice seems logical—most of the demand must fall on coal. Nuclear energy will be important, but it has technological problems which are seriously hampering its growth potential. In addition, nuclear fuel will not be abundant until workable breeder reactors are perfected and they are not expected by the scientific community to be a major factor until the turn of the century.

If the nation, therefore, must turn increasingly to coal for its energy supply, the coal industry of 1975 and beyond must be, in many respects, totally unlike that of the past.

If we are to produce 1.2 billion tons of coal in 1985 as government forecasters say we must, the coal industry in the next decade and beyond has to be assured of long-term growth. It must expand at an annual rate of nine percent in order to mine the necessary coal, replace depleted mines and provide a capacity margin above actual production.

I have reviewed the capital requirements—more than four times greater than our current capitalization. It was not until recently that coal companies have been able to internally generate any appreciable amount of capital, and only now are we becoming an industry that can attract venture capital from the financial community. In spite of our more favorable financial outlook, we must turn to external sources for the greatest part of our expansion funds.

I trust the findings of your hearings will further document our industry's need for growth capital. In addition, I sincerely hope your deliberatitons will result in action designed to enhance the capability of private financial markets to meet the coal industry's capital needs.

If I or any of my staff can be of assistance in this or any other matter related to the coal industry please do not hesitate to call on me.

I respectfully request that these comments be included as part of the hearing record.

Sincerely,

CARL E. BAGGE.

PACIFIC LIGHTING CORP.,
Los Angeles, Calif., May 9, 1975.

Mr. MICHAEL STERN,
Staff Director, Senate Committee on Finance,
Dirksen Senate Office Building, Washington, D.C.

DEAR MR. STERN: This Statement is submitted by Pacific Lighting Corporation for inclusion in the record of the joint hearings of May 7th and 8th of the Subcommittee on Financial Markets and Energy, Pacific Lighting Corporation is a Los Angeles based holding company whose principal subsidiary is Southern California Gas Company. Southern California Gas Company is the nation's largest gas distribution utility serving one out of every thirteen of the nation's gas customers.

Since 1960, Pacific Lighting Corporation, through a number of other subsidiaries, has been actively seeking new supplemental supplies of gas for southern California which has been dependent on gas as its basic source of stationary research for many years but is now in a position of serious deficiency; This search has included exploration and development activities in our traditional supply areas of the Southwest, a proposed major coal gasification joint venture in Northwest New Mexico which will be the pioneer plant in this country, proposed L.N.G. projects from South Alaska and Indonesia and participation in the Arctic Gas consortium which proposes to bring Prudhoe Bay and Mackenzie Delta gas to markets in the lower 48 states and Canada. These projects will also require substantial capital commitments. Our one-half share in the proposed coal gasification project alone represents about two-thirds of our present net worth.

It has been estimated recently that the total capital requirements of the natural gas industry will be between 100 and 120 billion dollars over the next ten years which is more than double the gross plant investment for the entire industry at the end of 1973. The challenges to the industry and the capital market are immense. However, there are initiatives which we believe can be taken by the industry, by the financial community, by the regulatory agencies, and by Congress which will enable us to meet the energy needs of this country and at the same time preserve the economic system which has so far provided this nation with the world's highest standard of living.

It is clear, this industry does not have the financial capability at the present time to finance all the projects required to help meet this country's energy needs. Because of the sheer magnitude of the dollars, project financing will be required if many of these projects are to be financed and built. This means that investors must be assured that there will be sufficient revenue flowing to each project over its full life to recover its expenses and for them to recover their investment plus an adequate return thereon.

In our projects, we propose to have Southern California Gas Company contract on a "take or pay" basis for its projected share of the output from each project. We can only do this, and investors will accept no less, if the regulatory agencies (the Federal Power Commission and the California Public Utilities Commission, in our case) accept, approve and endorse the concept that investors must be assured the return of their investment over the life of the project. Unfortunately, the Federal Power Commission did not provide such assurances in its recent decision in our coal project (Transwestern Coal Gasification Company, et al.—

Docket No. 73-211—Opinion No. 728—Issued April 21, 1975) and has rendered the project unfinanceable based on the terms of such decision. We are at present preparing to file for rehearing and modification of the order. Because we do not have the financial resources to guarantee repayment to the lenders, it is necessary that the customers who are to receive the gas, provide the underlying assurances required to finance the projects. To the extent regulatory authorities and the industry will not or cannot provide assurances satisfactory to investors, it is clear to us that some form of governmental assistance will be required.

Regulatory delays have compounded the problem. In the case of our coal project, we originally filed an Application with the Federal Power Commission on February 7, 1973 and the decision was not received until April 21, 1975, a period of two years and three months. During this period costs have skyrocketed and this imperatively needed energy supply has been delayed perilously.

There are a number of specific other things we believe the Congress can do to help assure this country a continuing adequate and independent energy supply and to encourage capital formation to finance such a program.

1. Eliminate or defer the tax on dividends paid from the earnings of a regulated utility company when the dividends are reinvested in the payor's stock and provide for capital gains treatment upon the ultimate sale of the stock. This will enhance the attractiveness of utility stocks in the market and aid the formation of utility equity capital. This provision should include dividends paid by holding companies such as ours with a predominant investment in utility property.

2. Eliminate or defer the capital gains tax on sales of capital assets by investors who reinvest the proceeds in the debt or equity of regulated utility companies. This will also aid the formation of utility capital.

3. Eliminate the U.S. withholding tax on portfolio interest paid to foreign investors who have been reluctant to subject themselves to this taxation. Elimination of the withholding tax will materially help U.S. corporations obtain funds in foreign capital markets.

4. Permanently continue the 10% investment tax credit rate.

5. Extend the higher investment credit limitation (now limited to distribution companies) to include all natural gas utilities, particularly transmission facilities and new gas supply project facilities where nearly all the new capital formation is needed, and continue the limitation in these cases at the 100% level.

6. Provide that any unused investment tax credit be refunded directly to the taxpayer after a stated period of time.

Thank you for the opportunity to submit our views on the critical problem of financing essential energy projects.

Sincerely,

JOSEPH R. RENSCH.

PPG INDUSTRIES, INC.,
Pittsburgh, Pa., May 7, 1975.

Re: Capability of U.S. Financial Markets to Provide Capital for the Development of Domestic Energy Resources

Mr. MICHAEL STERN,
Staff Director, Senate Committee on Finance,
Dirksen Senate Office Building,
Washington, D.C.

DEAR MR. STERN: I would like to review for you briefly PPG Industries' involvement in the solar energy field—what we are doing now in research and production and what we hope to accomplish in the future. Most importantly, I would like to suggest some areas where you as the Staff Director of the Senate Committee on Finance can encourage widespread application of solar energy systems.

Many people never considered solar energy and what could be accomplished with the power of the sun until the summer of 1973. We were coming out of one minor energy shortage, heading for another winter. It was at that time that the House Science and Astronautics Committee began work on HR 10552, the Solar Heating and Cooling Act of 1973. The chief sponsor was Congressman Mike McCormack of Washington.

At that time, only a few universities and small companies in the United States were engaged in solar energy activities. An example is the Solar One test house at the University of Delaware. However, in many other countries—for instance, Australia and Israel—solar energy had been developed to a high level of national usage.

In the early 1970's PPG Industries was involved in supplying glass and glass technology to producers and scientists engaged in solar systems projects, among them, an experimental design for a home in West Virginia. No one was demanding completely fabricated solar collectors, and no one foresaw a market for such units. The National Aeronautics and Space Administration was developing solar cells--units which convert sun rays directly into electricity—but this was something only for space programs.

But while PPG Industries and other American industrial firms were not yet heavily engaged in solar activity, PPG was deeply involved in developing and manufacturing insulating high-performance architectural glasses for energy conservation. For example, double glass construction units were developed with a sealed air blanket between, providing high heat retention in winter. Reflective insulating units combine the double-glass construction with a transparent coating applied to the glass. By means of this coating, the unit reflects the sun's heat for lower cooling loads in summer, in addition to insulating against heat loss in winter.

These examples point up the versatility of glass. Clear glass transmits a high degree of solar radiation and has a total heat gain of 200 BTU's per square foot per hour. This makes it ideal for solar collectors. By contrast, reflective insulating glass transmits only 53 BTU's, making this product ideal for use in windows to reduce energy loads on a building's air conditioning system.

Many buildings constructed during the past decade have used high-performance glasses to combine attractiveness with energy savings and a high degree of natural lighting. These special insulating glass units were developed for commercial and residential construction as a result of a new need demanding a better product.

The glass industry's product upgrading of earlier years became increasingly important as the fuel crisis worsened in late 1973. Architects and builders who hadn't been especially concerned about conservation in the era of cheap energy began demanding high-performance glasses, and the glass industry was prepared to furnish them.

At the same time, some critics of fuel waste zeroed in on a highly visible target—the so-called all-glass building—without being fully informed about the small role glass plays in total U.S. energy consumption or the glass industry's advances in product technology.

Careful examination has shown that insulating and heat-reflecting glasses can aid energy conservation in buildings without sacrificing the traditional natural lighting, comfort and appearance benefits of large glass areas. There are many dramatic examples of this building in the United States.

From its background in the energy conservation aspects of glass, PPG quickly recognized the contribution it could make in the emerging area of solar energy. When we testified before the House in late 1973 concerning the Solar Demonstration Act, we reviewed our energy-conserving glass technology and pointed out its relationship to solar energy applications. We told the House Subcommittee on Energy that we had the technology not only to keep heat out of a building but also to capture the sun's heat for useful solar systems.

We felt at that time we could provide valuable service to the new solar interests because of our basic technology and our experience related to the requirements for producing an end product, the scope of manufacturing operations needs to serve the market, and the economies of large scale manufacturing.

As the hearings developed, and as PPG became more involved in private and group studies on solar energy, we became convinced that the impetus for the solar energy program would be inadequate unless a company capable of mass production began to manufacture solar collectors.

In early 1974 our first solar collector was developed, and we currently are in mass production at our plant in Ford City, Pennsylvania. We were able to accomplish this task because of our in-house knowledge of properties and techniques relating to environmental glasses as well as our manufacturing capabilities. We had our own aluminum framing operations, our own glass and tempering facilities, our own absorbent paint coatings, and the experience of over 25 years of related glass technology.

At the present stage of development, solar systems are ready for immediate, economical and widespread use for the heating of hot water, and are practical for certain space heating applications. For practical cooling by means of solar systems, continued work on collector development is needed, but this too can be accomplished in a relatively short time.

In recognition of remaining needs, PPG Industries had made a top-level decision to advance as quickly as possible to develop collector units that will make solar-powered cooling feasible, and that will make both solar heating and cooling systems economically attractive for wide-scale use.

I might note here that although development of practical solar collector units is somewhat involved, the concept of solar systems is a simple one. All systems include collector units which gather the sun's energy by absorption and transfer it to a circulating fluid within the unit. Piping systems then carry the heated fluid from the collectors to hot water and heating units, and potentially to cooling systems. The principle of a solar cooling system is the same as that of a gas-fired air-conditioning system, with the gas-burning unit being replaced by a high-temperature hot water coil.

The advanced collectors that PPG is working on now will be more efficient than present units in using solar energy to heat the circulating fluid. Generating high temperatures in this fluid is the key to successful operation of solar cooling systems.

PPG Industries is moving ahead as quickly as possible on our solar energy programs. As our research, development and mass production increase, the resulting improved and more economical collectors will help in furthering use of solar energy for hot water, heating and cooling.

We also expect that the solar systems industry in general will make great advances. Each day, the newspapers and magazines carry articles about new homes and other buildings using solar energy systems. Almost all such solar buildings are individually designed and custom constructed, because there are no handy, complete packages a builder can buy from a lumber yard or other distributor. However, this situation is being remedied right now.

In our opinion, solar energy represents a dynamic and highly rewarding opportunity for industry, government and the people of our country. Not only new buildings but existing ones as well can be equipped to take advantage of this perpetual energy source. A 10-year old school in Atlanta, for example, currently is being converted to solar heating and cooling under a National Science Foundation project involving Westinghouse Electric Corporation and PPG.

To continue our strides in utilization of practical and economical solar energy systems requires the continued development and improvement of solar system components; the design of ready-made, off-the-shelf equipment; the establishment of a distribution network; the establishment and training of system designers and contractors; the active involvement of all levels of government, and a national commitment.

With these comments as a background for PPG's involvement and opinions concerning solar energy, let me progress to our evaluation of government policies and how we feel various agencies can best aid the development of solar energy.

A little over three years ago the primary concern of solar enthusiasts was how much money would be allocated to solar energy research. With the introduction of the Solar Heating and Cooling Act of 1973 those concerns turn from how much, to precisely how the money would be spent. Specifically, the question arose as to whether or not demonstration projects were necessary, and if so, how many. With the passage of that Act, the problem logically turns to how the program could best be implemented. When the Energy Research and Development Administration was created, the scope of government involvement broadened into much wider areas including the question of management of the courses of development of solar systems and the difficult issue of incentives. It is this issue of incentives and their impact on capital requirements that I address the remainder of my comments.

First, industrial incentives. Most manufacturing companies are goal oriented. They perceive a market and proceed to create a product which will return them a profit. The market is normally defined, if only vaguely, and financial analyses can be done to determine if capital investment is warranted. When no definable market or distribution system exist, as is the case with solar systems, and assuming that industry, when given a choice, would prefer to progress without government involvement in research and development, the technique of incentives through tax credits and accelerated depreciation allowances can become very influential.

PPG, as well as many other large corporations, has made substantial investment of time and money in the last few years investigating solar energy. Larger corporations such as ours have an advantage of having substantial in-house

research facilities. In our case, the solar collector was a logical step forward from existing technology with glass and environmental control. However, large corporations can have cash flow problems and small fledgling solar firms more than likely will have no cash at all for research and development, so financial incentives obviously create a positive atmosphere for progressive firms.

We do not feel that incentives will be necessary for the middle-men (distributors and contractors) simply because their additional capital requirements will be minimal and the profit motive will provide adequate stimulus.

The real key to rapid progress in the solar energy field is the immediate creation of a marketplace. While individuals are clamoring for relief from increasing energy costs, they are not convinced that the high initial costs and relative newness of solar systems warrant their involvement. The Solar Heating and Cooling Act along with many independent experimental and model programs is taking care of eliminating the "newness" problem. The current economics at the homeowner and building owner's level appears to be the key stumbling block. Failure to provide ample incentives at this consumer level might be the largest drawback in the progress of solar energy.

There has apparently been some concern in the government about the magnitude of such incentives and their impact on national finances. The result of improper knowledge could be to minimize these incentives thus imperiling early solar progress.

There are about 75 million homes in the United States. TRW presents the following figures in their Phase O study based on a per installation unit cost of $8,000 providing 70% of demand for 1980:

	Without incentive	With 25 percent tax credit
Single family	1,430	2,030
Multifamily	6,520	8,150
Commercial buildings	650	680

Our best guess is that fewer than 3500 installations at prices ranging from $1500 for hot water to $8000 for hot water and space heating will be in place by the end of 1975 with a possible doubling in 1976. These figures are based on no incentives at the local, state and federal levels and are slightly higher than TRW. We estimate that 20% to 30% more installations would occur if incentives at all levels existed now. In all cases, the financial impact on the consumer is substantial, but the total impact on governments is far from being detrimental.

To summarize:

A need for alternate, non-polluting and non-depletive fuel is absolutely necessary to reach some level of energy independence. Solar energy can certainly fill this bill.

The public is ready to accept a non-polluting, non-depletive energy source *if it doesn't cost them anything.* In fact, the public is already willing to lay out capital to alleviate their accelerating energy costs.

The public is leery of a relatively new and untested energy source, but rising energy costs are already diminishing their fears.

Simple logic tells us that monetary incentives will cause a normally conservative buyer to become less conservative.

Consumer incentives will cause faster progress than industry incentives.

The total dollars required by various levels of government in the next five years is not substantial even at the maximum number of projected installations. Low incentives would be counterproductive to the purpose of increasing installations.

For incentives to work, they must be flexible. To that end, perhaps, previous attempts at incentive legislation should not be used as guidelines.

The potential of solar energy systems to alleviate pollution and energy source problems is enormous. A limiting influence could be confusion between federal and state governments and confusion among agencies within the same level of government.

Let's act quickly, with solid coordinated incentive programs and keep it simple.

Yours very truly,

NEILL M. BARKER,
Manager, Solar Systems Sales.

STATEMENT OF DANIEL M. ROHRER, BOSTON COLLEGE

INTRODUCTION

As the United States pursues its goal of energy independence and endeavors to attain the ability for self-sufficiency, several problems must be considered in analyzing the capability of U.S. financial markets to capitalize energy projects. The need to quickly expand and develop new oil sources was aggravated further on March 24, 1975 when President Ford signed an executive order placing 24 nations on a trade blacklist. Including here all 13 members of the Organization of Petroleum Exporting Countries (OPEC). In light of such action which will probably worsen U.S. relations with OPEC nations, it is essential that Congress refine legislation which will attack the problems of energy shortages, the refusal of industry to develop alternative sources of energy or to expand their energy resources, the ability of industry to set prices due to power arising from concentrated ownership, economies of scale, capital shortages and investment needs, and complications which result from lower prices and taxes waged upon the production and sale of energy.

SHORTAGES

It is commonly believed that the giant natural gas and oil monopolies have for several years deliberately engineered gas and oil shortages with the compliance of the Administration. After Nixon authorized oil imports, the response of the major oil companies was to import only one-third of the additional crude oil the President had authorized and to run most of their refineries below capacity for the rest of the year. This action on the part of the President and the oil companies was probably the beginning of the first peacetime petroleum shortage in the U.S. Several high-ranking American officials have known about well cappings for years. This information has been kept secret at the urging of the State Department. The oil shortage may have been deliberately contrived and tolerated by the government not only as a result of pressure from powerful oil industries but also for the purpose of setting aside laws and regulations which would otherwise prevent oil companies from polluting coastal waters, destroying the land by strip mining for coal, and polluting the air and water.

The government has further been instrumental in limiting the availability of coal. Most of the Nation's untouched supplies of coal are located on public lands in the West. These lands are administered by the Bureau of Land Management, a section of the Interior Department. Although there has been an increasing demand for coal to supply electric utilities with fuel, the bureau routinely parceled out coal to oil companies without requiring competitive bids. It was reported that the oil companies then sat on the land, holding it out for production, contributing to the scarcity of coal and driving up the price. An increasing number of oil and gas companies have expanded into the other areas, such as coal and nuclear energy, in an attempt to maintain themselves as the demand for oil and gas becomes greater and the supply less.

GROWTH AND DEVELOPMENT

The natural gas companies have refused to explore for new resources, the oil companies have refused to build new refineries, all part of their plan to restrict the needed growth in supply. Federal Trade Commission experts have testified that major oil companies are simply sitting on fields which could be producing oil and gas today. As was pointed out by *Editorial Research Reports* in 1973, by a written agreement between I. C. Farben, a German chemical firm which developed the technique of coal gasification, and Standard Oil of New Jersey, Jersey Standard was given sole right to the process outside Germany. They proceeded to sit on it to prevent anyone from using it in competition with Standard's oil and gas. The 23 largest oil companies also block the development of alternate new energy sources. They have retarded research in oil shale for fear of developing a new competitive energy industry.

CONCENTRATION AND PRICE SETTING

The major oil companies have not only aggravated their contrived shortages by refusing to develop their alternative sources of energy but they have used their shortages to put independent dealers out of business. Fuel shortages in the U.S. are linked directly with the anti-competitive practices of big oil companies. These practices include cooperation in lobbying for and against legisla-

tion, bidding for crude oil leases, and fixing the price of crude oil. The oil business in recent years has become increasingly dominated by a relatively few enormously wealthy and large corporations. This fact could create a tendency to seek monopolistic domination of a large segment of the American economy. Central to the antitrust position against the major oil companies brought by the states of Florida and Connecticut, and to the complaint filed by the Federal Trade Commission, is the contention that, through a deliberative policy of illegal combination and conspiracy extending over many years, the major oil companies have restricted independent entry and operation in all phases of the petroleum industry, thereby destroying the possibility of free and fair competition.

The monopolistic tendencies of oil companies affect many related energy industries. Evidence in the file of the FPC indicates that some natural gas producers in the U.S. have been trying to buy up available reserves, intending to keep the gas off the market and await higher prices. Most of the natural gas used in the U. S. is produced by a relatively few large companies, the major oil companies. The top 14 companies sell approximately 75 per cent of the total interstate gas sold in the U. S. and dominate the entire industry, according to Charles F. Wheatley, General Counsel, American Public Gas Association. In an effort to become total energy companies, the oil industry has consumed most of the coal producers. It already controls much of the natural gas reserves, and it is now moving into uranium. If oil companies control uranium as well as rival fuels used to generate power, they can set prices so as to make Americans pay billions of dollars more for electricity.

The major oil companies in general and the eight largest majors in particular have engaged in conduct which exemplifies their market power and has served to squeeze independents at both the refining and market levels. Such conduct and associated market power has its origin in the structural peculiarities of the petroleum industry and has limited the independents' share of the market to approximately one-quarter of the total. For nearly a quarter of a century the big oil firms have controlled the market from oil well to gasoline pump, making it almost impossible for new companies to enter the refining business. The development of total energy companies through acquisition of formerly competitive fuels represents a classic horizontal integration problem. The firms are interdependent in their pricing. Each firm avoids setting prices that are mutually destructive: it aims for prices that maximize its returns and by the same token those of others. To the extent that the gasoline crisis is real, the policies pursued in concert by major oil companies have been instrumental in its creation. So long as the majors are permitted free of any effective legal restraint, free of compliance with federal and state law, free of assuming their burden of the Federal tax laws, free from independent competition, to advance upon a complex of policies which are the antithesis of free enterprise, all the gasoline purchasers of America, public and private, will be at their mercy.

ECONOMIES OF SCALE

In the case of fuel industries, the acquisition of sufficient reserves, the initial development costs and the heavy mechanization necessary to take advantage of scale economies require the investment of substantial amounts of money. Specifically, energy producing firms, from coal strip miners to electric utilities, require large capital investments even to begin. Since such investments must be paid for whether output is high or low, the large firm stands in a better position than the small one to face the considerable work involved in developing and exploiting sources of energy.

It is for this reason that stringent application of anti-trust statutes to dismantle intra-fuel concentration might destroy rather than preserve the energy industry. The disruption caused by divestiture might worsen the fuel crisis for it could only result in chaos. Since the processing and refining of mineral resources require large capital expenditures, small diversified units may be inefficient. Combination companies were found to sell similar quantities but less electricity per customer. There is considerable doubt as to whether this reflects the combination or the location of companies. The clear mandate for breaking up combination companies is not supported by the evidence.

The antitrust laws are part of this country's basic economic philosophy, and as part of the law must be enforced. But as the late Joseph Schumpter of Harvard taught: "There are good monopolies and bad monopolies." Small-scale operation

saves relatively little in a capital-intensive industry. Conversely, high output adds little to costs, which are already largely sunk in fixed capital, but enables the investment to be spread over a larger revenue-yielding volume. So the unit costs of energy ostensibly go down as the scale of the operation goes up. That is why economists maintain that energy-processing firms are generally characterized by increasing returns to scale. When William E. Simon was Chairman of the President's Oil Policy Committee, he thus wrote the Chairman of the FTC to warn that an FTC antitrust case against major oil companies could worsen the energy crisis. He said that the suggestion that oil companies might have to divert producing or refining operations gives him a great deal of concern of its implications for domestic energy supply in the next few years. As John Landon of Case-Western Reserve explains, the evidence presented raises serious questions concerning the "monopoly" behavior of combined electric and gas utilities. No relation was found between price and incidence of combination utilities when all other factors are held constant. The regression equators argue convincingly that, given output and the distribution of it between customers, there is no separable consequence of combination utilities for price.

There are at least three alternative explanations for higher prices charged by combination companies than by their independent counterparts: (1) Combination companies may be able to use their monopoly power to achieve a higher margin of price over cost. (2) Less active promotion of electricity use, which as hypothesized by Landon and Wilson, may result in lower output and correspondingly higher prices (assuming economies of scale). (3) Differences may result from regional or other coincidental factors. Nevertheless, crude oil prices and profits would probably be measureably lower if the oil companies were not integrated all the way from crude production down to the service stations. If crude oil were available to independent refiners, crude oil prices would find their realistic free market value.

Despite the fact that prices might be lower with less concentration and integration, the goal of reducing prices of energy products would be extremely unwise. Even with the higher prices which have resulted from concentration, big oil companies are uninterested in stripper wells for they require too much maintenance, too much bookkeeping, and they are not profitable to large operations. In general, production will fall if prices on oil decrease. The independent oil producer who finds and produces a substantial portion of domestic oil will be most hurt by this disincentive. According to Senator Tower, approximately 75–80 per cent of the domestic exploration in this country is produced by independent operators not by major oil companies. Tower claims that rolling back prices does not affect the profits of the majors but only discourages production by the independents. We can, however, be successful in generating the new domestic capacity. It is a function of the cost of capital investment as compared to the rate of return. If the growth rate in the petroleum industry is to be accelerated sufficiently, it can be accomplished only with higher prices for petroleum. But governmental restraints of various forms are likely to constitute a major roadblock to price advances of the required magnitude. In 1974 Senator McGovern recognized that removing the great bulk of profits that oil companies earn in excess of the 1969-1972 based period might deprive them of the money they need to explore for oil, build refineries, or develop nuclear power.

Lower prices, furthermore, would mean less conservation on the part of consumers and less incentive to produce on the part of owners at a time when energy shortages already exist. For capital and energy are highly complementary. If the price of energy rises, energy consumption decreases and demand for capital goods falls. From 1947–1971 every one per cent increase in the price of energy reduced demand for capital goods by 16 per cent. Thus a doubling of energy prices would cut off demand for capital goods by fifteen per cent. Costlier energy will accelerate the shift from goods to services. Since nearly all services consume less energy than do goods, the price of most services will be falling in relation to goods. And with rising energy prices, final demand will shift to those goods-producing industries that use a higher proportion of labor per unit of output. Energy and labor are substitutes for one another. Rising energy prices will increase the number of job opportunities more rapidly than otherwise would have been the case. For example, a shift from disposable to returnable bottles and cans saves 30 billion kilowatt hours of electricity, increasing jobs by 30,000. And as the demand for labor rises so will wages.

It should finally be understood that profit volumes are not a good way to measure the profitability of a business because they give no indication of changes

in the volume of sales or of the stock of invested assets which produced them. The legitimate way to measure profits is not in aggregate terms but as a rate of return on investment. And it should be noted that from 1963–1973 the rate of return in the petroleum industry declined while in the manufacturing industry it increased. Throughout this period the rate of return on investment in the petroleum industry was always behind the manufacturing industry. During much of the last decade, U.S. oil companies and utilities earned a rate of return lower than U.S. manufacturing companies as a whole. Less risky and less basic industries than oil and utilities, with much smaller capital investment needs, have been earning 15–20 per cent. This is in contrast to the 10–12 per cent earned by energy stock investors who are wary of sinking money into an industry whose most visible asset—access to foreign crude oil—is threatened with nationalization.

It is not surprising that the attractiveness of petroleum producing investments in the U.S. relative to other opportunities decreased substantially in the 1960s. This change is evident from the relatively constant outlays of around five billion dollars a year, it was reported, for domestic oil and gas exploration and drilling during a year in which total private domestic investment in industrial durable equipment doubled under the stimulus of investment tax credits and accelerated depreciation. Generating the new domestic capacity is a function of the cost of capital investment as compared to the rate of return. Yet the most fundamental factor in determining the energy industry's capacity to raise adequate funds over the last 13 years was an increased price for energy, and prices will be a major factor during the next 13 years.

CAPITAL INVESTMENT

On May 4, 1975 William E. Simon, Secretary of the Treasury, explained that we support a mechanism that would protect domestic investment against a precipitous decline in world oil prices. He claimed that we are not going to obtain the needed ¾ of a trillion to a trillion dollars that is needed over the next decade for investment if the fear exists that oil prices will decline and destroy the investment that has been made. Simon said that some provision has to be made to give a little safety to this for a period of time depending on the investment.

INVESTOR INTEREST

The best and currently the most widely used approaches to the short-term projections of private investment expenditures are the surveys of business intentions. The only concern of the typical stockholder is that he be returned as much money as possible. If he can secure more income, with equal security, elsewhere, he sells and reinvests there. Assuming normal risks, a 12 per cent rate of return should be sufficient to encourage energy exploration and development of domestic production by their companies.

Potentially, there is an ample supply of capital available for new technology development. Venture capital may be found from investment bankers, mutual funds, individuals, family trusts, insurance companies, pension funds, commercial banks, corporations, private and public venture capital companies and private partnerships. Many venture capital investors seek high risk situations. Nevertheless, the petroleum industry has traditionally relied on internal cash generation for most of its investment capital. But in view of its enormous capital needs, it appears the industry will have to rely much more heavily on capital markets in the years ahead.

The oil companies are falling deeper into debt. Chase Manhattan reports that 37 of the largest U.S. owned oil companies have been forced to finance an increasing portion of their capital expansions by going into long-term debt because of difficulty in raising funds through the preferred method of selling common stock. It is abundantly clear that utility common stock investors have experienced substantial capital losses in the past five years. Unless investors become more convinced that the rate of return on equity will return to higher levels permitting improved earnings per share growth and the possibility of market appreciation, there is no reason for investors to purchase the common stocks. Investors in utility common stocks have not been able to achieve a satisfactory level of return on their investments for two reasons: (1) Due to constant inflationary pressure on utility costs and the long period required to decide rate increase applications. (2) The regulatory returns of equity are calculated on the book value of the common stock not the market value which the investor must pay.

The most serious problem concerns the energy industry's ability to attract the American savings into new issues of common stock. The common stock investor assumes considerably more risk than the bond investor both from a legal and investment standpoint, according to Eugene Meyer, Vice President of Kidder, Peabody and Company.

BORROWING

Despite these conditions, however, additional financing will be necessary. The return on earnings must be tempered between stock dividends and reinvestment. Companies have in the past relied on oil and gas funds, equity capital, and borrowing to finance expansion of their activities. These outside sources have in fact been the major sources of funds for most of the smaller companies. According to a recent FPC memorandum, an accelerated increase in an industry's investment requirements leading to a sharp increase in the ratio of external financing may be a cause for concern, but the danger would be in the probable rise of borrowing costs because of the need to divert funds from other potential borrowers. This danger would be largely offset by a realistic depreciation policy and adequate prices to cover the added costs of capital. The energy industries' past record of success in capital borrowing cannot offer assurance of equal success in the future because the competition for an unprecedented volume of financing has multiplied. Recently a major international plan to finance energy exploration development marketing and transportation has been formed with combined resources of more than 180 billion dollars. Based in London, operations of the International Energy Bank are worldwide with emphasis on large scale financial services in oil and gas developments. With the exception of this source, however, capital borrowing is a limited solution in light of the tight Federal Reserve reins on credit. In times of high inflation rates, it is difficult to loosen credit.

LEASING

As an alternative, the basic attractiveness of leasing is its ability to provide financing at a lower cost than might be otherwise available. The tight money situation has closed down other sources of capital and accelerated demand for leasing. Faced with higher capital costs, more and more businessmen are beginning to lease plants and equipment. In 1973 fifteen percent of all capital equipment acquisitions were made in this way, and leasing will no doubt increase in the future.

FOREIGN INVESTMENT IN UNITED STATES OIL

There can be substantial advantages to the U.S. from foreign producer governments' investments in the U.S. oil industry. It would help ease the very large capital requirements of the industry. It would create economic incentives through integrated or otherwise tied-in downstream investments for producer governments to maintain a steady and reliable supply of oil. Foreign direct investment in the U.S. is expected to grow rapidly in the near future. Most U.S. businessmen seem to agree that factories, no matter who owns them, are good for the U.S. economy. Over the years the Arabs have piled up American holdings estimated to be 10–15 billion dollars. The Arabs are likely to aim at "downstream" oil activity—refining and marketing in consuming nations. Foreign investments are receiving hearty approval from the U.S. government. It is a chance for the U.S. to reverse its unfavorable balance of payments. The massive funds that have gone to the OPEC nations comprise a substantial amount of savings which should be used for productive levels of investment both in the developing and in the developed countries, including the United States. We should encourage investments in this country and have as few restrictions as possible on them.

RISK IN ALTERNATIVES

Heavy financing in recent years, due to nuclear plants and increasing construction costs, developed at a time when interest charges were high and capital in short supply. As fixed charges on utility investments in new plants increase, financial performance could diminish and this industry would have difficulty in attracting equity investment and raising debt capital. The nuclear breeder program, fusion power, solar energy and MHD are all examples which have tremendous capital requirements and risk factors attached to their successful completion. Crude oil production costs are extremely low, about 12 cents per barrel in the Middle East. No firm could risk investing in a synthetic fuels company if at any

time oil prices could drop easily, eliminating any chance of synthetic fuels capturing part of the energy market.

GOVERNMENT REGULATION

The major constraint on investment lies in the rate of return of the industry. Public policy which adversely affects that rate of return will affect its capital attracting ability and, consequently, the growth of the industry. The greatest difficulties in attracting sufficient capital funds will arise from uncertainties about government policies on such matters as import controls, changes in tax treatment after capital has been risked, and delays in the ability to produce oil and gas after they have been discovered. Direct government investment in or subsidy of energy operations would be undesirable through its impact in discouraging private investments. If the growth rate in the petroleum industry is to be accelerated sufficiently, it can be accomplished only with higher prices for petroleum. But governmental restraints of various forms are likely to constitute a major roadblock to price advances of the required magnitude. Energy producers, caught between rising costs and fixed price ceilings, will respond by cutting back their plans for expanding energy output. They may not wish to do this, but sources of financial capital realize that price ceilings mean lower rates of return in energy. They respond immediately by shifting their funds to other, relatively more profitable sectors and often by cutting back on the total supply of capital funds. This adverse effect of government intervention into the market assumes that government price ceilings are imposed. The energy industries must be able to attract capital away from the channels it has been accustomed to flow in the past. It will be necessary for these industries not only to maintain a profit rate that at least matches that of the strongest competing borrowers in the capital market, but further to exhibit a promise of high investment quality of the assets on which fund raising will be based.

ENERGY TAXES

Price control regulations, natural gas pricing, oil import policy, the schedule for leasing the federal domain, and tax provisions would rank high among the policy items likely to affect future investment. Adverse changes in the tax applied to petroleum production in the Tax Reform Act of 1969 have depressed exploration and drilling by creating fears of further adverse changes in the future. The U.S. oil and gas industry has been paying a higher total tax per sales dollar than other industries. The Tax Reform Act of 1969 raised taxes on U.S. oil and gas production by four percent, an important factor contributing to the 20 percent decline in drilling from 1969–1971, according to economist Richard Gonzalez.

Negative taxes may temporarily reduce savings, thereby raise interest rates and threaten to reduce the level of investment. The impact of negative taxes may be to reduce investment. Senator Jackson's proposal for an excess profits tax would reduce oil and gas production and render us all the more dependent upon foreign oil imported from the Middle East. Furthermore, these measures would render us more vulnerable to future oil embargoes.

CONCLUSION

The taxes corporations pay are passed on to the consumer in the form of higher prices. Less retained earnings to put back into the industry for replacement reduces the ability to attract capital for investment in the company. Furthermore, a company can dodge them easily through wasteful spending. According to economist Joseph Pechman, an excess profits tax is an invitation to companies to spend money like water to get out from under it. This is accomplished by paying huge salaries or bonuses or even making misguided investments. All those activities would reduce the profit subject to the tax, while contributing little to the community welfare.

The indirect result of the excess profits tax may be one of the strongest arguments against the adoption of the energy import tax. Since such action would put a particular squeeze on the Northeast, which depends on imports for 85 percent of its oil, it would force Congress to go along with taxing domestic crude and decontrolling domestic prices as well to even the burden.

A superior alternative to the import tax and the excess profit tax would be to recognize the importance of long term capital gains and long term investment. William E. Simon has suggested a move into the area of integration of corporate and personal taxes, without penalizing the dividend. The corporation would deduct the dividend it pays to the individual in a similar fashion that it deducts its long term bond indebtedness, or the individual could, or a combination of both. There could be a declining capital gain rate for the length of the asset held. It is important that Congress pursue an energy bill that will carry the U.S. toward energy independence. The best means of achieving this objective is to move toward market forces, to utilize higher prices to curb consumption, and to provide the incentive for expanding production. This goal can be reached only by removing controls from this area. Too many impediments to the development of energy resources have been established in this country. This course must be reversed in favor of the fastest possible removal of the control mechanism.

Domestic Petroleum Industry Capital Needs and Availability 1975–85

By The Standard Oil Co. (Ohio), Cleveland, Ohio

Congress cannot act constructively on matters affecting the petroleum industry from this point on unless it takes into consideration the possible impact on industry capital formation.

The term "capital formation" is not new, but it isn't well understood. When we express concern about capital formation in the petroleum industry, we are referring to a question, as yet unanswered, which is, "Where is the money going to come from to create the energy the Country will require?"

The importance of the answer to that question is just this: The availability of energy has a close relationship with the level and direction of our Gross National Product, which in turn, relates directly to the creation of jobs and the general level of employment. To illustrate, the inescapable fact is that the use of energy has closely paralleled our Gross National Product. See Chart 1. If the availability of energy becomes less than the economy needs to maintain increases in productivity, taking conservation into account, there will be unsatisfactory growth in the GNP. The GNP reflects Americans at work, so consequently, there would tend to be a continuing problem with our ability to maintain full employment.

These four things . . . Gross National Product, energy availability, employment, and capital formation . . . are closely bound together and are basic to the economic stability of the Country.

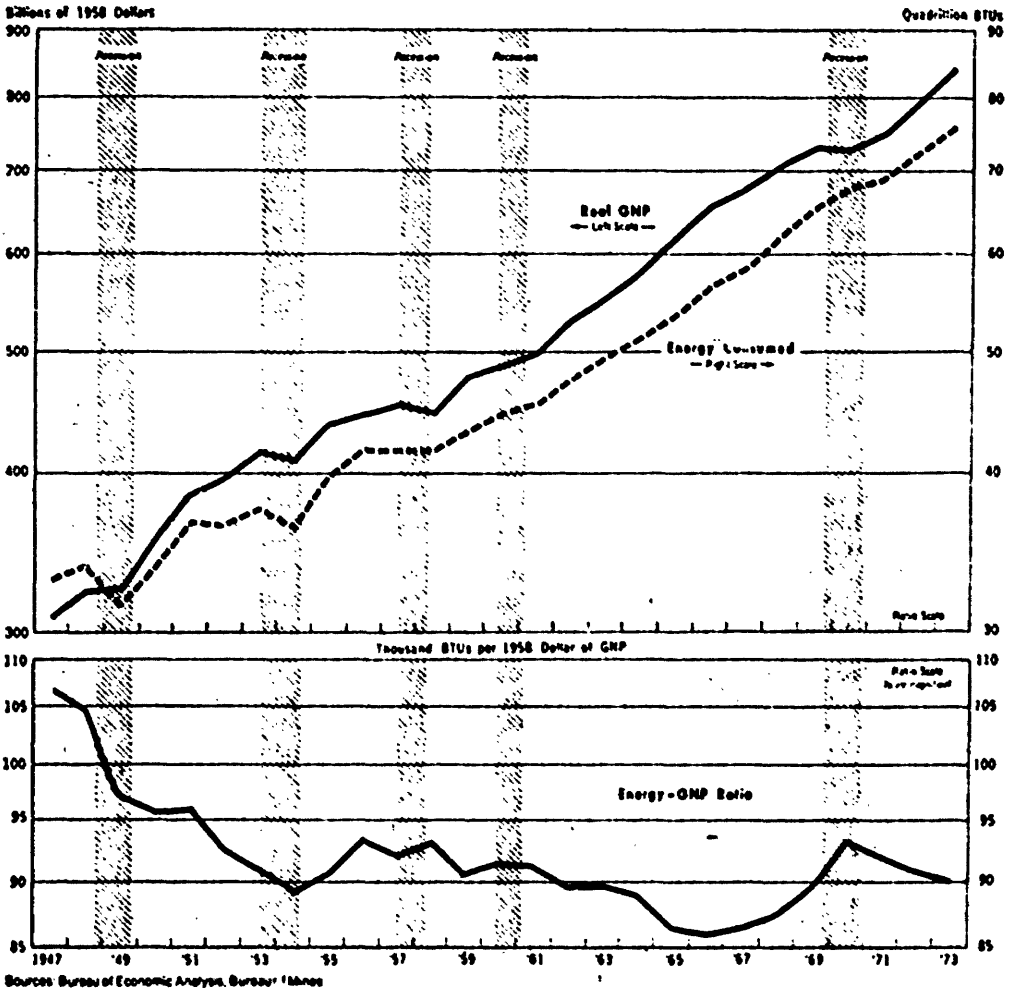
Too often the matter of capital formation is overlooked or disregarded in the legislative process.

The purposes of this paper are to demonstrate the increasing need for capital formation in the petroleum industry and to make a conservative projection of the size of this need. The highlights are summarized below and in the three charts immediately following the summary. The details of the underlying work are set forth in the sections entitled "Capital Needs" and "Capital Availabilities".

Although this paper deals only with the capital formation problem of the petroleum industry, a similar problem exists with other industries—those that are in the energy business and those that are in other lines of endeavor. The problem becomes particularly acute in times of inflation. Companies earn and invest current inflated dollars while rates of return are based on stockholder equity in historical dollars. Yet, criticism arises when the returns are above some "norm".

CHART 1

ENERGY and OUTPUT in the U.S.



Sources: Bureau of Economic Analysis, Bureau of Mines

SUMMARY

The domestic petroleum industry will need to invest more than $400 billion of new capital to achieve some degree of energy independence between now and 1985. This is based on the needs identified in the President's message to Congress on

January 15, 1975, and the costs prepared by the Federal Energy Administration in "Project Independence Blueprint", escalated at an inflation factor of 5 percent per year.

If the domestic petroleum industry profits were to continue at 1974 levels (return on equity estimated at 15 to 17 percent), the industry could come close to providing these capital needs. However, there is no assurance that this level of return could be sustained, even without the recent change in depletion. Indications are that it would have been lower. Faced with this prospect, and with most of depletion now eliminated, the industry's capital formation problem is compounded.

No addtional action should be taken by Congress which will further hinder capital formation. On the contrary, some stimulators of capital are needed. Foremost of these is the removal of price controls promptly. While Congress's first impression may be to the contrary, the following charts make clear the dimensions of the problem. Decontrol of prices is one of the principal factors which Congress must consider in meeting the Country's energy needs.

CHART 2

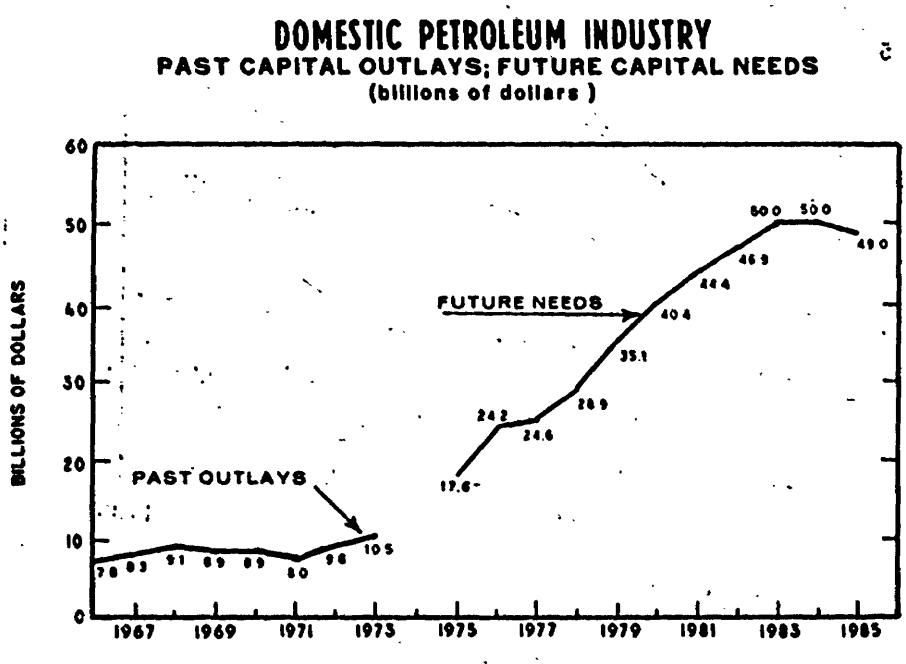


Chart 2

This chart shows the actual capital outlays of the domestic petroleum industry from 1966 through 1973[1] and the outlays projected by the FEA for the next decade in its Project Independence Blueprint for the petroleum industry.[2] The job ahead for the petroleum industry compared with the past is obvious—past outlays of about $9 billion per year compared to future outlays rising from $20 to $50 billion per year.

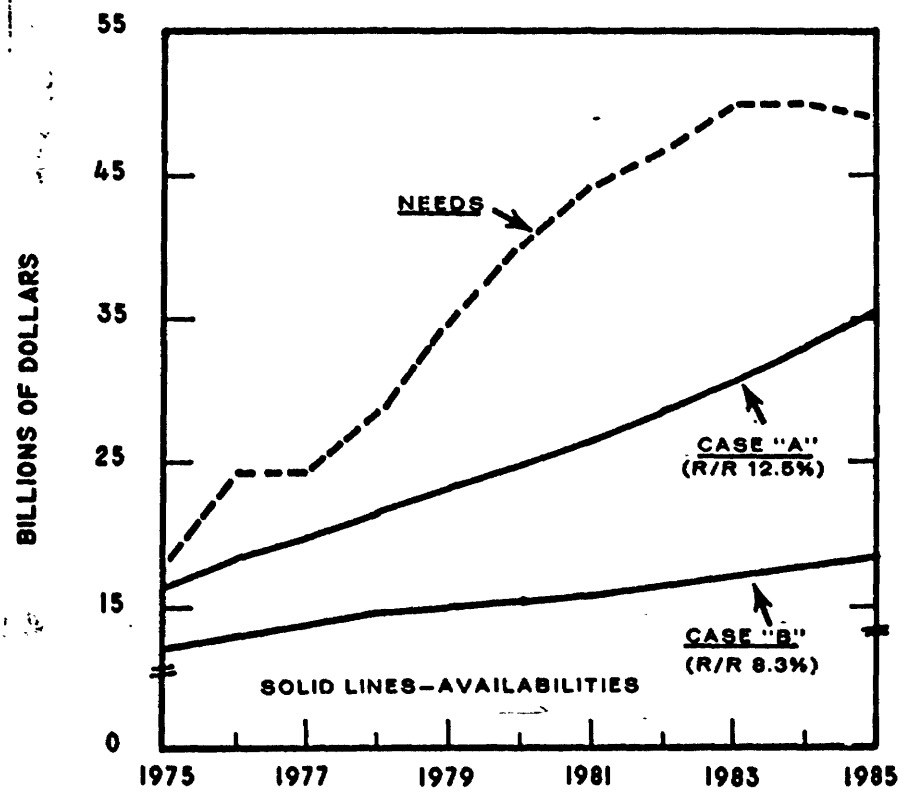
[1] Source: "Capital Investments of the World Petroleum Industry, 1973," published by the Chase Manhattan Bank, page 11.

[2] Source: FEA Project Independence Blueprint, November 1974. Since FEA figures are in 1973 dollars, we adjusted them for inflation.

CHART 3

CAPITAL NEEDS and AVAILABILITIES

AT 1974 RATE OF RETURN AND AT 1969–1973 RATE OF RETURN, ADJUSTED FOR THE 1975 DEPLETION LAW, WITH PRESENT PRICE CONTROLS.



ECONOMIC ASSUMPTIONS

	AVERAGE RETURN ON EQUITY	DIVIDENDS PAYOUT	DIVIDENDS BILLIONS	DEBT: EQUITY	1975 DEPLETION LAW?	CRUDE OIL PRICE
CASE A	12.5%	27%	$38	35:65	YES	TWO TIER THROUGHOUT.
CASE B	8.3%	32%	25	32:68	YES	TWO TIER THROUGHOUT.

TOTAL CAPITAL (Billions)

	AVAILABLE	NEEDS	SHORT
CASE A	$279	$411	$132
CASE B	168	411	243

Chart 3

This chart illustrates the real problem—capital needs far in excess of the capital projected to be available.

If the industry's rate of return continues at the 1974 level, adjusted for the impact of the 1975 depletion law, there will be a capital shortage of $130 billion from 1975 to 1985. See Case A. We estimate that the industry return on stockholder equity was in the range of 15 to 17 percent in 1974. If the 1975 depletion law had been in effect during 1974, this return would have been reduced to about 12.5 percent. A 12.5 percent return was assumed for the calculations in Case A.

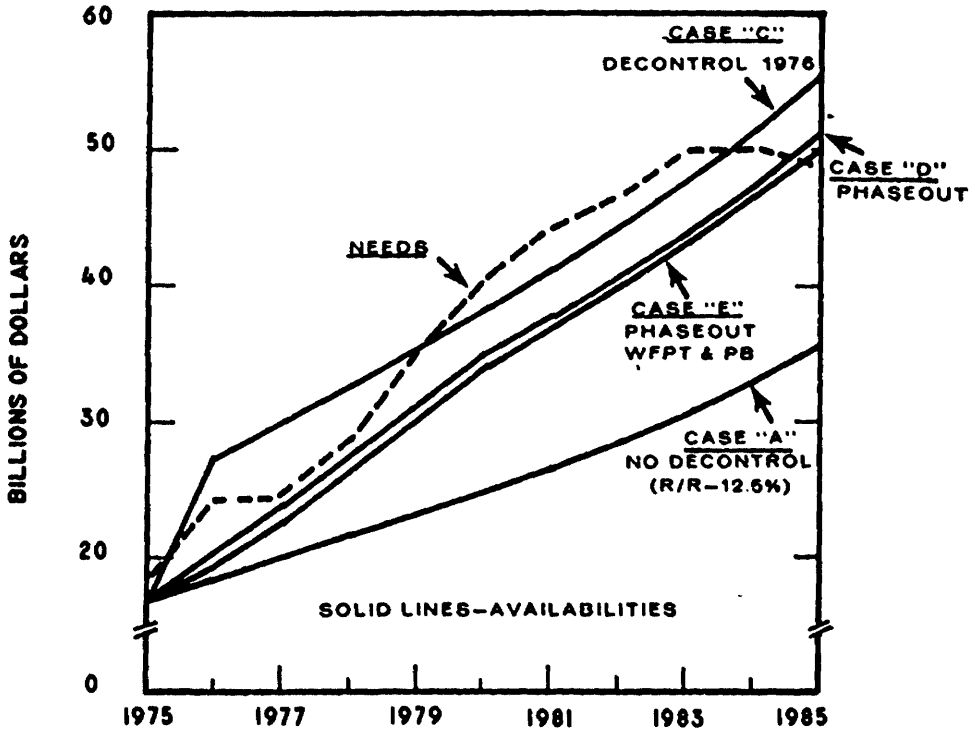
If the industry's rate of return should go down to the 1969–1973 level, adjusted

for the impact of the 1975 depletion law, the shortage of capital would be about $240 billion. The return during the 1969–1973 period was about 10 percent, and the impact of a depletion change would reduce that rate to about 8.3 percent. An 8.3 percent return was used for the calculations in Case B.

CHART 4

CAPITAL NEEDS and AVAILABILITIES

ASSUMING CONTINUATION OF 1974 RATE OF RETURN, ADJUSTED FOR 1975 DEPLETION LAW, AND FOR THE EFFECTS OF VARIOUS PRICE DECONTROLS.



ECONOMIC ASSUMPTIONS

	AVERAGE RETURN ON EQUITY	DIVIDENDS PAYOUT	DIVIDENDS BILLIONS	DEBT: EQUITY	1975 DEPLETION LAW?	CRUDE OIL PRICE
CASE A	12.5%	27%	$38	35:65	YES	TWO TIER THROUGHOUT.
CASE C	16.0%	23%	49	37:63	YES	DECONTROL 1976.
CASE D	15.0%	24%	46	36:64	YES	DECONTROL PHASEOUT 1976-1980.
CASE E	14.8%	24%	45	36:64	YES	DECONTROL PHASEOUT AND WINDFALL PROFITS TAX 1976-1980 WITH PLOWBACK EQUALLING 2/3 OF TAX.

TOTAL CAPITAL (Billions)

	AVAILABLE	NEEDS	SHORT
CASE A	$279	$411	$132
CASE C	420	411	---
CASE D	374	411	37
CASE E	367	411	44

Chart 4

Chart 4 takes the capital availabilities from Case A which are shown on Chart 3 and compares them to the capital that would be available under various types of price decontrols.

Case A reflects a continuation of the present two tier pricing system, that is, no decontrol. Capital figures are shown for complete decontrol at the start of

1976 (Case C); a phaseout of controls over a five year period (Case D); and a five year phaseout, coupled with a five year windfall profits tax and a plowback provision (Case E). In Case E we assumed that two-thirds of the windfall profits tax would be offset by qualified energy investments.

If a windfall profits tax were imposed in 1976 and maintained for five years without decontrol, the capital available in Case A during those years would be reduced about 15 percent. This is not on Chart 4.

Chart 4 indicates that *if* it were possible for industry to continue to earn a return similar to that in 1974, reduced for the impact of the 1975 depletion law and increased by the impact of immediate price decontrol, it could meet its capital needs, at least in the near-term years.

Charts 2, 3 and 4 taken together simply says that Congressional action can have a significant and critical impact on capital formation by the petroleum industry. Actions taken by Congress in 1975 will have a profound effect on energy development in the next ten years, which will be decisive ones.

The petroleum industry has experienced a lot of public and political criticism. Be that as it may, and while many of the men and women in the industry who are working hard to produce and deliver energy can argue that most of the past criticism is undeserved, neither they nor the Congress will accomplish much by perpetuating the argument. The more important thing is that here is an industry that for many years has marshalled its capital and its experience to find energy resources in substantial quantities, to manufacture a great variety of energy products, and to bring them to market at the times and places where needed, and at prices generally below those charged others elsewhere in the world.

Today this same industry is hard at work trying to build up our domestic energy supplies, and it is still ready, willing, and the most able to do the job. It needs help with capital formation. Congress can assist by allowing the market mechanism to work freely once again so that industry can accomplish the task before it.

The more we have gotten into this study, the more apparent it has become that this matter is beyond any particular company and any political party in importance.

The sections which follow set forth the details of our work on "Capital Needs" and "Capital Availabilities".

CAPITAL NEEDS

President Ford's State of the Union Message to Congress last January called for a broad program to conserve energy and develop additional energy resources in the United States.[3] Development of energy principally involves three industries—the utilities industry, the coal industry, and the petroleum industry. This paper deals only with the petroleum industry since that is the portion of the task we are familiar with.

Various estimates have been made recently of the capital that will be needed by the petroleum industry.

> Secretary Simon has made reference to estimated domestic petroleum industry capital needs of over $400 billion from 1974 through 1985 and of needs by the whole domestic energy industry of $850 billion during the same period. These figures are in 1974 dollars.[4]

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[3] See message of Gerald R. Ford to the Congress of the United States, January 15, 1975. The message called for the following:

200 major nuclear power plants;
250 major new coal mines;
150 major coal-fired power plants;
30 major new oil refineries;
20 major new synthetic fuel plants;
The drilling of many thousands of new oil wells;
The insulation of 18 million new homes;
The construction of millions of new automobiles, trucks, and buses that use less fuel.

With respect to new jobs, FEA's Project Independence Blueprint forecasts the number of new jobs, both in construction and in operation, that the new energy facilities identified by the President in his message will require. The multiplier for added employment across the whole economy is unknown, but the number of additional jobs has to be significant.

[4] Source: Testimony of Secretary of the Treasury William E. Simon before the Subcommittee on Government Regulations of the Senate Select Committee on Small Business, August 13, 1974.

The National Academy of Engineers has estimated the domestic petroleum industry's capital needs to be $160 to $200 billion and the entire energy industry's needs to be from $400 to $610 billion from 1974 to 1985. These figures are in 1973–1974 dollars.[5]

The FEA has estimated that the petroleum industry's requirements from 1975 to 1985 will be $223 billion and all energy industry requirements will be $561 billion. These estimates are in 1973 dollars.[6]

For purposes of this work, we used the FEA's figures which have been developed in recent months and are up-to-date. Reportedly, 800 man-years were involved in the effort of compeling these figures and other Project Independence Blueprint data. With permission of the FEA, we were able to secure from the FEA's consultants[7] certain additional supporting information in the form of types of capital outlay and the years in which they would be made.

The future capital needs of both the petroleum industry and all energy industries, as projected by the FEA, are tabulated below.

U.S. ENERGY INDUSTRY CAPITAL REQUIREMENTS[1] 1975-85

[In billions of 1973 dollars]

	All energy industries	Petroleum industry
Capital outlays for:		
Oil and gas (including refining)	$205.8	$205.8
Transportation:		
Oil and gas pipelines[2,3]	11.9	11.9
Gas transmission	5.5	5.5
Other[3]	8.1	.....
Coal	11.9	.....
Synthetic fuels	.6	.....
Nuclear (powerplants)	138.5	.....
Electric powerplants (excluding nuclear)	60.3	.....
Electric transmission	116.2	.....
Other[4]	2.2	.....
Total	561.0	223.2

[1] Loc cit., Project Independence report, table V-21, p. 282, and table V-27, p. 290.
[2] Includes $5,500,000,000 for trans-Alaskan oil pipeline.
[3] Does not include tanker fleets.
[4] Includes solar, geothermal, municipal waste treatment plants, and shale oil.

We adjusted these figures slightly (a) to take into account certain small discrepancies between published data and the consultants' figures; (b) to add our own estimates of investments for chemicals and marketing which apparently were not considered by the FEA; (c) to delete gas transmission line costs which the FEA had included for the petroleum industry; and (d) to pick up a portion of the total investment indicated for the coal industry. Our reason for changes (b), (c), and (d) was to make the industry data for special needs consistent with the industry data on the sources of capital available. Our model for calculating capital availability, described later in this paper, uses profits from all types of businesses engaged by the domestic petroleum industry.

Additionally, we have increased the figures from a 1973 basis to a 1975 basis to take into account the actual inflation of the past two years. We then added 5 percent per year to the 1975 base figures to reflect some amount of inflation in the future. The eleven year totals for capital requirements are as follows: $311 billion in terms of 1975 dollars, or $411 billion in terms of 1975 dollars with 5 percent per year added for inflation. The projected expenditures for each year from 1975 to 1985 are shown in Table I of the Appendix.

[5] Source: "U.S. Energy Prospects—An Engineering Viewpoint", published by the National Academy of Engineers, Washington, D.C., May 15, 1974, page 96.
[6] Source: Project Independence Report, published by the Federal Energy Administration, Washington, D.C., November 1974, Table V-21, page 282, and Table V-27, page 290. The $561 billion figure is the $454 billion in the last column of Table V-21, plus $107 for lease bonuses, dry holes, intangible drilling costs, and exploratory wellhead costs taken from footnote (d) to Table V-21.
[7] ICF Inc. of Washington, D.C., and LaRue, Moore & Schafer of Dallas, Texas.

[In billions of dollars]

Activity	1973 dollars	1975 dollars	1975 dollars plus 5 percent per year
Oil, gas[1] and refining	$232.0	$276.8	.....
Marketing (85 cents per year for 11 yr)[2]	9.4	11.0	.....
Chemicals (45 cents per year for 11 yr)[2]	5.0	5.8	.....
Oil and product pipelines	11.9	14.0	.....
Coal (25 percent of 11.9)[4]	3.0	3.5	.....
Total	261.3	311.1	411.1

[1] Includes lease bonuses, exploration expense, dry holes, intangible drilling costs, and equipment, including gas plants.
[2] Based on industry experience in the United States for 1973. See "Capital Investments of the World Petroleum Industry, 1973," published by the Chase Manhattan Bank, p. 11.
[3] Ibid.
[4] Assumed that the petroleum industry would provide 25 percent of capital outlays for coal. In some of its work the FEA assumed this percentage would be 20 percent. See FEA Project Independence Blueprint, task force report—Finance, November 1974, pt. 2, p. 48.

CAPITAL AVAILABILITIES

Capital availability has been determined by the use of our financial model which is similar to a model described in a report prepared for the Ford Foundation in 1974.[8] A similar model was also used by certain petroleum companies in responding to a 1974 inquiry by the Finance Committee of the United States Senate.[9]

The basic outputs of the model are cash available from internal operations and cash available from external borrowings. Internal cash generation is equivalent to the sum of net income and non-cash charges for depreciation, net of dividends. Net income is based on a percentage return of stockholder equity. Money available from outside borrowings is a function of a debt-equity ratio in relation to stockholder equity and, therefore, reflects the level of profits retained in the business.

In order to provide these outputs, the model requires certain initial *inputs* and certain *assumptions* with respect to how these inputs will be handled. The initial *inputs* consist of existing property, plant and equipment; long-term debt; and stockholder equity for the domestic petroleum industry. The *assumptions* are the rate of return to be applied to stockholder equity; the portion of income that will be paid out as dividends; and the level of the debt-equity ratio.

The initial inputs for the domestic petroleum industry were based on data for a group of companies which are analyzed each year by the Chase Manhattan Bank. This group of companies is called the "Chase companies" and the report is herein referred to as the "Chase report".[10]

The Chase report covers about 30 companies, some of which have both domestic and foreign operations. We estimated that the domestic portion of these operations was equal to 72 percent of the total domestic industry, and we used that factor to adjust the figures for the Chase companies to reflect the total domestic industry.[11]

The amounts of property, plant and equipment; long-term debt; and stockholder equity for the domestic petroleum industry at the end of 1973, calculated in this manner, were determined as follows. The details are shown in Tables II and III of the Appendix.

Domestic Industry

	Billions
Property, plant, and equipment:	
Gross	$114.0
Net	62.2
Long-term debt	24.8
Stockholder equity	56.2

[8] See Appendix B to "Financing the Energy Industry," a report to the Energy Policy Project of the Ford Foundation, published in 1974.
[9] See response to Question 6 in "Profitability of Selected Major Oil Company Operations," published Dec. 30, 1974, by the Committee on Finance, U.S. Senate.
[10] See "Financial Analysis of a Group of Petroleum Companies, 1973," published by the Chase Manhattan Bank in October 1974, as an example of these annual reports.
[11] We estimate that the domestic activities of the Chase companies represent 70 to 75 percent of the total domestic industry, and so we used a figure of 72 percent. The report cited in footnote 13 used 75 percent. See p. 86 of that report.

The assumptions with respect to return on stockholder equity, dividend payout and the debt-equity ratio were determined as outlined in the following paragraphs.

The Chase report indicates that the *dividend payout* has generally been in the range of 45 to 55 percent of net income. In 1973, when profits rose, dividends amounted to 34 percent of net income, down from 54 percent in 1972.[12] We recognize that there must be some increase in the amount of dividends over time, if stockholders' participation in the petroleum industry is to continue. Therefore, generally we provided for modest increases in the dollar level of dividends, but we did not assume a payout percent in relation to net income as high as had been true in the past.

Historically, the *debt-equity ratio* of the petroleum industry has been somewhat low when compared to other industries. The Chase figures indicate that these rates have increased somewhat in the recent past. A ratio of 24:76 was experienced in 1969 and 30:70 in 1973. We anticipate that the ratio may continue to increase, and we used a ratio as high as 35 to 40 percent, depending in the level of return of stockholder equity.

We have assumed that the net income *return on stockholder* equity for the domestic portion of the Chase companies is representative of the return for the entire domestic petroleum industry. The latest such figure that has been published by Chase is for 1973. The numbers for all years since 1966 are shown below.

Domestic petroleum industry return on stockholder equity

Year:	Percent
1973	10.5
1972	9.6
1971	9.3
1970	9.9
1969	10.9
1968	12.2
1967	12.6
1966	12.3

We estimate the return for 1974 to be in the range of 15 to 17 percent. We made no predictions as to what the return on stockho'der equity is likely to be in the future, but the change that was made in the depletion law recently will have some effect on profits. Instead of predicting a level of return, we made two initial calculations for comparative purposes.

First, in *Case A* we assumed the return in the future wou'd be what it was in 1974 but reduced for the impact of the 1975 depletion law. Our estimated figure of 15 percent for 1974 was thus reduced to 12.5 percent. We calculated the capital availability in Case A using a 12.5 percent return, and plotted the results on Chart 3 on page 7.

Second, in *Case B* we assumed a reduction in the return on equity to the level experienced in 1969–1973. The return during those years was about 10 percent. That return, if reduced for the impact of a change in depletion similar to that provided in the 1975 law, would become about 8.3 percent. We calculated the capital availability in Case B using an 8.3-percent return, and plotted these results on Chart 3.

Since the cases described above assumed the present two tier pricing system would remain intact, we worked other cases in which the capital availability in Case A was supplemented by capital made available through three types of price control situations:

Case C—Decontrol effective January 1, 1976, with no windfall profits tax.

This case reflects what might result from our basic recommendation that prices be decontrolled completely in the immediate near term. However, we recognize that Congress may decide to decontrol over a period of time, and we have, therefore, also calculated Cases D and E.

Case D—Decontrol phaseout over five years with no windfall profits tax.

Case E—Decontrol phaseout over five years with a five year windfall profits tax and with a plowback provision. Under the plowback provision the windfall could be offset by investments made in qualified energy projects. Case E assumes that two-thirds of the tax would be offset by such investments.

The capital available under Cases A, C, D, and E are all plotted on Chart 4 on page 9.

[12] See page 20 of the publication cited in footnote 15.

As an additional calculation, we programmed the model to calculate the return which the domestic petroleum industry must realize over the next decade to meet its capital needs, given our assumptions as to dividends and debts. *The answer was a return of 16 percent on stockholder equity* of the domestic petroleum industry.

While the return on equity of *16 percent* per year *will generate* the amount of *capital necessary* to meet the estimate of capital requirements, it is strongly noted that *this is a composite industry return*, and it should *not be viewed as a maximum return* necessary *for individual industry members*. Some industry members will earn significantly higher returns because of better managements, different investment strategies and—in some cases—natural advantages, while other industry members will have substantially lower returns. This has always been the case and in a free enterprise economy will continue to be the case. Therefore, any inclination to establish a ceiling return will necessarily mean that the composite return will be substantially less than the ceiling. In this circumstance the capital requirements would not be met.

Our calculations take into account capital made available from domestic internal operations and from borrowings. We recognize that there are other sources of capital that we have not considered. Those that readily come to mind are funds from foreign operations, from off-balance sheet financing, and from sales of additional stock. With respect to off-balance sheet financing, the capital needs figures which we used in this work do not include future tanker investments, one of the items commonly on an off-the-balance sheet basis. Consequently, we believe that probably no more than about 5 percent of the capital needs we have included would lend themselves to off-balance sheet financing.

We do not know how much the domestic industry realizes from sales of capital stock, except for the larger companies. However, from 1969 to 1973 the Chase companies issued just under $2 billion of stock worldwide. This was equal to only 10 percent of the funds borrowed during that period by these companies and was less than 2 percent of funds available from all sources.

Funds from foreign operations may be a source of capital, assuming that the business climate in the United States is such that investments here are more attractive than they are in countries where the money is being earned. We do not know what amounts may be available from foreign operations in the future. However, actions taken by host countries in the last few months would lead one to doubt that foreign operations will provide significant sources of capital in the future. Thousands of companies in this industry do not have foreign operations from which such funds could come.

These factors would tend to support an inference that our capital availability figures may be too low. However, there is at least one factor which would indicate that they may be too high. We have assumed that if the industry has the financial strength to borrow money, such money will always be available. This may not be true. The U.S. Government may be borrowing so much money that sufficient funds will not be available to meet the requirements of private industry.

Consequently, we believe the points mentioned above which would indicate that our capital availability figures may be too low and those which indicate they may be too high somewhat offset each other. We believe our assumptions are both reasonable and properly conservative for projections looking ahead as far as ten years. We recognize that others could elect to make somewhat different assumptions and derive slightly different results. We believe, however, that we have used the best data now available and that any other reasonable set of assumptions will not change the picture of the basic need for capital formation by the petroleum industry or the general magnitude of the funds which will be required.

APPENDIX

TABLE I.—DOMESTIC PETROLEUM INDUSTRY CAPITAL NEEDS BY YEAR

[Billions of 1975 dollars]

Activity	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Total
Oil and gas	$12.2	$17.1	$17.1	$20.4	$24.4	$27.1	$28.6	$28.7	$29.3	$27.7	$25.6	$258.8
Refining	1.0	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	18.0
Marketing	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	11.0
Chemicals	.6	.5	.6	.5	.5	.5	.5	.6	.5	.5	.5	5.8
Oil and product pipelines	2.5	2.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	14.0
Coal	.3	.3	.3	.4	.4	.3	.3	.3	.3	.3	.3	3.5
Total	17.6	23.1	22.3	25.0	29.0	31.6	33.1	33.3	33.8	32.2	30.1	311.1
Total (1975 dollars plus 5 percent per year)	17.6	24.2	24.6	28.9	35.1	40.4	44.4	46.9	50.0	50.0	49.0	411.1

Source: FEA Project Independence report, November 1974, supplemented with data from consulting firms, ICF Inc., Washington, D.C., and LaRue, Moore and Schafer, Dallas, Tex., and with additions by Sohio for items which appeared to have been overlooked.

TABLE II.—NET ASSETS AT THE END OF 1973 FOR A GROUP OF PETROLEUM COMPANIES [1]

[In millions of dollars]

	United States	Other countries	Combined
Working capital	9,620	10,027	19,647
Investments and advances	2,334	8,052	10,386
Property, plant, and equipment [1]	44,764	34,849	79,613
Other assets	1,643	2,625	4,268
Total	58,361	55,553	113,914
Less:			
Long-term debt	12,780	9,947	22,727
Other reserves and credits	4,025	4,507	8,532
Minority interests	1,076	2,198	3,274
Preferred stock	257	58	315
Total net assets	40,223	[2] 38,843	79,066
Percent distribution	50.9	49.1	100

[1] After deducting accumulated reserves of $37,901,000,000 for U.S. facilities and $26,159,000,000 for facilities of other countries.

[2] Distribution by areas:

	Amount (million)	Percent of total
Western Hemisphere	$10,404	26.8
Eastern Hemisphere	28,439	73.2
Total	38,843	100.0

Source: "Financial Analysis of a group of Petroleum Companies, 1973" published by the Chase Manhattan Bank, p. 31.

TABLE III.—DETERMINATION OF PROPERTY, PLANT AND EQUIPMENT, LONG-TERM DEBT AND SHAREHOLDER EQUITY FOR THE U.S. DOMESTIC PETROLEUM INDUSTRY AT DEC. 31, 1973

[Dollars in millions]

Item	Amounts for Chase Co's.[1]	Comment	Domestic petroleum industry
Property, plant, and equipment:			
Gross	$82,665	These figures were divided by 0.72 [2] to provide property, plant, and equipment for the entire domestic industry.	$114,812
Net	44,764		62,172
Long-term debt	12,780	The total was divided by 0.72 to provide long-term debt for the entire domestic industry.	24,835
Other reserves and credits	4,025		
Minority interests	1,076		
Total	17,881		
Preferred stock	257	The total was divided by 0.72 to provide stockholder equity for the entire domestic industry.	56,222
Total net asset	40,223		
Total	40,480		

[1] Source: Table II.

[2] We estimate that the domestic activities of the Chase Co's. represent 70 to 75 percent of the total domestic industry and so used a figure of 72 percent.

STATEMENT OF DR. TIMOTHY W. STANLEY, PRESIDENT, INTERNATIONAL ECONOMIC POLICY ASSOCIATION

The International Economic Policy Association is a nonprofit business-supported research organization dealing with the various policy issues in the international economic arena. Since 1957 the Association has specialized in U.S. balance of payments, trade, investment, and natural resource issues and has published a number of major studies in these areas. Under the auspices of the Association and its Advisory Committee on Natural Resources a study entitled "U.S. Natural Resources Requirements and Foreign Policy" was published in July of 1974. As a follow-up to that study, the Association and its Advisory Committee undertook an examination of Petroleum and Foreign Economic Policy and this statement summarizes the results of that study.

Our study deals with the global macroeconomic problems which followed the quadrupling of world oil prices, the Arab readiness to embargo oil in support of political objectives, and the new financial strength of OPEC. These developments have brought major changes to the world economic and political environment. They have already disrupted the domestic economies of the industrial countries and the developing world, intensifying recessions and forcing adjustments in future production and investment patterns. Moreover, the possibility of additional oil price hikes or embargoes remains a disturbing threat.

The oil-importing countries have been forced into an aggregate balance of payments deficit with the oil producers. The remedies will require successful international cooperation; for nationalistic solutions stemming from financial uncertainties threaten further setbacks for world trade and commerce.

OPEC has emerged particularly strong: The members of that organization are expected to accumulate a financial surplus of at least $200–$300 billion by 1980, bringing with it the potential for great economic and political power. Their price hikes have caused intractable medium-term difficulties in the form of global balance of payments distortions, threatening financial instability and difficulties in deficit finance. The oil revenues of the OPEC states have soared from $25 billion in 1973 to an estimated $90 billion in 1974, and they are expected to reach from $100 to $120 billion in 1975. If the world economy were to adjust immediately to international transfers of purchasing power of this size, the resulting surge in the real level of exports to OPEC could involve the transfer of nearly 3 percent of the goods and services produced by the industrial states. The point sometimes made that the magnitude of the transfer payments to OPEC is similar, in relative terms, to the effects of the German reparations after World War I is not exactly a comforting one in the light of subsequent developments in Germany!

Such an immediate real burden of adjustment through greatly expanded exports to OPEC was not required of the oil importing countries at the 3 percent level mentioned above. Financial transfers dominated instead because of the lag in imports behind income for even the most populous OPEC members and especially the Arab states with low import absorptive capacity. OPEC 1974 imports totaled an estimated $36 billion, 70 percent larger than those of 1973, but nonetheless a $60 billion surplus resulted in the OPEC current account. The size of this current account, of course, is reduced by burgeoning sales of military equipment to the Middle East producers, but it is debatable whether the improved financial stability the importers derive can sufficiently offset the insecurity implicit in a Persian Gulf arms race.

While there have been several revised estimates of the petrodollar surplus, even the most recent minimum estimates of OPEC accumulated financial assets predict an international investment position unprecedented in history, with a peak of $200 to $300 billion by 1980. For comparison, the overall international investment position of the United States at the end of 1973 was a net $83 billion in assets taking into account all assets and liabilities of varying degrees of liquidity. The net asset position of OPEC in five years will be at least four times as large and probably far more liquid.

In 1972 the world's major monetary problems were widely thought to be the $70 billion overhang built up by the cumulative balance of payments deficits and the liquidity of the resulting Eurodollar market. The 1980 OPEC surplus will be more than three times as great. By way of further comparison, the total accumulated book value of U.S. foreign direct investments was $107 billion at the end of 1973, about half the minimum estimate of OPEC assets in 1980. United States direct investments are sometimes international issues because

of their supposed influencing control over foreign economies. It would appear that fears over the economic influence of OPEC are much more justified; and those who worried about the unsettling effects in the foreign exchange markets of U.S. liabilities overseas (or shifts in corporate funds) obviously need to worry more about the dangers of precipitous actions by Arab investors with enormous liquid short-term funds at their disposal.

Regardless of whether the international financial community can accommodate OPEC fiancial surpluses, fears remain that political motivations will dictate how they are used. This prospect is particularly worrisome because over time the OPEC assets will be concentrated in the hands of a very few states. There are several types of investment activities which may have undesirable consequences for the West and these include: (1) Purchase of equity in or even effective control of selected Western industries. Control of industries by Arab countries could be used to support such discriminatory measures as the Arab boycott of Israeli businesses and foreign firms dealing with Israel or it could be used to assume a constant supply of materials which could be in short supply in the future, such as certain types of steel. From this standpoint the Iranian purchase of a 25-percent interest in Krupp Steel was a good insurance policy. (2) Development of new OPEC industrial capacity competing on a subsidized basis with existing Western companies. The establishment of high-technology industries in the Middle East countries whose populations cannot absorb the resulting domestic production will necessitate expanded exports. Petrochemical facilities, for example, are now planned in several OPEC countries, and they might (if all are built) greatly increase world petrochemical supply without necessarily producing any expansion in demand. Further, OPEC could use their control over oil to give their petrochemical plants preferred supplies or marketing leverage; and OPEC petrochemicals might, in effect, be "dumped" abroad in an effort to take over world markets, disrupting in the process the balance of payments and employment performance of an important U.S. industrial sector. (3) An attempt to expand the OPEC oil monopolies to other fields of energy in order to prolong Western dependence on the petroleum supplies of its members. (4) Pursuit of a "new international economic order" in an attempt to create a united front for forcing a redistribution of the world's income. The use of OPEC members' assets to finance cartel price fixing measures by other LDC raw material producers is a possibility. Alternatively, the funds can be used to buy out private foreign investments. Such is one of the stated aims of the $500 million special trust fund established by Venezuela in the Inter-American Development Bank for use by her South American neighbors.

These developments and the principal sets of problems involved are analyzed in detail in the paper. The study concludes that the industrial countries should take immediate steps to adjust their economies to these radically changed world situations. In pursuit of the recommended objectives, the United States should:

Avoid hasty attempts to limit dependence on oil imports from OPEC which would delay domestic economic recovery, and encourage the orderly investment of OPEC funds to help expand the economy and improve our eventual ability to repay petrodollar debts. In this connection, we believe that although some greater transparency and monitoring of OPEC investments is needed (especially by government instrumentalities and in sensitive sectors) the United States should not change the basically open investment climate it has traditionally maintained at home and sought abroad. The public sectors of oil-consuming countries should also be considered as a basis for creating new investment receptacles, such as the "U.S. Public Development Corporation" first proposed by IEPA in 1972 to borrow excess foreign dollar holdings and relend them to local governments and tax exempt authorities in the United States.

Encourage domestic substitute energy sources and conservation measures by establishing a more predictable environment of petroleum prices, government programs, and ground rules for private investment activities.

Reduce dependence on imports of OPEC oil by administrative means, taking into full account the effects of oil shortages upon economic recovery and growth, as well as the possibilities of forcing down oil prices.

Strengthen the means to withstand future embargo action without domestic economic disruption.

Take the lead in international financial innovations which will aid global adjustment to protracted payments deficits with OPEC, and provide guidance for OPEC investments in the West.

Programs which would serve these purposes include:

Conservation measures aimed at specific areas of energy consumption rather than across-the-board levies and taxes which would disrupt domestic prices and production and retard recovery from the recession.

A domestic floor price for oil imports, to be maintained if necessary through a variable levy mechanism. Preferably, such a floor price would be applied on an international basis, reducing its effects on international trade competitiveness. If that arrangement is not achievable, the United States should adopt a landed duty-paid price for oil imports with compensatory border tax adjustments for manufactured goods in international trade. Creation of more predictable future price and availability patterns for OPEC oil in the United States will permit domestic investment in more costly alternative energy sources, as well as in conservation measures by energy-consuming industries.

An oil import quota system, incorporating secret bidding for oil import tickets to be granted to the lowest price source. Adjustment of quota levels would be made in accordance with the availability of domestic supplies and in conjunction with gradual domestic price decontrol for energy.

Creation of a stockpile and standby production system for petroleum, sufficient by 1980 to substitute for an import cutback of possibly 3 million barrels per day for a year. This program would make continued OPEC imports acceptable by providing an alternative to economic disruption in case of a future cutoff of supplies. It would include tapping the Naval Petroleum Reserves for the stockpile, and might permit specially arranged import purchases from major OPEC countries in exchange for U.S. Government securities.

Congressional ratification of the International Energy Agency emergency oil import allocation plan. The United States readiness to participate in future implementation of that program in case of a renewed oil embargo must be established if other signatories are to participate fully. Strong representations of this country's unwillingness to accept a future embargo without taking appropriate countermeasures should be made.

Action along the lines of the proposed IEA financial "solidarity" fund would help prevent oil-importing industrial countries from taking steps to balance their payments deficits at the expense of other trading partners. The availability of a lender of last resort would also help international financial stability.

American support for enlarged IMF and IBRD programs for petrodollar recycling, and the encouragement of OPEC loans to LDC's through the international lending institutions.

The study also suggests that the United States should consider a negotiated compromise with OPEC which would serve the long-run purposes of both the oil-producing and importing countries by providing a fixed range for oil prices. Despite the complexities, it is possible to conceive of a program which, for a prescribed period, would establish both minimum and maximum limits for OPEC revenues from oil sales, with supply and demand allowed to operate within the price and volume limits set by the floor and ceiling agreements. If an upper limit were negotiated between present OPEC prices and the landed price floor which consuming countries need to protect the development of alternative energy sources, there would be some relief for the consumers. They would, however, forego the possibilities of a sharper drop in oil prices if the cartel cannot maintain its cohesion. For its part, OPEC would be accepting lower revenue limits in return for insurance against a major price break. Within such a trade-off, there might also be an indexation arrangement tied to future inflation in the OECD countries.

A basic element in such a bargain should be provision of special aid to the resource-poor developing countries. For example, the importing countries and OPEC could each set aside $1 for each barrel of oil sold under the plan. Half of the funds generated in this manner could be channeled to LDC's as bilateral and "tied" aid, and the other half given through international development agencies. At current levels of OPEC oil sales, aid from this source would amount to $20 billion annually, a prospect which should encourage third world support for the plan. "Recycling" of petrodollars through the needy countries that are able to spend them currently on goods and services would also help the industrial countries. If it could be brought about, such a "detente" between the industrial countries and the developing world would ease some of the main uncertainties that are hampering world economic recovery; and it could lead to a period of renewed growth, reflecting greater confidence among investors, producers, and suppliers of basic raw materials such as petroleum.

Submitted with this statement for the Committees' use is a copy of the full report on Petroleum and Foreign Economic Policy which is being released publicly as of May 12, 1975.[1]

STATEMENT OF TEXAS EASTERN TRANSMISSION CORPORATION

Texas Eastern Transmission Corporation is a Houston-based company which owns and operates large natural gas pipeline systems serving the Midwest and both the East and West Coasts of the United States, and is further engaged in a number of aspects of the petroleum business. The subject matter of the Joint Hearings is of vital interest to us, and we are pleased to have the opportunity of filing this statement.

In the search for additional supplies of hydrocarbon fuels, Texas Eastern for many years has devoted much effort and large sums of capital to both traditional exploratory programs and to such newer supply prospects as liquefied natural gas, gasification and liquefaction of various hydrocarbon feedstocks, exploration in frontier areas, and research into pipelining in new geographic areas and under harsh climactic conditions. Our Company's experience has always been in businesses which are capital intensive by their nature, and we are neither surprised nor intimidated by the magnitude of the capital required by energy projects. However, as the conduct of these hearings clearly suggests, conditions have changed so significantly as to raise the question of our national capability of providing adequate capital in traditional ways to provide for our energy needs. The magnitude of the financial requirements has reached the point where, in our judgment, that questions must be answered in the negative, and we must therefore seek alternate means of accomplishing our objectives.

Without entering into a debate on the degree to which the U.S. should be dependent on foreign sources of energy supply, it should be beyond question that we *must* have an adequate supply of energy in the aggregate to meet the legitimate needs of our economy. Under this assumption, the cost of energy, while always a relevant consideration, cannot be the controlling factor in determining whether or not an adequate supply is to be provided. It should logically follow that the capital-intensive nature of energy supply would argue that adequate development of our available resources be accomplished as quickly as possible. Delay simply drives the cost of this development higher and higher as inflation takes its toll, and the unit cost of that energy is thus permanently increased. These unit costs have already been increased significantly in recent years by the changing nature and location of energy sources, aside and apart from inflation, and the pressure from both factors shows no signs of abatement.

It is our judgment that the credit capacity of the energy industries is not sufficient to cope with the magnitude of capital requirements as they are now evolving, and that our financial markets cannot be expected to provide the necessary funds in traditional ways. Individual companies and even groups of companies acting as joint venturers simply cannot handle the massive liabilities nor accept the related risks with the financial resources at their command. In our opinion, significant government financial assistance is absolutely required if we are to establish any credibility as to our national willingness and ability to maintain any degree of energy independence.

There are any number of estimates of the total capital requirements for energy development over the years immediately ahead, and there is no need for us to further pursue that point. It should also go without saying that the ability of energy companies to finance their own capital requirements with internally-generated cash has been significantly impaired (most recently, for example, by punitive tax measures) at a time when substantial growth is needed instead. In the case of a company like Texas Eastern, with a substantial portion of its business subject to regulation by the Federal Power Commission, regulatory attitudes add another dimension to the financeability of projects and programs designed to provide additional energy supplies.

As is perhaps well known, Federal Power Commission rate regulation under the Natural Gas Act in essence provides for rates determined on an approach which recognizes the need for the natural gas company to recover all expenses and costs reasonably and prudently incurred in providing the regulated service, including a reasonable return on the company's investment in jurisdictional facilities. The Act affords an opportunity for companies subject to the jurisdiction of the FPC to increase rates under prescribed procedures when costs have increased, and also affords the FPC the opportunity to reduce rates when costs have

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[1] This report was made a part of the official files of the Committee.

declined. Obviously, investors must receive assurance of the recovery of reasonable and prudent costs plus a reasonable return on investment in connection with the financing of synthetic and supplemental gas projects. Moreover, the capital requirements of such projects are so massive that all reasonable costs must be recovered currently as they are incurred. This has been accomplished in the past for domestic pipeline projects and could be accomplished now for synthetic and supplemental gas projects by means of a so-called "cost of service" tariff, wherein rates are adjusted periodically to compensate for increases or decreases in actual costs. However, the FPC has thus far declined to assure investors that the full "cost of service" of synthetic gas projects will be recoverable principally because the costs cannot presently be quantified with a satisfactory degree of accuracy. Such a position limits still further the ability of utility companies to finance these projects.

For example, our Company and Pacific Lighting Corporation plan to construct a coal gasification plant in New Mexico at a cost of approximately $1 billion. Clearly, Texas Eastern is not in a position to financially backstop its pro-rata share of such an amount. Even if the Commission were to provide assurances of full "cost of service" recovery we would have great difficulty in raising permanent capital of this magnitude, and construction financing poses an even greater problem. Nor can the problem be limited to one project. Meeting the nation's energy needs inevitably requires that a multiplicity of synthetic and supplemental gas projects be pursued. The Arctic Gas Pipeline project, including its corollary U.S. facilities, will probably have a cost in the range of $10 billion. Liquefied natural gas projects, which our Company continues to pursue, can attach costs measured in multiples of billions of dollars.

In addition to the problem of capital magnitude posed by the development of needed energy sources, the financing problem is compounded by the long lead times required to first produce revenues from the new sources. Further, in most instances these new projects and programs represent completely incremental efforts which derive no benefit from any phasing in of the capital commitment nor of the revenue realization. The combination of these factors represents, in our judgment, an insurmountable barrier to the industry in its efforts to provide additional energy. The task has simply assumed proportions which exceed the financial strength of the companies involved, and thus preclude their use of traditional financial markets without governmental assistance.

We would be remiss in not at least offering a range of possibilities that under varying circumstances could help surmount these serious problems insofar as the regulated sector of the industry is concerned. We would hope the Subcommittees would consider among other possibilities:

1. A Federal program designed to insure or guarantee construction and possibly permanent financing with such guarantees extending through an initial "shakedown" period until production on a commercial scale is achieved.

2. A Federal loan fund which would provide for loans to be made either during construction or as a part of the permanent financing framework.

3. A program whereby certain facilities could be built by the Federal government and operated under contract by private industry, or which would be sold to private industry under agreed-upon price terms after construction and "shakedown" has been completed.

We would contemplate that under any or a combination of these approaches standards of public necessity would be adopted.

It is our view that recognition of these problems is urgently required, and we urge the Subcommittees to address themselves to early solutions.

STATEMENT OF F. PERRY WILSON, CHAIRMAN OF THE BOARD, UNION CARBIDE CORP.

PART I: CAPITAL NEEDS AND AVAILABILITY

The problem of providing for the capital needs of the United States has been receiving increasing attention recently, particularly as it bears on the energy shortage. While much has been said and written by others, the subject is of such pressing importance that I would like to take this opportunity to emphasize the salient points as seen by Union Carbide Corporation.

It is our belief that the United States has not been making adequate capital investment to provide for the national needs and to achieve a satisfactory rate of economic growth:

Investment as a percentage of real GNP has been declining, and is low by comparison to other major industrialized nations.

Growth in productive capacity in many primary processing industries has lagged since the 1960's. This trend must be reversed if we are to meet the nation's needs.

Productivity has been improving at a slow pace, especially compared to countries such as Japan and Germany. The consequent reduction of competitiveness of U.S. goods in foreign trade has become a serious problem. More importantly, it is only through productivity increases that the standard of living in the United States can be improved.

The trends indicated above have certainly been contributing factors to the recent U.S. experience of slow real economic growth. From 1966 to 1970 the ratio of investment to GNP in the United States has averaged between 14% and 15%. In the common market countries and Canada this ratio has been over 22%, and in Japan well over 30%. During the same period, the annual increase in productivity in manufacturing (i.e., output per man hour) has grown about 30% in the United States, 40% in the European community, and well over 100% in Japan. The resulting contrast in real growth has been great. Of all the industrialized nations during the 1960's, only the United Kingdom had a slower GNP increase than did the United States.

Inflation is another by-product of inadequate investment:

If productive capacity is insufficient to meet growing demand, prices will be driven up.

If productivity does not keep up with wage demands an increase in prices will follow.

Inattention to the two economic effects indicated above will result in a high future rate of U.S. inflation.

Current investment needs in the private sector fall generally into four categories:

1. Increasing productive capacity to meet growing demand.
2. Increasing productivity to allow improvement in the standard-of-living.
3. Expanding and developing new energy sources to make the U.S. less dependent on foreign supplies and to keep the costs down.
4. Reducing pollution and improving environmental conditions.

It is important to note that the last two categories represent areas of new need. They have created a large demand for capital at the same time that the requirements of the first two categories have increased as a consequence of deficiencies since the 1960's.

Estimating the precise sums required to meet our capital needs is difficult, and particular estimates are open to question; there is no denying however, that the amounts are huge. A recent report by the New York Stock Exchange [1] suggests that the demand for capital through 1985 will be $4.7 trillion. The report projects capital availability under present trends at approximately $4 trillion in the same period. The anticipation of a shortfall of $650 billion during the next decade has serious implications for the U.S. economy. The significance of this figure is better understood when one notes that in a period of the same duration, 1962–1973, total capital outlays were only about $1½ trillion.

In testimony before your committee Sec. William E. Simon quoted several sources which tend to substantiate the New York Stock Exchange report's projection of capital demand:

"The Department of Commerce estimates the capital requirements for Gross Private Domestic Non-residential Fixed Investment through 1985 at $3.3 trillion.

A General Electric Co. study anticipates gross domestic investment including residential housing to total $4½ trillion through 1985."

The most important sources of capital are the savings of individuals and business. Neither source is increasing as fast as the demand described earlier. Indeed, the indications are that they will not even maintain their historical pace, and this is the heart of the problem.

Personal savings as a percentage of GNP are projected by the New York Stock Exchange report to decline from the 5.0% averaged in 1968–1972 to 3.9% in 1985. Factors producing this trend are:

The shifting age distribution of the U.S. population toward the lower-saving 20–35 age bracket.

Increases in taxes and social security contributions.

[1] "The Capital Needs and Savings Potential of the U.S. Economy"; September 1974.

A disinclination to postpone purchases, as prices rise more rapidly than in the past.

Business savings are undergoing an erosion even worse than personal savings, although inflation tends to hide the true state of affairs. Basically, the problem is one of declining real profits. Much of recent "growth" in profits has resulted from the understatement of costs—the cost of materials taken from inventory and the amount charged as depreciation. The understatement of costs stems from the application of conventional accounting procedures during high inflation. When the purchasing power of the dollar is declining, using historical costs is misleading. The amounts charged are insufficient to restore real assets used up in production.

In a report for the Machinery and Allied Products Institute,[2] George Terborgh has recalculated the profits and retained earnings of non-financial corporations, removing the effects of inflation. He shows that while reported after-tax profits of non-financial corporations rose from $38 billion in 1965 to $55 billion in 1973, retained earnings in constant dollar terms adjusted for inventory valuation and under-depreciation, declined very sharply from $10.2 billion in 1965 to $3.2 billion in 1973. Estimates for 1974 show a *loss* of $5.3 billion in retained earnings, in effect a net liquidation.

Just as the capital shortage problem is multi-faceted, so must be the solution. At least part of that solution must include corrective Federal legislation. In reply to possible criticism that the Government cannot now afford to lose the tax revenue which some of these proposals would entail, it should be noted that much if not all of the lost tax revenue would be recovered as new investment brings about a period of faster economic growth. It would be far better to postpone non-essential Government expenditures than stifle the economy—the source of wherewithal for both the private and public sectors. To ignore the capital needs of our economy in the pursuit of short-term expediency would be disastrous for our society and our economic system. Among current proposals which we believe merit serious considerations are:

1. Increase the investment tax credit and put it on a permanent basis. Past experience with the investment tax credit has demonstrated its usefulness in encouraging business investment.

2. Increase the rate of capital cost recovery. More rapid depreciation allowances would help offset rising replacement costs (which are a consequence of inflation), and also provide funds for expansion. The United States currently has one of the longest capital cost recovery periods of the major industrial nations.

3. Lower the basic rate of corporate income taxation. The resulting increase in corporate cash flow would stimulate investment.

4. Reduce taxes on capital gains, dividends and interest paid on savings accounts. The United States is a consumption-oriented society and is becoming more so. Inflation and taxes are tending to make savings unattractive. Reducing taxes on all forms of private savings will make more funds available for investment.

5. Allow deductions for expenditures for safety and environmental protection as incurred. Such investment, while important, does not add to productive capacity. Immediate write-off for these expenditures would help offset their negative impact on productive capital formation. Various testimonies before this Committee have forecasted, quantified, and debated the urgent need for capital to renovate and expand our systems of energy supply. We can not materially improve and will not therefore repeat the analyses of capital availability in this specific area which have already been offered to the subcommittees. There are however, important fundamental questions regarding the most efficient use of any capital consumed in the energy sector of the economy. For example:

To what target objectives should scarce capital be directed in the development of our energy resources?

What tasks are necessary in moving the U.S. energy supply structure toward our objectives?

What set of factors should influence our choices of objectives and tasks?

The following section discusses the most critical objectives of any socially responsible energy program. The important fundamental factors are presented which motivate these objectives. From the basic facts and objectives we can select effective governmental programs.

[2] "Inflation and Profits"; December 1974.

It is common during any debate on the topic of energy that many words are sacrificed in discussing the world's resources of oil and natural gas. These two natural resources have become so closely aligned to the energy crisis that the logic that enchains gas and oil to the subject of energy is rarely questioned. The habitual, close association between our hydrocarbon resources and the satisfaction of our energy demands can impair our ability to develop efficient and socially responsible energy programs. Many today feel that solutions to our energy problems are, by definition, solutions to the availability of oil and natural gas, or conversely that solutions to the problem of adequate supplies of these resources are, by definition, solutions to our energy problems. To many, supplies of oil and natural gas have become indistinguishable from supplies of energy and the "energy crisis" has become an alias for the "oil crisis". The petrochemical industry recognizes the relationship between the energy and oil crises but we also recognize the essential differences. Our arguments will show that supplies of energy and oil are related but extremely different propositions, and that our policies and plans must be careful not to solve one problem at the tragic expense of the other.

Basic Energy Facts

In discussing effective plans and policies it will be necessary to recall basic facts concerning energy and our scarce hydrocarbons so that we may recognize the most preferred plans and policies.

Energy production essentially involves the consumption of BTU's to generate a force, which has the capacity to do work. Oil and natural gas are burned in energy generation in order to liberate their contained BTU potential energy. It is a fact that BTU potential is found in many forms. In the past, coal, wood, water and animal waste have been major sources used to generate a necessary flow of energy for man's cultures. In the long term future we may envision wind, sun, oceans and the planet itself as sources of energy generation. But over the next two generations, our reliance on oil and natural gas must be diverted to coal and nuclear sources. Annual capital sums, of the order of magnitude of recent years' total annual U.S. industrial investment, will be required for this energy conversion.

Studies of the investment pattern in developed countries confirm that one eighth of all investment is in energy production. All other productive investment is dependent on energy development. Provisions for such energy investment must be made, indeed encouraged, or all other productive investment will be curtailed.

Perpetual Need for Energy

The problem of energy production is certainly not transitory. Despite this ever-growing, ever-continuing almost everlasting need for energy flow we have paired this process with one which cannot possibly keep in step. Oil and natural gas are produced very slowly by a recipe and process only under the control of mother nature. This natural process is calculating, mysteriously deliberate and tragically slow for our current and emerging cultures. The marriage of the earth's scarce hydrocarbon resources to the voracious appetite of energy generation is ill-fated. We may equate each day's consumption of oil and natural gas to an irreversible net depletion of these resources. In seeking the proper direction in which to find "energy independence" we may first want to address the question: from what do we want to be independent? ***We believe that our main objective should be to seek energy independence from the fundamental scarcity of natural oil and gas resources.*** This objective of independence is not motivated by the particular geographic location of these resources or the political philosophy which controls them. This independence is motivated by the coldest and hardest fact of all, namely, the growing scarcity and depletion of our oil and gas resources.

The Dependence of the Petrochemical Industry on Hydrocarbons

The petrochemical industry is naturally very sensitive to any issue which impacts on the supply of oil and natural gas. There are two major reasons. First, unlike the production of energy, the petrochemical industry uses oil and gas because of their unique molecular structures. When we purchase hydrocarbon feedstocks we are purchasing these desirable molecular structures as raw materials for our processes from which a vast spectrum of valuable products are produced. The production of energy however, requires that we burn these hy-

drocarbon resources for their BTU content. For energy production the molecular structure is immaterial. The petrochemical industry has no known alternative to basic hydrocarbon feedstocks. Once supplies of these hydrocarbons are depleted there is no known ability to salvage the petrochemical industry from extinction, whereas the depletion of these resources need not inherently deter energy production whatsoever. The petrochemical industry is inextricably dependent upon these scarce hydrocarbon resources. The production of energy is not. The second reason the petrochemical industry is sensitive to the burning of these hydrocarbon resources is that we feel that we can impart greater added value to the quantities of hydrocarbons we use as feedstock. It is our firm belief that our hydrocarbon resources are more wisely used as raw mtaerials in the production of goods rather than burned as fuel. Petrochemical-based fertilizers, pesticides, herbicides and packaging have made great contributions to providing food to the peoples of the world. Without these products many crops would fail, farm productivity would be lowered, food storage would be impaired and the costs of food supplies would rise dramatically. Man-made fibers are used to produce nearly all of our carpets and blankets. These petrochemical-based fibers comprise the bulk of fabric used in the clothing of women and children, and in approximately half of all men's and boy's clothing. In the area of health an incredible number of pharmaceuticals and drugs are petrochemical-based. In transportation, nearly all automobile tires are made from synthetic rubber. Petrochemicals are used for effective wire insulation in the communications industry and are an importut factor in nearly every household item. Plywood is bonded together with plastic resins. Latex paints, appliance enamels, carpeting, wiring insulation, piping, soaps, refrigerants all emanate from the raw material use of liquid hydrocarbon feedstocks by the petrochemical industry. The list of useful products produced from the petrochemical industry's raw material input of oil and natural gas is nearly inexhaustible.

Economic Importance of America's Petrochemical Industry

The petrochemical industry should be a participant, not a spectator to the planning of our national energy supply since this planning ultimately and unavoidably has current and future impact on the prices and supplies of hydrocarbon resources. Because our industry cannot substitute for oil and gas feedstocks, as can the energy industry, any action which affects prices and supplies of these feedstocks motivates an immediate economic response among petrochemical producers.

The effects are then ubiquitous throughout the country as we have seen that petrochemicals are intimately involved in the daily lives of all Americans. Since many petrochemical-based products are used as raw material input to other industries it is estimated that petrochemicals directly or indirectly affect over 12 million jobs and the domestic value of all of these related industries is probably in excess of $400 billion. The U.S. petrochemical industry itself employs nearly 400,000 people, and is a large positive factor in the U.S. balance of trade. It is precisely the intimate relationship petrochemicals have with the standard of living of each American and this critical, inextricable dependence of the petrochemical industry on scarce hydrocarbon feedstocks that should be the catalyst for effective governmental policies.

Basic Concepts of Effective Energy Programs

Let us summarize some of the major facts which should guide us in deriving effective policies regarding energy supply and our oil and gas resources.

Energy is difficult to store. It must be constantly and continuously produced to satisfy our ever-growing and ever-lasting needs.

Whereas energy must constantly be renewed, the resources of oil and natural gas are non-renewable.

Energy production requires the generation of BTU's which may be generated under a great number of alternate schemes.

Petrochemical producers exploit the unique molecular structures found in these scarce hydrocarbon resources.

There is no alternative to hydrocarbons for supplying these molecular structures used by the petrochemicals industry.

Petrochemicals are critically important in the daily lives of each American.

From these facts we may derive standards for responsible governmental policies on energy and feedstock planning.

The first objective or standard should be to liberate energy production from its dependence on scarce hydrocarbon resources. This objective is motivated by the fact that energy production does not inherently require hydrocarbon resources and that the need for energy will continue beyond the existence of the last molecule of these resources. The demand for energy is timeless compared to our reserves of oil and natural gas. Effective policies should now begin the process of divorcing energy from these hydrocarbon resources and begin synchronizing energy production with a more abundant resource. Such policies will act to insure energy sufficiency, but may not automatically insure *self-sufficiency*.

A second objective of any effective policy would be to encourage the conservation of all of our scarce resources. We must recognize that the timely consumption of resources is just as important as their timely development. We must strive to make the most efficient use of our resources by developing the reserves and uses for our more abundant resources while conserving those which are scarce.

The Minimum Import Price Proposal

The minimum import price on oil is one proposal which has been offered as an aid to accomplishing our energy objectives of self-sufficiency. This proposal is an example of how we can obviate the issues of hydrocarbon resource availability when debating the subject of energy. The adoption of this proposal could have disastrous effects on the petrochemical industry. The alleged economic value of the minimum import price is that it would insulate domestic oil producers from low cost of foreign oil and thereby stimulate the domestic exploration and development of our reserves. The political value of this proposal is to show that solidarity exists among the non-OPEC countries in seeking oil independence. First, let us examine the alleged economic value of the minimum import price proposal. The economic effect would be deleterious if the minimum import price encouraged the development and the ensuing consumption of our scarce hydrocarbon resources such that their continued coupling into energy production is maintained. The impact of the minimum price is then to deepen the dependence of energy production on oil and natural gas which, in turn, serves to increase the rate at which we extinguish our hydrocarbon resources. In addition to hastening the depletion of domestic resources this price, if applied equally to all users of hydrocarbons, would deprive the U.S. petrochmeical industry of its ability to purchase hydrocarbon feedstock at the best competitive world price. This would increase the cost of domestically produced petrochemicals and weaken the competitive position of the U.S. petrochemical industry both here and in world markets. Politically, the desired solidarity is unlikely to ever exist since some countries (such as Japan) would continue to purchase oil and gas at the lowest possible price and thereby win competitive world trade advantages in their petrochemical industries. This political coalition would be very unstable.

The minimum import price proposal is unacceptable to the petrochemical industry unless the proposal would also include 1) sufficient inducements to stimulate substitution for oil and gas in energy production, 2) conservation policies to protect our domestic resources while we develop them, and 3) differential price treatment for U.S. petrochemical producers so that they may retain competitive position in the world petrochemical markets. Only under these conditions could we ever accept this proposal. It is only under these conditions that the proposal could facilitate the conservation of oil and natural gas and hasten the liberation from their function as fuel to be burned. Although the minimum import price proposal is currently unacceptable to the petrochemical industry there are many policies which are acceptable. These preferred policies would encourage the independence of energy from scarce hydrocarbons and allow us greater latitude in conserving these resources.

Some Preferred Policies

One acceptable set of policies would be those that stimulate the short-run use of coal in the energy generation processes. Coal is one of our country's most abundant resources. It has been said that coal is to the U.S. what oil is to Saudi Arabia. Certain air-pollution and other environmental standards could be relaxed in the short-run in order to motivate the mining and direct burning of coal wherever possible. The government could also increase its funding or economic protection of those ventures which are seeking to convert coal to liquid fuels or pipeline gas. These short-run policies would help to conserve our scarce reserves of oil and natural gas while making greater use of one of our abundant resources. In addition to switching from oil and natural gas to the use of coal we need policies

which could encourage the growth of nuclear power. One advantage of conventional nuclear power is that there is no known alternative large-scale uses for North America's sizeable uranium reserves. Government policies could act to reduce the red-tape and the long lead times required to plan, erect and utilize environmentally compatible nuclear power plants. In concert with this, the government could lend further financial support for the development of breeder reactors technology such that energy indepedence from scarce resources may be ensured in the longer run.

The expanded use of nuclear power allows more efficient use of our more abundant resources and facilitates the liberation of energy from our more scarce resources. Other governmental policies could encourage the development and use of processes which convert solid wastes into usable fuel gas. This would help dispose of municipal wastes while at the same time helping to conserve oil and natural gas.

In conclusion, the petrochemical industry emphatically believes that "all uses of scarce hydrocarbons are not equal". Oil and natural gas are more important and valuable as raw materials than as fuel to burn. We have numerous alternative schemes to generate energy but petrochemicals require the unique molecular structures found in these hydrocarbon feedstocks. Because substitution for these scarce hydrocarbons is possible in our energy generation processes we should begin immediately to plan for the withdrawal of energy from its dependence on oil and natural gas. This objective should be of the utmost priority in energy planning.

We believe that our main objective should be to seek independence from the fundamental scarcity of oil and gas resources. The location of the resources and the political philosophy controlling them are much less important. By substitution of the abundant for the scarce resources in the production of energy we can insure energy sufficiency in the long run while we await the luxury of *self-sufficiency.*

PART III: SUMMARY

To summarize our views:

1. Government efforts to encourage capital formation for energy should not sacrifice the capital needs for added capacity and increased productivity in other industrial sectors.
2. We must distinguish between energy needs, and needs for oil and gas.
3. America's quest for energy independence should have a goal of energy independence from scarce hydrocarbons.
4. Government action should promote the formation of business and personal savings.
5. The petrochemical industry's value to the economy, and the industry's dependence on hydrocarbon feedstocks should be recognized in any governmental actions taken which affect oil and gas.
6. Development of coal offers a viable, timely solution to conserve scare oil and natural gas.

STATEMENT OF JOHN WINTHROP WRIGHT

The prolonged mismanagement of our nation's fiscal and monetary affairs which has brought our economy to its lowest point in forty years has also so reduced the cumulative formation of capital and its investment in national productive capacity that when we emerge from the present slough of stagnation and unemployment we will face shortages of industrial materials and products of all kinds and the consequent probability of renewed inflation. I believe that only a major program, utilizing the tax powers of our government to enhance both personal savings and corporate capital investment, can prevent this prospect from becoming a depressing reality, and enable us to finance the massive industrial developments which will be required to achieve domestic energy independence. For these reasons, I propose that in addition to providing extended Investment Tax Credits of 10% for industrial productive facilities and significantly greater incentives for expenditures which will enhance domestic energy production, the Congress should: Establish a citizens' capital investment tax credit to encourage savings and capital formation by individual citizens.

Although I recognize that tax proposals are not the special province of this Committee, I venture to bring to your attention this proposal which I included in my testimony as Chairman of the Committee on Capital Gains Taxation before

the Committee on Ways and Means in 1973 and in my testimony before the House Committee on Banking and Currency last August. I do so, because I believe that the preservation of our free enterprise capitalistic system requires, in addition to other remedial measures, every practicable encouragement to the formation of new capital by individual American citizens, as distinguished from simply incentives for credit allocations by banks and major corporatons many of which, although domiciled here, are trans-national in character, interests, and loyalties.

For these reasons, I propose that Congress give individual American citizens a break, and free-enterprise capitalism a boost, by extending to our people a "Citizen's Capital Investment Tax Credit" of 5% on the first $100,000 accumulated, beginning in 1975 and continuing for life.

Mechanically, this would take the form of a supplemental optional tax schedule on which any citizen could list the net annual increase (up to a cumulative total of $100,000) of his savings, cash, investments and real estate at cost less indebtedness. 5% of the net annual increase could be deducted each year from his federal income tax due. Thus each citizen who saved $1,000 in a year would get a $50 tax break, and dedicated savers could look forward to saving $5,000 in taxes on the first $100,000 accumulated over the years.

Here at one stroke, the Congress would:

(1) offer every citizen a non-inflationary tax break and incentive to become a constructive capitalist

(2) provide individual citizens with a savings tax credit comparable to the investment tax credit which is now available to commerce and industry, and creating by personal savings the capital which will be employed in productive industrial investment

(3) reduce inflationary demand by substituting savings for consumption, and capital formation for its dissipation

The immense amount of capital required for the development and utilization of our energy resources cannot be created out of thin air, or by any kind of financial manipulation. It can come only from the accumulated values which result when the productivity of our people exceeds personal consumption—in a word from Savings. I believe that a CITIZENS' CAPITAL INVESTMENT TAX CREDIT would provide the essential incentive which will be required to achieve this.

BACKGROUND AND QUALIFICATIONS OF JOHN WINTHROP WRIGHT

Born Bridgeport, Connecticut, June 27, 1912.

Education: Phillips Exeter Academy 1929, Amherst College 1933, Teacher of Economics St. John's College 1939–40.

Experience: Accountant, Home Owners' Loan Corporation, Washington, D.C. 1933–36; Special Representative, Mortgage and Trust Departments, First National Bank, Bridgeport, Connecticut 1937–38; Fraternity Business Manager, Amherst College 1938–39; Treasurer, St. John's College, Annapolis, Maryland 1939–40; Commander, active duty, U.S. Naval Reserve 1940–47; Executive Vice President, Standard Air Service 1947–48; Founder and President Wright Power Saw and Tool Corporation 1947–54; Sr. Partner, Andres Trubee and Company, Financial Consultants 1955–59; Chairman, Rototiller, Incorporated 1958–59; President Wright Investors' Service, Bridgeport, Connecticut 1960 to date. Wright Investors' Service is an investment management and advisory organization, registered with the United States Securities and Exchange Commission since 1961, presently managing directly about one quarter of a billion dollars of investments of corporate and union pension and profit sharing funds, eleemosynary institutions and other organizations and individuals, and serving as investment adviser to numerous NYSE member brokerage firms, banks, insurance companies, and institutional investors.

Author: "Q.V.T., Three Keys To Stock Market Success", published by Prentice-Hall, Inc., 1970. Also numerous articles on investment and economic subjects in most leading financial journals.

Widely consulted and quoted on economic and investment matters, Mr. Wright is frequently interviewed by national TV ("Wall Street Week") and publications (U.S. News & World Report, Finance Magazine, etc.), has testified at the invitation of the Chairman of the House Committee on Banking & Currency and Ways & Means, and was a delegate to the President's Summit Conference on Inflation.

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